PROJECT MANUAL

OLD STONEY REMODEL
PHASE TWO

June 30, 2025

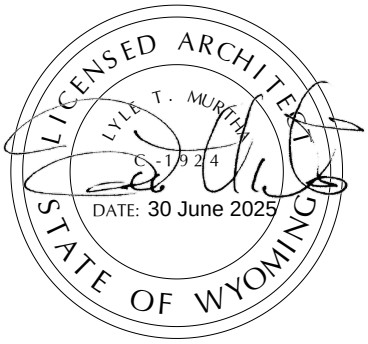
Stateline No. 7 Architects

TITLE PAGE

PROJECT:	OLD STONEY REMODEL – PHASE TWO 120 NORTH FOURTH STREET SUNDANCE, WYOMING 82729
OWNER (GRANT ADMIN.):	CITY OF SUNDANCE 213 EAST MAIN STREET PO BOX 542 SUNDANCE, WYOMING 82729 CONTACT: THERESA CURREN, CLERK-TREASURER
DATE:	JUNE 30, 2025
ARCHITECT:	STATELINE NO. 7 ARCHITECTS 444 SOUTH CENTER STREET CASPER, WYOMING 82601 (307) 265-3611 PRINCIPAL: LYLE T. MURTHA, AIA E-MAIL: lylem@stateline7.com
STRUCTURAL ENGINEER:	MARTIN/MARTIN WYOMING, INC. PO BOX 1067 SUNDANCE, WYOMING 28729 (307) 283-3900 AMANDA MILLER, P.E. E-MAIL: amiller@mmwyo.com
MECHANICAL ENGINEER:	ENGINEERING DESIGN ASSOCIATES 1607 CY AVENUE, SUITE 303 CASPER, WYOMING 82604 (307) 266-5033 ANDREW ELSTON, P.E. E-MAIL: aelston@edaengineering.com
ELECTRICAL ENGINEER:	ENGINEERING DESIGN ASSOCIATES 1607 CY AVENUE, SUITE 303 CASPER, WYOMING 82604 (307) 266-5033 MONTE N. SCHAFF, P.E. E-MAIL: mschaff@edaengineering.com

CONSTRUCTION MANAGER: VAN EWING CONSTRUCTION, INC.
5650 MAGNUSON BLVD.
GILLETTE, WYOMING 82718
(307) 682-8085
JAKE EWING
E-MAIL: jaewing@vanewing.net

I hereby certify that this specification together with the accompanying contract documents was prepared by me under my direct supervision and that I am a duly Registered Architect under the laws of Wyoming.



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Advertisement and Invitation to Bid

Sundance, WY **Old Stoney Phase II**

OWNER: City of Sundance, 213 East Main Street, Sundance WY 82729
CMAR: Van Ewing Construction, Inc., P.O. Box 99, Gillette, WY 82717, Phone 307-682-8085, Fax 307-682-3064, E-mail vec@vanewing.net, Website www.vanewingconstruction.com
BIDS: Bid packages will be bid on **July 24th, 2025 at 2:00 p.m**. Emailed bids will be accepted at vec@vanewing.net until 12:00 p.m. on July 24th, 2025. Hand delivered bids will be accepted at 120 N. 4th St, Sundance, WY 82729. All bids will be publicly opened and read aloud. Wyoming preference will apply on this project as defined by Wyoming State Statues Section W.S. 16-6-101 through 16-6-107.
PRE-BID: A Pre Bid will be held on July 10th, 2025 at 10:00am.
BOND: Contact CMAR.
PLANS: Electronic drawings & Specifications will be available upon request.
NOTE: **All Subcontractors must be pre-qualified to receive a bid packet. Pre-qualification forms will be accepted up to 5 business days prior to bid. Contact Van Ewing Construction to receive packet and information.**

DSCRP: Bid Packages:

P1 – General Construction Work
P2 – Selective Demolition
P4- Masonry Tuckpointing
P6 – Millwork & Casework
P7 – Thermal Insulation
P8 – Glazing
P9A – Gypsum Board Assemblies
P9B – Tiling
P9C – Wood & LVT Flooring
P9D – Painting & Coating
P10 – Operable Partitions
P11 - Stage Curtains
P12 – Window Coverings
P21 – Fire Suppression
P22– Plumbing
P23 – HVAC
P26 – Electrical, Communications, Fire Alarm System

Instructions to Bidders

To be considered, Bids must be submitted in accordance with these Instructions to Bidders.

1. QUALIFICATION:

All subcontractors wishing to bid on this project will be required to submit a current qualification statement to Van Ewing Construction, Inc. Forms are available by contacting Van Ewing Construction, Inc.

2. OBTAINING DOCUMENTS

Digital copies of the Contract Documents are available from Van Ewing Construction, Inc.

Contact: Van Ewing Construction, Inc.
Jake Ewing
Email: jaewing@vanewing.net
P: (307) 682-8085 | F: (307) 682-3064

3. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

Bidders shall carefully examine the Contract Documents and the construction site to obtain first-hand knowledge of existing and local conditions. Neither adjustment in subcontract price nor subcontract time will be made for conditions which can be determined by examining the site and Contract Documents. Bidders may examine the site during the scheduled walk thru on July 10th, 2025

Submit all questions about the Drawing and Specifications in writing to the CMAR at the location listed above. Replies will be issued to all bidders of record as Addenda and will become part of the Contract Documents. The CMAR and the Owner will not be responsible for oral clarification. Questions received less than Seven (7) days before the bid opening may not be answered.

4. PREPARATION OF BIDS

To be entitled for consideration, Bids must be in compliance with the following instructions:

a) All bidders must complete the prequalification process.
b) Bids must be on the Bid Form provided by the CMAR.
c) All blank spaces on the form must be filled in.
d) The authorized signature must be in longhand.
e) The completed Bid Form must be without interlineations, alterations, qualifications, or additions.
f) Bidders must submit with their bids a list of Subcontractors or Organizations proposed for the portions of the Work not provided by the submitting bidder.
g) Bidders must submit with their bids their bond rate. Bond requirements determined by CMAR.

h) 5% Wyoming preference applies as provided in W.S. 16-6-101 through 16-6-107. Certificate of Residency must be attached to each bid for consideration.

5. AWARD OF CONTRACT

The CMAR reserves the right in awarding contracts to consider the competency, responsibility and suitability of the bidders, as well as the amounts of the various bids. Contracts will not necessarily be awarded to the lowest bidders. The CMAR further reserves the right to accept or reject alternates in any order or combination, to accept or reject any bid, to waive any irregularities or informalities and to award contract in the best interest of the OWNER and CMAR.

6. SUBMISSION OF BIDS

Bid Forms will be provided by Van Ewing Construction, Inc.

Emailed Bids:
All emailed bids must be received by 12:00pm on July 24th, 2025 to the following email address: vec@vanewing.net

Hand Delivered Bids:
The Bid Form and any other documents required to be submitted with the Bid shall be enclosed in a sealed envelope. The envelope shall be addressed to:

Van Ewing Construction, Inc.
Sealed Bid Enclosed for: Old Stoney Phase II
120 N. 4th St. Sundance, WY 82729
Bid Package Number:

Bid Opening:
Date: July 24th, 2025
Time: 2:00pm
Location: Old Stoney Building
120 N. 4th St
Sundance, WY 82729

If bidding more than one Bid Package, submit each bid in its own SEALED envelope. The SEALED envelope shall be identified with the Project Name, the Bidder's name and address and the Bid Package for which the Bid is submitted. If the Bid is sent by mail, the SEALED envelope shall be enclosed in a separate mailing envelope with the notation "BID ENCLOSED FOR: "Old Stoney Phase II" on the outside.

Bidder shall assume full responsibility for timely delivery at the location designated for receipt of all Bids. Bids received after the time and date for receipt of Bids will not be accepted or returned. Telephoned Bids **will not** be accepted.

7. WYOMING SALES OR USE TAX

Contractors purchasing and consuming materials, equipment, and supplies for their performance of alteration, improvement, or repair of real property are subject to the Wyoming Sales and Use Tax. Purchases by Contractors of equipment, materials and supplies consumed in contracts with the United States government, the State of Wyoming, its departments and institutions, and the political subdivisions thereof are subject to Wyoming Sales or Use Tax. For more information contact: Wyoming Department of Revenue and Taxation, Contracts Section, 2200 Carey Avenue, Cheyenne WY 82002.

8. PREFERENCE FOR WYOMING LABORERS

The Subcontractor shall comply with the requirements of Wyoming State Statutes 16-6-201 through 16-6-206 regarding preference for Wyoming resident Laborers. This law requires Subcontractor to hire Wyoming resident laborers, as defined by the statue, when available. The Subcontractor may hire non-resident laborers but must first register with the Wyoming Department of Workforce Services office nearest to the project location.

9. LIMITATION ON SUBCONTRACTING

The project is subject to the application of State Statue 16-6-103. A successful resident bidder shall not subcontract more than thirty percent of the work covered by their contract to nonresident contractors**.**

10. BONDS:

The successful subcontractor may be required to provide a Payment and Performance Bond for 100% of the subcontract amount at the discretion of the CMAR.

11. BID MODIFICATION / WITHDRAWL

Prior to the time and date listed for receipt of bids, bids submitted early may be modified or withdrawn. Bids may not be modified or withdrawn after the bid date and time as listed for receipt of bids. Bidders are required to hold their bid for thirty (30) days from the bid date.

12. PRODUCT SUBSTITUION / PRIOR APPROVAL

Submit written substitution requests for prior approval to the Architect for consideration. Identify product, fabrication, or installation method to be replaced. Include numbers and titles of all applicable Specification Sections and Drawings. Approved substitutions will be issued to all plan holders of record as Addenda and will become part of the Contract Documents.

A. Product data will be required that shows compliance with requirements for substitution
B. If necessary, the architect will request additional information or documentation upon receipt of a request for substitution.
C. All requests for prior approvals must be received no later than seven (7) business days from bid date.

13. Alternates:

As listed on bid forms and drawings

14. ADDENDA

Addenda will be emailed to all plan holders of record. Each bidder shall acknowledge they have received all Addenda in its bid. Failure to do so may result in disqualification.

15. PERMITS, FEES, AND CONTRACTOR LICENSE

Van Ewing Construction, Inc. will obtain the prime building permit. All other fees, permits, licenses, etc. required will be the responsibility of the subcontractor performing the work.

END OF INSTRUCTIONS TO BIDDERS

ASBESTOS STATEMENT

It is brought to the contractor's attention that asbestos containing materials (greater than 1%) may be present outside the project requirements yet within the building or area. the contractor shall take the necessary precautions so as not to disturb this material. if asbestos containing materials are disturbed, the contractor shall follow and comply with the state rules.

All bidders and contractors are hereby notified that to the best knowledge of the owner or those representing the owner in any capacity, this project does not involve asbestos containing materials (greater than 1%). bidders are further instructed that no asbestos containing materials are to be installed in this project.

The contractor is cautioned that hidden materials unknown to the owner and inaccessible for testing may be found during the demolition work of this project which may be asbestos containing materials. Proper procedures shall be followed upon discovery of these materials. The owner or those representing the owner in any capacity shall not be held responsible or liable for any injury or cost to any person resulting from handling of, or proximity to such materials.

Neither the owner, employees or agents of the owner, nor any other person may have any claim, right or action against the prime contractor for any asbestos related injury or damage arising from the activities or a certified asbestos abatement subcontractor. Unless exempt under applicable state and federal law, no asbestos abatement work shall be performed except by a certified asbestos contractor. A certified asbestos abatement subcontractor shall hold the owner and general contractor harmless from any liability arising from such subcontractors activities on the project. A certified asbestos abatement contractor shall cause the owner and, if acting as a subcontractor, the general contractor to be named as additional insured’s and provide sufficient proof of insurance for the purpose of this section.

No asbestos-containing materials have been specified for this project and none shall be installed. Upon completion of this project all subcontractors and material suppliers shall provide the owner a letter stating that no asbestos-containing materials were used in the construction of this facility.

PRODUCT SUBSTITUTION REQUEST

Stateline No 7 ARCHITECTS

PROJECT: Old Stoney – Phase Two

PROJECT #: 16-022

FIRM NAME/ADDRESS/PHONE-FAX # OF PROPOSER_____

_____

_____

_____

_____

ATTN:_____

DATE RECEIVED:_____

SUBSTITUTION DEADLINE: Minimum of 10 days prior to the bid date

This Product Substitution Request must be submitted with all substitution requests, or the request may not be considered.

The substitution request must be received at the Architect's office no later than the date indicated above, or the request will not be considered.

By signing below, bidder acknowledges that they are providing a Certificate of Equal Performance and Assumption of Liability for Equal Performance.

Signature_____ **Title**_____

PRODUCT SPECIFIED_____

DIVISION/SECTION_____**PAGES**_____

PROPOSED SUBSTITUTION_____

Please attach additional product information to form so that a complete comparison between the specified item and the substitution item can be thoroughly examined. Highlight and mark pages and items to be considered.

PRODUCT ANALYSIS:

SPECIFIED ITEM DESCRIPTION:	**SUBSTITUTION ITEM DESCRIPTION:**

For Architect/Engineer Use:

THE PROPOSED SUBSTITUTION IS ☐ APPROVED ☐ NOT APPROVED DATE_____

REMARKS_____

_____

307.265.3611 307.265.3617 fax 444 South Center Street Casper, WY 82601 www.stateline7.com

DIVISION

1

GENERAL REQUIREMENTS

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Old Stoney Remodel - Phase Two

B. Architect's Name: Stateline No.7 Architects.

C. The Project consists of the alteration of two floor levels of an existing 1924-constructed building of approximately 8,000 square feet.

1.02 DESCRIPTION OF ALTERATIONS WORK

A. Scope of alterations work is indicated on drawings.The building as previously undergone a complete "gut" demolition project and Phase 1 project that included all new finishes along with interior partitions, stairs, elevator, mechanical (HVAC and plumbing) and electrical systems. This Phase 2 project includes a renovation of the second floor level with all new finishes, HVAC, plumbing, and electrical along with some remodel work on the basement floor level to include finishes, HVAC, plumbing, and electrical.

1.03 WORK BY OWNER

A. The owner will supply (only) tin ceiling, tin soffit, and tin braid panels as noted on the drawings. The owner will supply (only) refurbished wood panel doors as indicated on the drawings. The owner will supply (only) electrical fixtures as noted on the drawings. And the owner will supply (only) wood trim as noted on the drawings.

1.04 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building (sub basement level, basement level, and first floor level) during the entire construction period.

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

C. Schedule the Work to accommodate Owner occupancy.

1.05 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 and owner's tenant occupancy.
   2. Work by Others.
   3. 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. See sequencing plan on drawings for additional information.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Existing building spaces may not be used for storage, except for the second floor level.

E. Time Restrictions:
   1. Limit conduct of especially noisy exterior work to as is acceptable to the owner and the owner's tenants _____.

F. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 017800 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement (or similar form).

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. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

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

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Monthly.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

F. Execute certification by signature of authorized officer.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

I. Include the following with the application:
   1. Partial release of liens from major subcontractors and vendors as stipulated in the Owner-Contractor agreement.
   2. Affidavits attesting to off-site stored products.

J. When Architect requires substantiating information, submit data justifying dollar amounts in question.

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.

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

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 016000.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.

F. Substantiation of Costs: Provide full information required for evaluation.
   1. 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. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

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

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

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

J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

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

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 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 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

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

1.03 SCHEDULE OF ALTERNATES

A. Alternate No. One - Exterior building brick tuck pointing of masonry (base bid: none).

B. Alternate No. Two - Architecural mullions on west exterior windows (base bid: none).

C. Alternate No. Three - Glass operable walls in banquet rooms (base bid: fabric operable walls in banquet roms).

D. Alternate No. Four - Stage sound equipment (base bid: rough in for only).

E. Alternate No. Five - Stage curtains (base bid: front stage curtains and front stage valance only).

F. Alternate No. Six - Basement floor level remodel including all associated mechancial, plumbing, and electrical work (base bid: none).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 012300 - Alternates, for product alternatives affecting this section.

B. Section 013000 - Administrative Requirements: Submittal procedures, coordination.

C. 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.
      a. Unavailability.
      b. Regulatory changes.
   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 after the bid period.

1.04 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

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 provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. 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.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

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

1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

E. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
   1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.
   2. Owner and the design team will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.

B. Submittal Form (before award of contract):
   1. Submit substitution requests by completing the form contained in the project manual. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable (including standard susbstition forms from suppliers and subcontractors).

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. 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.

B. 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.

C. 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.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

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.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Progress meetings.

E. Construction progress schedule.

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

G. Requests for Interpretation (RFI) procedures.

H. Submittal procedures.

1.02 RELATED REQUIREMENTS

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

B. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

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 WEB-BASED PROJECT SOFTWARE SERVICE

A. Web-Based Project Software Service is not required, but may be used.
   1. ELECTRONIC DOCUMENT SUBMITTAL SERVICE
      a. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via email or alternatively an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

1) Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
2) It is Contractor's responsibility to submit documents in allowable format.
3) If an alternate internet based submittal service is used, subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
4) Paper document transmittals will not be reviewed.
5) All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
6) Any verification samples or samples for selection must be accompanied by the physical sample (no photographs and/or brochure color selections or verifications will be made).

b. Cost: The cost of the alternate internet based submittal service, if used, is to be paid by Contractor; include the cost of the service in the Contract Sum.

2. PRECONSTRUCTION MEETING
   a. Architect will schedule a meeting after Notice of Award, if necessary.
   b. Attendance Required:
      1) Owner.
      2) Architect and necessary Design Team Consultants.
      3) Contractor.
      4) Major Subcontractors (mechanical, electrical, plumbing, etc..
   c. Items to be submitted to the Architect prior to preconstruction meeting:
      1) Execution of Owner-Contractor Agreement or change order for the portion of the work (Building Package).
      2) Submission of list of subcontractors, schedule of values, and progress schedule.
      3) Designation of personnel representing the parties to Contract and Architect.
      4) Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
      5) Scheduling.
3. PROGRESS MEETINGS
   a. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
   b. Attendance Required:
      1) Contractor.
      2) Owner.
      3) Architect.
      4) Special consultants.
      5) Contractor's superintendent.
      6) Major subcontractors when necessary.
   c. Agenda:
      1) Review of work progress.
      2) Field observations, problems, and decisions.
      3) Identification of problems that impede, or will impede, planned progress.
      4) Review of submittals schedule and status of submittals.
      5) Review of RFIs log and status of responses.
      6) Review of off-site fabrication and delivery schedules.
      7) Maintenance of progress schedule.
      8) Corrective measures to regain projected schedules.

9) Planned progress during succeeding work period.
10) Coordination of projected progress.
11) Maintenance of quality and work standards.
12) Effect of proposed changes on progress schedule and coordination.
13) Other business relating to work.

4. 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) Ensure that major Subcontractors have reviewed and accepted proposed schedule prior to submittal.
   d. Within 10 days after joint review, submit complete schedule.
   e. Submit updated schedule every 30 days.
5. 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. 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 using an electronic version of the form appended to this section.
      3) Combine RFI and its attachments into a single electronic file. PDF format is preferred.
   c. 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) 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).
      2) 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.

d. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1) Official Project name and number, and any additional required identifiers established in Contract Documents.
   2) Discrete and consecutive RFI number, and descriptive subject/title.
   3) Issue date, and requested reply date.
   4) 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).
   5) Annotations: Field dimensions and/or description of conditions which have engendered the request.
   6) 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.

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

f. Review Time: Architect will respond and return RFIs to Contractor within ten 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.

g. 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, R1, R2, etc. 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.

6. SUBMITTALS FOR REVIEW
   a. When the following are specified in individual sections, submit them for review:
      1) Product data.
      2) Design data.
      3) Shop drawings.
      4) Samples for selection.
      5) Samples for verification.
   b. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
   c. Contractor to review (thoroughly) all submittals prior to forwarding to the Architect.
   d. Samples will be reviewed for aesthetic, color, or finish selection.

e. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

7. SUBMITTALS FOR INFORMATION
   a. When the following are specified in individual sections, submit them for information:
      1) Design data.
      2) Certificates.
      3) Test reports.
      4) Inspection reports.
      5) Manufacturer's instructions.
      6) Manufacturer's field reports.
      7) Other types indicated.
   b. Submit for Architect's knowledge as contract administrator or for Owner.
8. SUBMITTALS FOR PROJECT CLOSEOUT
   a. Submit Correction Punch List for Substantial Completion.
   b. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
      1) Project record documents.
      2) Operation and maintenance data.
      3) Warranties.
      4) Bonds.
      5) Other types as indicated.
   c. Submit for Owner's benefit during and after project completion.
9. NUMBER OF COPIES OF SUBMITTALS
   a. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
   b. Samples (hard copies of colors/materials to be selected): Submit the number specified in individual specification sections; two of which will be retained by Architect.
      1) After review, produce duplicates.
      2) Retained samples will not be returned to Contractor unless specifically so stated.
      3) Contractor responsible for all costs associated with procuring and providing samples.
10. SUBMITTAL PROCEDURES
    a. General Requirements:
       1) Use a separate transmittal for each item.
       2) Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
       3) Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
       4) Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
          (a) Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
       5) Deliver submittals to Architect at business address or email electronic/PDF submittals.
       6) Schedule submittals to expedite the Project, and coordinate submission of related items.

(a) For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.

7) Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
8) Provide space for Contractor and Architect review stamps.
9) When revised for resubmission, identify all changes made since previous submission.
10) Distribute reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
11) Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
12) Submittals not requested will not be recognized or processed.
13) Submittals not requested will be recognized, and will be returned "Not Reviewed",

b. Product Data Procedures:
1) Submit only information required by individual specification sections.
2) Collect required information into a single submittal.
3) Do not submit (Material) Safety Data Sheets for materials or products.

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

d. Samples Procedures:
1) Transmit related items together as single package.
2) Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

11. SUBMITTAL REVIEW
a. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
b. Submittals for Information: Architect will not acknowledge receipt, and take no other action.
c. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1) Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

d. Architect's and consultants' actions on items submitted for review:
1) Authorizing purchasing, fabrication, delivery, and installation:
(a) "Approved", or language with same legal meaning.
(b) "Approved as Noted, Resubmission not required", or language with same legal meaning.
(1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
(c) "Approved as Noted, Resubmit for Record", or language with same legal meaning.
(1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
(2) Non-responsive resubmittals may be rejected.

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.

e. Architect's and consultants' actions on items submitted for information:

1) Items for which no action was taken:

(a) "Received" - to notify the Contractor that the submittal has been received for record only.

2) Items for which action was taken:

(a) "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 013553
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security measures including entry control, personnel identification, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: use of premises and occupancy.

B. Section 015000 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

A. Protect Work , existing premises and Owner's operations from theft, vandalism, and unauthorized entry.

B. Initiate program at project mobilization.

C. Maintain program throughout construction period until Owner occupancy.

1.04 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.

B. Allow entrance only to authorized persons with proper identification.

C. Owner will control entrance of persons and vehicles related to Owner's operations.

1.05 RESTRICTIONS

A. Do not allow cameras on site or photographs taken except by written approval of the Contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Control of installation.

G. Mock-ups.

H. Tolerances.

I. Manufacturers' field services.

J. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.

B. Section 016000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.04 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
   1. Design Services Types Required:
      a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor’s sole responsibilities for construction means, methods, techniques, sequences, and procedures.
      b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

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

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
   1. Temporary sheeting, shoring, or supports.
   2. Temporary scaffolding.
   3. Temporary bracing.

1.06 SUBMITTALS

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

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include required product data and shop drawings.
   2. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
   3. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

C. Test Reports: After each test/inspection, promptly submit electronic copies of report to Architect, Owner, and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
   2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

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

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.08 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

E. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.09 TESTING AND INSPECTION AGENCIES AND SERVICES

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

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

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

D. Contractor is responsible for coordinating and scheduling of materials testing agency.

E. Costs for re-testing due to failure to meet specifications shall be borne by the General Contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

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

C. Notify Architect seven (7) working days in advance of dates and times when mock-ups will be constructed.

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

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

F. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.

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

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

3.03 TOLERANCES

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

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

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

3.04 TESTING AND INSPECTION

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

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

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

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

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

3.05 MANUFACTURERS' FIELD SERVICES

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

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

3.06 DEFECT ASSESSMENT

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

B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 014219
REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements relating to referenced standards.

1.02 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with the reference standard of date of issue specified in this section, except where a specific date is established by applicable code.

C. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.01 AA -- ALUMINUM ASSOCIATION, INC.

A. AA DAF-45 - Designation System for Aluminum Finishes; 2003 (Reaffirmed 2009).

2.02 AABC -- ASSOCIATED AIR BALANCE COUNCIL

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

2.03 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022, with Errata (2023).

B. AAMA 305 - Voluntary Specification for Fiber Reinforced Thermoset Profiles; 2022.

C. AAMA 307 - Voluntary Specification for Laminates Intended for Use on AAMA Certified Profiles; 2016.

D. AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure; 2017.

E. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

F. AAMA 501.4 - Recommended Static Test Method for Evaluating Window Wall, Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Story Drift; 2018.

G. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

H. AAMA 624 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Fiber Reinforced Thermoset Profiles; 2020.

I. AAMA SFM-1 - Aluminum Storefront and Entrance Manual; 2014.

2.04 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS

2.05 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL

A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Concrete Construction; 2020.

C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI 305R - Guide to Hot Weather Concreting; 2020.

F. ACI 306R - Guide to Cold Weather Concreting; 2016.

G. ACI 308R - Guide to External Curing of Concrete; 2016.

H. ACI 310.1 - Specification for Polished Concrete Slab Finishes; 2020.

2.06 AIA -- THE AMERICAN INSTITUTE OF ARCHITECTS

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

B. AIA G702CMa - Application and Certificate for Payment, Construction Manager-Adviser Edition; 1992.

2.07 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

A. AISC 325 - Steel Construction Manual; 2023.

2.08 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE

A. ANSI/ACMA (GM) - FRP Composites Grating Manual for Pultruded and Molded Grating and Stair Treads; 2017.

B. ANSI/APA PRG 320 - Standard for Performance-Rated Cross-Laminated Timber; 2019.

C. ANSI/AWI 0400 - Factory Finishing; 2022.

D. ANSI/AWI 0620 - Finish Carpentry/Installation; 2018.

E. ANSI/AWI 0641 - Architectural Wood Casework; 2019.

F. ANSI/IWCA I-14 - Window Cleaning Safety Standard; 2001.

G. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

H. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.

I. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2023.

J. 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.

K. 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.

L. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

M. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

N. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

O. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.; 2003.

P. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.; 1998 (R2011).

Q. ANSI A250.11 - Recommended Erection Instructions for Steel Frames.; 2012.

R. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2024.

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

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

U. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames; 2022.

V. ANSI A300 Part 5 - American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction); 2019.

W. ANSI A300 Part 6 - Tree, Shrub, and Other Woody Plant Management--Standard Practices (Planting and Transplanting); 2012 (Reapproved 2018).

X. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

2.09 APA -- APA - THE ENGINEERED WOOD ASSOCIATION

A. APA E30 - Engineered Wood Construction Guide; 2019.

B. APA PRP-108 - Performance Standards and Qualification Policy for Wood Structural Panels (Form E445); 2021.

2.10 ASHRAE -- AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASHRAE (REFR) - ASHRAE Handbook - Refrigeration; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASHRAE (HVACS) - ASHRAE Handbook - HVAC Systems and Equipment; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

2.11 ASTM A SERIES -- ASTM INTERNATIONAL

A. ASTM A29/A29M - Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought; 2023.

2.12 ASTM D SERIES -- ASTM INTERNATIONAL

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2022.

2.13 ASTM E SERIES -- ASTM INTERNATIONAL

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

2.14 DHI -- DOOR AND HARDWARE INSTITUTE

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

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

C. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; 2000 (ANSI/DHI A115 Series).

2.15 FM -- FACTORY MUTUAL GLOBAL

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

2.16 GA -- GYPSUM ASSOCIATION

A. GA-201 - Using Gypsum Board for Walls & Ceilings; 1990.

B. GA 203 - Installation of Screw-Type Steel Framing Members to Receive Gypsum Board;.

C. GA-214 - Levels of Finish for Gypsum Panel Products; 2021.

2.17 HPVA -- HARDWOOD PLYWOOD VENEER ASSOCIATION

A. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

2.18 ICC -- INTERNATIONAL CODE COUNCIL, INC.

A. ICC (IEBC) - International Existing Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

2.19 IGMA -- INSULATING GLASS MANUFACTURERS ALLIANCE

A. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

B. IGMA TM-4000 - Insulating Glass Manufacturing Quality Procedures; 2002 (Reaffirmed 2007).

2.20 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

A. NFPA 1 - Fire Code; 2024, with Errata.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

2.21 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION

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

2.22 SCAQMD -- SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

A. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

2.23 UL -- UNDERWRITERS LABORATORIES INC.

A. UL (BMD) - Building Materials Directory; current edition.

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

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

2.24 WCMA -- WINDOW COVERING MANUFACTURERS ASSOCIATION

A. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

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

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

I. Field offices.

1.02 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical power and metering, consisting of making these available..
   2. Water supply, consisting of making these available.

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

1.03 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office and/or superintendent at time of project mobilization.

1.04 TEMPORARY SANITARY FACILITIES

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

B. Use of existing facilities is permitted.

C. Maintain daily in clean and sanitary condition.

D. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

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

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

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

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

1.06 FENCING

A. Construction: Contractor's option.

B. Construction: Commercial grade chain link fence.

C. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

D. Provide fencing around construction site as needed.

1.07 EXTERIOR ENCLOSURES

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

1.08 INTERIOR ENCLOSURES

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

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

1.09 SECURITY

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

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

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

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

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Use on-street parking to accommodate construction personnel.

1.11 WASTE REMOVAL

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

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

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

1.12 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.13 FIELD OFFICES - SEE SECTION 015213

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

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

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

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. Procedures for Owner-supplied products.

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

C. Section 014000 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

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

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

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

1.04 QUALITY ASSURANCE

A. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
   1. Hardwood flooring for salvage and reuse as indicated on the drawings.
   2. Tin ceiling panels, tin soffit panels, and tin braid panels as indicated on the drawings.

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 drawings for list of items required to be salvaged for reuse and relocation.

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.

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.

B. "Notice for Request for Bids" document specifies time restrictions for submitting requests for substitutions during the bidding period and the documents required.

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

D. A Substitution Request for products, 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.

E. 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.

F. Substitution Submittal Procedure:
   1. Prior to bid date, submit request for substitution using standard product substitution form contained in this project manual (see due date on form).
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. The Architect will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

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

3.03 TRANSPORTATION AND HANDLING

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

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

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

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

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

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

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

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

3.04 STORAGE AND PROTECTION

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

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

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

D. Store with seals and labels intact and legible.

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

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

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

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

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

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

K. Do not store products directly on the ground.

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

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

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

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

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

END OF SECTION

SECTION 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. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

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

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

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

B. Section 013000 - Administrative Requirements: Submittals procedures.

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

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

E. Section 015000 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

1.03 SUBMITTALS

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

B. 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.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
      e. Alternatives to cutting and patching.
      f. Effect on work of Owner or separate Contractor.
      g. Written permission of affected separate Contractor.
      h. Date and time work will be executed.

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

1.04 QUALIFICATIONS

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

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.

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.

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

C. 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 enclosures to prevent entry of dust generated outdoors.

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

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

F. Ensure windows, doors, and the buildign envelope remains closed and sealed to prevent the intrusion of bats.

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

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

1.06 COORDINATION

A. See Section 011000 for occupancy-related requirements.

B. 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.

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

D. 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.

E. 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.

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

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

H. 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 PREINSTALLATION MEETINGS

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

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

C. Contractor to prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

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

3.04 LAYING OUT THE WORK

A. Promptly notify Architect of any discrepancies discovered.

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

C. Utilize recognized engineering survey practices.

D. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

E. Periodically verify layouts by same means.

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

3.05 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. 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.

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

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

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

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

3.06 ALTERATIONS

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

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction as needed .

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

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

E. Services (Including but not limited to Electrical): 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 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.
   3. Verify that abandoned services serve only abandoned facilities.

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; patch holes left by removal using materials specified for new construction.

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

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where 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.
   3. 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.

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

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

J. Clean existing systems and equipment.

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

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

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

3.07 CUTTING AND PATCHING

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

B. See Alterations article above for additional requirements.

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

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

E. Employ skilled and experienced 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 , to full thickness of the penetrated element.

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

3.08 PROGRESS CLEANING

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

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

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

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

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

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

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

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

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

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic from landscaped areas.

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

3.10 SYSTEM STARTUP

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

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

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

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

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

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

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

3.11 DEMONSTRATION AND INSTRUCTION

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

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

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

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

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

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

3.12 ADJUSTING

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

B. Testing, adjusting, and balancing HVAC systems: See Section 230593 - Testing, Adjusting, and Balancing for HVAC.

3.13 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.
   1. Clean areas to be occupied by Owner prior to final completion and Architect's punch walkthrough before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

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

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

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

F. Clean filters of operating equipment.

G. Clean debris from area drains and drainage systems.

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

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

J. Clean Owner-occupied areas of work that were affected by construction activities.

3.14 CLOSEOUT PROCEDURES

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

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

C. 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.

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

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

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

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

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

3.15 MAINTENANCE

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

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

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

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

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

END OF SECTION

SECTION 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.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Record information for "as-built" drawings concurrent with construction progress.

D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

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

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. 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. 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.

D. 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.
   1. Include HVAC outdoor and exhaust air damper calibration strategy.
      a. Include provisions which ensure that full closure of dampers can be achieved.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Provide control diagrams by controls manufacturer as installed.

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

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

L. Include test and balancing reports.

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

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into PDF digital format 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. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

D. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

E. 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.

F. 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.

G. Text: Manufacturer's printed data.

H. Drawings.

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. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Original 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.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

DIVISION

2

EXISTING CONDITIONS

SECTION 020342
REMOVAL AND SALVAGE OF PERIOD CONSTRUCTION MATERIALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work includes deconstruction and salvage of identified historic items and materials and removal of rubbish and debris.

B. Specified procedures required for preservation, rehabilitation, restoration, and reconstruction treatment areas.

C. Historic items and materials are indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Contract descriptions, description of nonhistoric preservation alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

B. Section 024100 - Demolition: Selective demolition of nonhistoric, built site elements.

C. Section 024100 - Demolition: Selective demolition of nonhistoric building elements for alteration purposes.

1.03 DEFINITIONS

A. Debris: Nonhistoric building materials and contents destroyed during demolition.

1.04 REFERENCE STANDARDS

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

1.05 QUALITY ASSURANCE

A. Deconstruction Crew Qualifications: Workers trained and experienced in removal and salvage of specific historic materials.

1.06 FIELD CONDITIONS

A. Dust Control: Control dust resulting from removal, salvage, and demolition operations from spreading to occupied portions of the project and creating a nuisance in surrounding area. Use of water to control dust is not permitted when it will result in or create:
   1. Damage to existing building materials.
   2. Hazardous or objectionable conditions such as ice, flooding, or pollution.

B. Protection of Existing Historic Property: Before beginning removal, salvage, or demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Take necessary precautions to avoid damage to existing items to remain in place, be reused, or remain Owner's property. Repair or restore to original condition items damaged by Contractor, using approved means, methods, and techniques. Replace items that cannot be successfully repaired or restored to original condition.

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PERIOD TREATMENT, GENERAL

3.02 GENERAL PROCEDURES

A. Drawings indicating existing construction, building services, and site utilities are based on casual field observation and existing record documents only.
   1. Verify that construction, building services, and site utilities arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing historic elements.
   3. 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; as necessary.

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

D. See Section 024100 for selective demolition of nonhistoric elements.

3.03 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.

3.04 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.
   1. Remove furnishings, equipment, and materials not scheduled for salvage or recycling prior to initiating salvaging procedures.
   2. Remove historic items to be salvaged from the structure prior to deconstruction work.
   3. Accomplish removal of salvageable items by hand labor to the maximum extent possible.
   4. Take care not to damage historic portions of the structure scheduled to remain or items identified for salvage.

B. Site Elements: Remove intact and salvage site elements indicated on drawings.

C. Masonry Elements: Remove intact and salvage masonry elements indicated on drawings and stone.

D. Metal Elements: Remove intact and salvage metal elements indicated on drawings.

E. Wood Elements: Remove intact and salvage wood elements indicated on drawings.

F. Mechanical Equipment: Remove intact and salvage equipment and fixtures indicated on drawings.

G. Electrical Equipment: Remove intact and salvage equipment and fixtures indicated on drawings.

3.05 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.
   1. Remove items indicated on drawings.

B. Services: Remove existing systems and equipment to extent indicated, including but not limited to Plumbing, HVAC, Electrical, and Telecommunications elements:
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and other 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 switchover.
   3. Verify that abandoned services serve only abandoned facilities prior to commencing removals.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stubs and tag with identification.

C. 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.

3.06 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.

3.07 CLEANING

A. Upon completion of work, clean dust, dirt, and debris caused by salvage and demolition operations from portions of existing structure to remain and adjacent areas. Remove and transport debris and rubbish in a manner that prevents spillage on streets or adjacent areas. Obey local regulations regarding hauling and disposal.

END OF SECTION

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of building elements for alteration purposes.

C. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

D. Section 020342 - Removal and Salvage of Period Construction Materials.

1.03 DEFINITIONS

A. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.

B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of 3 years of documented experience.

PART 3 EXECUTION

2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 017000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Use of explosives is not permitted.
   3. 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.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.

8. 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.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

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.

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

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

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

2.02 EXISTING UTILITIES

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

B. Protect existing utilities to remain from damage.

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

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

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

2.03 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 and as necessary for the owner's occupancy.

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

D. Remove existing work as indicated and required to accomplish new work.
1. Remove items indicated on drawings.

E. Services including, but not limited to, HVAC, Plumbing, 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. See Section 011000 - Summary for limitations on outages and required notifications.
4. Verify that abandoned services serve only abandoned facilities before removal.
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.

F. 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.

2.04 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

DIVISION

4

MASONRY

SECTION 040300
CONSERVATION TREATMENT FOR PERIOD MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleaning of existing masonry surfaces.

B. Repair of damaged existing masonry.

C. Raking and repointing of existing mortar joints.

1.02 RELATED REQUIREMENTS

A. Section 013591 - Period Treatment Procedures for general historic preservation project requirements.

1.03 DEFINITIONS

A. Aggregates: Sand component of mortar.

B. Repointing: Removal of existing mortar joints to specified depth and replacement with mortar matching color, texture, and performance of original mortar, and with water vapor transmission, bond, hardness, and flexibility compatible with original mortar, tested in accordance with ASTM C1713.

1.04 REFERENCE STANDARDS

A. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

B. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

C. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

D. ASTM C1713 - Standard Specification for Mortars for the Repair of Historic Masonry; 2023.

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

1.05 SUBMITTALS

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

B. Product Data: Provide data on cleaning compounds.

C. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.

D. Restorer's qualification statement.

E. Mortar testing agency qualification statement and existing mortar analysis test including formula for custom blended mortar mix.

1.06 QUALITY ASSURANCE

A. Mortar Testing Agency Qualifications: Independent firm specializing in performing analysis of historic masonry mortar.

B. Restorer Qualifications: Company specializing in period masonry restoration with minimum ten years of documented experience.

1. Use experienced masons who have demonstrated proficiency with tools on historic structures.

1.07 MOCK-UPS

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

B. Restore and repoint existing masonry wall defined below. Include mortar and and stone masonry cleaning.

1. Repointing Mortar Joints:
    a. Demonstrate cutting out mortar joints, preparation for repointing, and mixing, installing, and curing mortar.

C. Clean a 10-foot (3 m) by 10-foot (3 m) panel of wall of each type of period masonry.
   1. Repeat, using different cleaning methods for until acceptable.

D. Approved restoration mock-up areas, including results of procedures employed, will remain and become the quality standard for work of this section.

1.08 FIELD CONDITIONS

A. Cold and Hot Weather Requirements for Masonry Work: Comply with requirements of TMS 402/602.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

A. Cleaning Agent: Detergent type.
   1. Manufacturers:
      a. American Building Restoration Products, Inc: www.abrp.com/#sle.
      b. Diedrich Technologies, Inc: www.diedrichtechnologies.com/#sle.
      c. HMK Stone Care System: www.hmkstonecare.com/#sle.
      d. PROSOCO: www.prosoco.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.

2.02 MORTAR MATERIALS

A. Hydraulic Hydrated Lime:

B. Hydrated Lime: ASTM C207, Type S.

C. Sand: ASTM C144.

D. Mortar Mixing:
   1. General Requirements:
      a. Do not use modern additives unless permitted in writing by Architect.
      b. NHL Mortar: Mix in accordance with manufacturer's instructions.
      c. Match the historic mortar in color, texture, and tooling.
      d. Match sand used in the historic mortar.
   2. Mortar for Stone:
      a. Use lime and sand mortars with compressive strength approximately 1/3 of compressive or crushing strength of stone units.
      b. Do not use portland cement mortars.

2.03 ACCESSORY MATERIALS

A. Mortar Additives: Matching project's existing historic mortars including components to enhance color and texture.

PART 3 EXECUTION

3.01 PERIOD TREATMENT, GENERAL

3.02 EXAMINATION

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

3.03 EVALUATION AND ASSESSMENT

A. Begin masonry work after evaluation and analysis of areas to be repaired are completed including, but not limited to, sampling and testing of the existing mortar to determine its composition and qualities.

1. Retrieve a sample of the existing mortar and submit it to a testing company to determine the exact orginal mortar formula for a custom pre-blended mortar mix (including color and addative analysis)
    a. Acceptable testing company: Prism Testing, Inc., Minneapolis, Minnesota.

B. Do not start repairs until conditions causing masonry deterioration have been identified.

C. To forestall recurrence of masonry deterioration, correct deterioration-causing conditions prior to start of the restoration work.

D. Analyze composition of existing historic bedding mortar to provide basis for matching with new mortar.

3.04 PREPARATION

A. Protect other elements from damage that may result from restoration procedures.

B. Carefully remove and store identified items located in areas to be restored including, but not limited to, fixtures, fittings, finish hardware, and accessories; reinstall upon completion of restoration work.

C. Protect nonrestoration areas from restoration areas to prevent damage.

D. Mask or cover adjacent surfaces and permanent equipment. Secure coverings without using nails and without tape that leaves residue. Do not use impervious sheeting which produces condensation.
    1. Use materials that will withstand cleaning and restoration procedures.

E. Cover existing landscaping within work areas with tarpaulins or similar covers during work periods.
    1. Provide coverings that allow plants to breathe.
    2. Remove coverings at the end of each workday. Do not cover plants with waterproof membranes for more than eight hours at a time.
    3. Set scaffolding and ladder legs away from plants. Request and receive approval from Owner for plant pruning necessary to conduct conservation treatment operations.

F. Separate adjacent occupied areas with dust proof and weatherproof partitions.

G. When using liquid cleaning methods, provide drainage devices to prevent runoff over adjacent surfaces, unless those surfaces are impervious to damage from runoff.

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

I. Do not attach scaffolding, ladders, or working platforms to the building without written authorization and instructions from Architect.

3.05 INSTALLATION

A. Do not mix or apply materials when the ambient temperature or humidity are outside of range recommended by their manufacturers.

B. Schedule conservation treatments to be carried out during appropriate environmental conditions to avoid weather-related failures.

3.06 REPAIR

3.07 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1/2-inch (6 mm) depth or until sound mortar is reached.

C. Use power tools only after test cuts determine no damage to masonry units will result.

D. Exercise appropriate caution to prevent damage to existing masonry.

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

F. Premoisten joints and apply pointing mortar. Pack tightly in maximum 1/4-inch (6 mm) layers. Form a smooth, compact concave joint to match existing historic joints (verify).

G. Moist cure for 72 hours.

3.08 RESTORATION CLEANING

A. Preclean surfaces and remove large particles with wood scrapers or nonferrous wire brush.

B. Perform cleaning and rinsing of exterior masonry only during daylight hours.

C. Preparatory Exterior Masonry Cleaning: Use safe spray pressures for each type of item to be cleaned.
   1. Account for use of detergent and abrasives in cleaning solutions when setting pressure and flow of spray.
   2. Use low-pressure spray at 100 to 400 psi (0.69 to 2.76 MPa) and 4 to 6 gpm (0.25 to 0.4 L/s) flow rate for cleaning stone masonry.

D. Restoration Cleaners:
   1. Do not use acidic chemical cleaners on limestone, marble, concrete, or other calcareous masonry materials.
   2. Apply restoration cleaner on masonry using brush or roller in accordance with manufacturer's instructions.
   3. Allow sufficient time, as recommended by manufacturer, for solution to remain on masonry.

E. Washing or Rinsing Vertical Surfaces:
   1. Rinse from the bottom up with potable water applied at 600 psi (4140 kPa) and at a rate of 6 gpm (24 L/min) through a 15 to 45 degree fan spray tip.
      a. Use adjustable equipment capable of reducing water pressure and flow rate as needed for sensitive surfaces.
      b. Rinse with water and pressure sufficient to flush restoration cleaner and dissolved soiling from the masonry surface and surface pores without damaging masonry. Do not leave cleaning procedure residues on masonry.

3.09 AGING

A. Rub in new masonry work to match adjacent historic work and the approved mock-up.
   1. Use carbon black in small amounts, rubbing in well with burlap rags.

B. After each application, dust off surplus and wash down with low-pressure hose. Allow surface to dry before proceeding with succeeding applications.

C. Match mock-up approved by Architect.

3.10 CLEANING

A. Remove stains, efflorescence, or other excess resulting from the work of this section. Do without delay to avoid penetration and setting.

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

C. Clean surrounding surfaces.

END OF SECTION

DIVISION

6

WOOD, PLASTICS, AND COMPOSITES

SECTION 060300
CONSERVATION TREATMENT FOR PERIOD WOOD

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Repair of damaged wood components.

B. Replacement of damaged wood components.

C. Removal of existing wood finishes and refinishing.

1.02 RELATED REQUIREMENTS

A. Section 099300 - Staining and Transparent Finishing.

1.03 DEFINITIONS

A. Dutchman: Repair method in which deteriorated wood component is removed in part and replaced with salvaged, harvested, or new wood.

B. In situ: Repair procedure in which wood elements and components remain in place and are repaired without removal from the system they are a part of.

C. New Elements: New, nonhistoric materials added to wood structures to aid in resistance to structural loads or water infiltration.

D. Patch: Use of substitute repair materials to treat damaged or deteriorated components in situ.

E. Surface Treatment: Application of traditional materials or contemporary chemical products to the surface of wood components to provide protection and reduce water infiltration.

1.04 REFERENCE STANDARDS

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

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

1.05 QUALITY ASSURANCE

A. Restorer Qualifications: Company specializing in period wood restoration with minimum five years of documented experience.
   1. Use experienced carpenters and furniture craftspersons who have demonstrated proficiency in properly operating tools on historic elements.

1.06 MOCK-UPS

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

B. Restore existing wood framedl in location indicated including trim and wood flooring.
   1. Removal and Replacement: Remove deteriorated siding and replace with sound salvaged wood flooring. Demonstrate proposed restoration techniques and sequencing.
   2. Repair Material:
      a. Patching: Apply repair material on two areas, minimum, of wood components of type to be repaired.
      b. Dutchman: Provide dutchman repairs in two locations including one that is only cut and prepared for application. Indicate wood inserts and techniques. Do not proceed with other dutchman repairs until technique has been approved by Architect.

C. Approved restoration mock-up areas, including results of procedures employed, will remain and become the quality standard for work of this section.

PART 2 PRODUCTS

2.01 REPLACEMENT ROUGH CARPENTRY MATERIALS

A. Sizes: Nominal sizes as indicated on drawings, or field verify. Use salvaged flooring, no new wood flooring to be used.

B. Moisture Content: S-dry or MC19.

PART 3 EXECUTION

3.01 PERIOD TREATMENT, GENERAL

3.02 EXAMINATION

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

3.03 PREPARATION

A. Protect surrounding elements from damage that may result due to performance of restoration procedures.

B. Remove and store removable items located in areas to be restored including, but not limited to, hardwood flooring; reinstall upon completion.

C. Separate areas to be protected from restoration areas to prevent damage.

D. Mask or cover adjacent surfaces and permanent equipment. Secure coverings without nails or tapes that leave residue. Do not use impervious sheeting which produces condensation.
   1. Use materials that withstand cleaning and restoration procedures.

E. When using liquid cleaning methods, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

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

3.04 IN SITU RESTORATION

A. Do not mix or apply materials or products when the ambient temperature or humidity are outside range recommended by their manufacturers.

B. Schedule conservation treatments to avoid weather-related failures.

3.05 REPLACEMENT ELEMENT INSTALLATION

A. Match existing elements unless otherwise required for protection of wood materials from the weather and approved by Architect.

B. Maintain continuity of historic architectural fabric.

C. Rough Carpentry Elements:
   1. Set structural members level and plumb.
   2. Provide for erection loads, and temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
   3. Do not field cut or alter structural members without approval of Architect.

D. Finish Carpentry:
   1. Interior Elements:
      a. Do not begin installation until wood materials have been acclimated to interior conditions.
      b. Standing and Running Trim: Attach using finishing nails. Set finish nail heads just below the surface of trim.
         1) Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use overlay trim to conceal larger gaps.
         2) Attach using finishing nails. Set finish nail heads just below the surface of trim.
      c. Sanding:
         1) Patch all floor areas with similar salvaged wood prior to sanding; field verify quantity/extent required.
         2) Rill and repair open seams and defects in flooring and other wiood with wood filler material prior to sanding. Gain approval of the architec for type and coloring of all filler materials.
         3) Sand floor areas after all other trades are complete.
         4) Machine-sand all existing salvage wood with heavy power driven sander.

(a) First cut, use 30 grade sandpaper (for flooring areas, the first cut shall be traversed in both directions going with the grain of the flooring)
(b) Second cut, follow with 40 grade paper.
(c) Third cut, follow with 60 grade paper.
(d) Finish cut, with 100 grade paper.
(1) Rough or finish sanding on the diagonal will not be permitted.
(e) Particular attention should be given on each finishing cut to completely remove the coarser grit marks from teh preceeding cut.

5) For flooring areas: after sanding floor area, screen disk abrade the floor with a rotary buffing machine.
6) For flooring areas: vacuum floor with heavy duty commercial type vacuum.
7) For flooring areas: protect finish sanded floors after sanding.

d. Stairs, Balustrades, and Handrails: Fit replacement pieces in with remaining elements.
1) Securely fasten and tightly fit elements with flush joints.
2) Add secondary supports at underside of stair for existing unstable treads.

2. Field Finishing: Prepare elements for field finishing.
a. Preparation: On exposed portions of woodwork remove handling marks or effects of exposure to moisture by sanding exposed surfaces with appropriate grit sandpaper.
b. Clean before applying sealer or finish.
c. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
d. Site Finishing: See Section 09 9000.

3.06 REPAIR

A. General: Use corrosion-resistant or nonferrous fasteners. Isolate dissimilar metals from each other.

B. Patching: For wood elements indicated on drawings.
1. Mix patching compound components and colorants as recommended by manufacturer.
2. Mask off areas to be kept free of compound.
3. Apply with putty knife or similar implement into and over areas to be repaired.
4. Sand, plane, and shape repair area after patch has set for time period recommended by manufacturer.

C. Dutchman Installation: For wood elements indicated on drawings.
1. Trim and square area of replacement.
2. Check prepared dutchman piece for proper fit.
3. Mix adhesive components as recommended by manufacturer.
4. Spread adhesive thinly on both faces keeping adhesive away from edges to avoid squeezing out.
5. Press dutchman into place.
6. Remove excess adhesive at glue line.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Nonstructural dimension lumber framing.

C. Rough opening framing for doors, windows, and roof openings.

D. Sheathing.

E. Subflooring.

F. Underlayment.

G. Miscellaneous framing and sheathing.

H. Communications and electrical room mounting boards.

I. Concealed wood blocking, nailers, and supports.

J. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

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

B. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.

C. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.

D. PS 1 - Structural Plywood; 2023.

E. PS 20 - American Softwood Lumber Standard; 2025.

F. SPIB (GR) - Standard Grading Rules; 2021.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

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

2.02 CONSTRUCTION PANELS

A. Subfloor/Underlayment Combination: PS 1 or PS 2 type, rated Single Floor.
   1. Panel Type: Plywood.
   2. Bond Classification: Exposure 1.

2.03 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.02 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

10. Wall mounted televisions.
11. Tin ceiling, tin soffit, and tin braid blocking.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring: Glue and nail to framing; staples are not permitted.

B. Underlayment: Secure to subflooring with nails and glue.
   1. Place building paper between floor underlayment and subflooring.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. Install adjacent boards without gaps.
   2. Size: 48 by 96 inches (2440 by 4880 mm), installed horizontally at ceiling height.

3.05 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 CLEANING

A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

C. Wood panel board: beadboard.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 064100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

C. Section 081433 - Stile and Rail Wood Doors.

D. Section 088000 - Glazing: Glass and glazing of wood partitions and screens.

E. Section 099113 - Exterior Painting: Painting of finish carpentry items.

F. Section 099123 - Interior Painting: Painting of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

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

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

B. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: MDF; prepare for paint finish.
   2. Stairs, Balustrades, and Handrails: Clear fir; prepare for stained finish.

2.02 SHEET MATERIALS

A. Beadboard: Face species red oak, 1/4" thickness.

2.03 PANEL CORE MATERIALS

A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
   1. Grade: 115; moisture resistance: MR10.
   2. Panel Thickness: as indicated on drawings.

B. Basic Hardboard: Panel manufactured from inter-felted lignocellulosic fibers consolidated under heat and pressure; comply with ANSI A135.4.

2.04 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

2.05 ACCESSORIES

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

B. Primer: Alkyd primer sealer.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.06 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Fit exposed sheet material edges with 3/8 inch matching hardwood (9 mm matching hardwood) edging. Use one piece for full length only.

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

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 099113 and 099123.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Hardware.

D. Factory finishing.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

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. BHMA A156.9 - Cabinet Hardware; 2020.

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

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Product Data: Provide data for hardware accessories.

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

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

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

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets:
   1. Finish - Concealed Surfaces: melamine.
   2. Casework Construction Type: Type A - Frameless.
   3. Cabinet Design Series: As indicated on drawings.

4. Cabinet Doors and Drawer Fronts: Flush style.

2.02 WOOD-BASED COMPONENTS

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

2.03 PANEL CORE MATERIALS

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

2.04 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation: www.formica.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as indicated.
   1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, through color, finish as indicated.
   2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, through color, colors as indicated, finish as indicated.

2.05 COUNTERTOPS

2.06 ACCESSORIES

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

B. Edges: of plastic laminate.
   1. Color: same as adjacent cabinet or countertop face.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

F. Adjustable Drawer Organization Systems: Drawer trays, dividers, and connectors.
   1. Products:
      a. Blum, Inc; AMBIA-LINE; www.blum.com/#sle.

G. Grommets: Standard plastic grommets for cut-outs, in color as selected from manufacturers standard colors.

2.07 HARDWARE

A. Cabinet Hardware: Comply with BHMA A156.9 for hardware types and grades indicated below:
   1. Hardware Types: As indicated on drawings.
   2. Product Grade: Grade 2.

B. 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.

C. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.
   1. Materials: Steel; T-shape cross-section as indicated on drawings.
   2. Products:
      a. A&M Hardware, Inc; Heavy-Duty Hybrid Brackets: www.aandmhardware.com/#sle.

D. Drawer and Door Pulls: as indicated on drawings.

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

F. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: Commercial grade.
   3. Stops: Integral type.

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

2.08 FABRICATION

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

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

C. 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.)

E. 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.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

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

END OF SECTION

SECTION 068316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. 9 CFR 416.2 - Regulatory Requirements Under the Federal Meat Inspection Act and the Poultry Products Inspection Act, Part 416-Sanitation; current edition.

B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

D. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.

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

F. FDA Food Code - Chapter 6 - Physical Facilities; Current Edition.

1.03 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. Samples: Submit two samples 2 inches by 2 inches inch (____x____ mm) in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Crane Composites, Inc: www.cranecomposites.com/#sle.
   2. Marlite, Inc: www.marlite.com/#sle.
   3. Nudo Products, Inc: www.nudo.com/#sle.
   4. Panolam Industries International, Inc: www.panolam.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).
   2. Panel Thickness: 0.10 inch (2.5 mm).
   3. Surface Design: Embossed.
   4. Color: White.
   5. Attachment Method: Mechanical fasteners concealed by trim, with sealant in joints.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Impact Strength: Greater than 6 ft lb force per inch (320 J per m), when tested in accordance with ASTM D256.
4. Sanitation and Cleanability: Comply with 9 CFR 416.2.
5. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 - Physical Facilities.

B. Trim: Vinyl; color coordinating with panel.

C. Fasteners: Nylon rivets.

D. Adhesive: Type recommended by panel manufacturer.

E. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

C. Verify that layout of hangers will not interfere with other work; make adjustments in layout as necessary.

D. Do not begin ceiling installation until services above ceiling are complete except for final trim

3.02 INSTALLATION - WALLS

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

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Pre-drill fastener holes in panels, 1/8 inch (3.2 mm) greater in diameter than fastener, spaced as indicated by panel manufacturer.

D. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

E. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

F. Install panels with manufacturer's recommended gap for panel field and corner joints.

G. Drive fasteners to provide snug fit, and do not over-tighten.

H. Place trim on panel before fastening edges, as required.

I. Fill channels in trim with sealant before attaching to panel.

J. Install trim with adhesive and screws or nails, as required.

K. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

L. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

DIVISION

7

THERMAL AND MOISTURE PROTECTION

SECTION 070553
FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

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

1.05 FIELD CONDITIONS

A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.

B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install neatly, with horizontal edges level.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at exterior wall furring behind gypsum board finish.

B. Batt insulation in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Installation requirements for board insulation at exterior perimeter walls.

1.03 REFERENCE STANDARDS

A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

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

D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

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

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation on Inside of Framed Walls with Exposed Facer Providing Interior Finish: Rigid cellular polyisocyanurate with exposed facers.

2.02 FOAM BOARD INSULATION MATERIALS

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
   1. Classifications:
      a. Type I: Faced with aluminum foil on one sideof the core foam.
         1) Class 1 - Non-reinforced core foam.
         2) Compressive Strength: 16 psi (110 kPa), minimum.
         3) Thermal Resistance, R-value (RSI-value): At () 1 inch thick; 6.5 (____), minimum, at 75 degrees F (24 degrees C).
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
   5. Board Thickness: 2.0 inch (50 mm).
   6. Board Edges: Square.
   7. Products:

a. GAF; EnergyGuard Polyiso Insulation: www.gaf.com/#sle.
b. Johns Manville; AP Foil-Faced: www.jm.com/#sle.
c. Owens Corning Corp.
d. Substitutions: See Section 016000 - Product Requirements.

2.03 ACCESSORIES

A. Rigid Insulation Pronged Attachment Washers: Solid plastic cap washer with prongs and flexible perimeter seal attached with screws to substrate for attachment of rigid insulation and to help seal against air and moisture penetration through weather barrier assembly.
1. Products:
a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Thermal-Grip ci Prong Washer: www.trufastwalls.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

B. Support for Continuous Rigid Insulation:
1. Fastening Clips: Two-piece PVC insulation clips with retainer and T-shaped clips mechanically fastened to surface receiving insulation, depth to suit insulation thickness, capable of securely and rigidly fastening insulation in place.
a. Manufacturers:
1) Victory Bear; Flex-Tite Insulation Clips: www.victorybear.com/#sle.

C. Support for Cladding and Continuous Insulation: Horizontal self-shimming, adjustable aluminum framing system thermally isolated from building substrate. Noncombustible; comply with NFPA 285.
1. Substrate: As indicated on drawings.
2. Fasteners: Provide support system and cladding attachment fasteners as recommended by system manufacturer in accordance with requirements. Provide materials and engineering from same source.
3. Products:
a. exo Surfaces; exoFRAMING Subframe System: www.exo-surfaces.com/#sle.

D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.

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

3.03 BOARD INSTALLATION USING CLADDING AND CONTINUOUS INSULATION SUPPORTS

A. Install supports in accordance with manufacturer's installation instructions.

B. Install supports in compliance with system orientation, sizes, and locations as indicated on drawings and in accordance with approved shop drawings.

C. Install supports to fill in exterior wall spaces without gaps or voids in insulation.

D. Trim insulation neatly to fit spaces and provide a continuous thermal layer.

3.04 PROTECTION

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

END OF SECTION

SECTION 072129
SPRAYED INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Spray Insulation to infill gaps and irregular openings,concealled from fiew.

1.02 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B. ASTM C739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation; 2021a.

C. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2020.

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

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

1.03 SUBMITTALS

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

B. Product Data: Provide data on materials, describing insulation properties.

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

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

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

1.05 FIELD CONDITIONS

A. Maintain acceptable ambient and substrate surface temperatures prior to, during, and after installation of primer and insulation materials and overcoat.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exposed Cellulosic Fiber Sprayed Insulation:
   1. International Cellulose Corporation; K-13 Thermal Insulation: www.spray-on.com/#sle.
   2. Isolatek International Corp; CAFCO CELLU-SHIELD: www.isolatek.com/#sle.
   3. ThermoCon, Inc: www.thermocon.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Cellulosic Fiber Insulation: ASTM C739; treated cellulosic fiber.
   1. Thermal Resistance (R-value (RSI-value)): 3.7 (0.65), at 1 inch (25.4 mm) thick when tested in accordance with ASTM C177 at 75 degrees F (23 degrees C) temperature
   2. Density: 2 pcf (32 kg/cu m), when tested in accordance with ASTM D1622.
   3. Noise Reduction Coefficient (NRC): 0.80 for 1-inch (25 mm) thickness.
   4. Flame Spread / Smoke Developed Index: 0-25 / 0-450, Class A, when tested in accordance with ASTM E84.
   5. Color: Tan.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Protective Overcoat: Cementitious type, spray applied; flame spread / smoke developed index of 0-25 / 0-450, Class A, when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are clean, dry, and free of matter that may inhibit adhesion.

B. Verify that ceiling hangers and supporting clips have been are installed correctly.

C. Verify other work on and within spaces to be insulated is complete prior to application.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from overspray or damage.

B. Apply primer in accordance with manufacturer's instructions.

C. Install insulation at all gaps between finishes to avoid acoustical/sound migration.

3.03 INSTALLATION

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

B. Install sprayed insulation to a uniform monolithic density without voids.

3.04 PROTECTION

A. Do not permit subsequent construction work to disturb applied sprayed insulation.

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 070553 - Fire and Smoke Assembly Identification.

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 E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).

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

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

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

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

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

1.04 SUBMITTALS

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

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

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

D. Manufacturer's qualification statement.

E. 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.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

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:

1.06 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. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

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

D. Fire Ratings: Refer to drawings for required systems and ratings.

2.02 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: See drawings for required systems and ratings.

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.

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.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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

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

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

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

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

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

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

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

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. Backing material recommended by sealant manufacturer.
4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
5. Substrates the product should not be used on.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

1.05 QUALITY ASSURANCE

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

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:

1. Dow: www.dow.com/#sle.
2. Hilti, Inc: www.hilti.com/#sle.
3. Pecora Corporation: www.pecora.com/#sle.
4. Sika Corporation: usa.sika.com/#sle.
5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
6. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Interior Joints:
      a. Do not seal interior joints indicated on drawings as not sealed.
      b. Do not seal gaps and openings in gypsum board and suspended ceilings
      c. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
      d. Seal the following joints:
         1) Joints between door frames and window frames and adjacent construction.
         2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
   2. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant installation is specified in other sections.
      d. Joints between suspended ceilings and walls.

B. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.04 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: To be selected by Architect from manufacturer's standard range.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.

C. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
   1. Color: White.

2.05 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

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

3.02 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 acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

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

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

G. 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.

H. 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. 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

DIVISION

8

OPENINGS

SECTION 081433
STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood doors, stile and rail design; fire rated and non-fire rated.

B. Panels of wood and glass.

1.02 RELATED REQUIREMENTS

A. Section 062000 - Finish Carpentry: Wood door frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

D. Section 099123 - Interior Painting: Field finishing.

E. Section 099300 - Staining and Transparent Finishing: Field finishing.

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. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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

F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

G. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.

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

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

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

M. WDMA I.S. 6A - Interior Architectural Wood Stile and Rail Doors; 2021, with Errata (2022).

N. WI (CCP) - Certified Compliance Program (CCP); Current Edition.

1.04 SUBMITTALS

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

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

C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, cutouts for glazing, and cutouts for louvers.

D. Samples: Submit two samples of door veneer, 6 by 6 inches (___ by ___ mm) in size illustrating wood grain, stain color, and sheen.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
   1. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.

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 quality standard specified.

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. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stile and Rail Wood Doors:
   1. Architectural Concepts, LLC; Glass Doors: www.archconceptsllc.com/#sle.
   2. Karona, Inc: www.karonadoor.com/#sle.
   3. Forte Opening Solutions; Aspiro Authentic Stile & Rail Doors: www.forteopenings.com/#sle.
   4. VT Industries, Inc: www.vtindustries.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 DOORS

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

B. Interior Doors: 1-3/8 inches (34.93 mm) thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Transparent or opaque finish as indicated on drawings.

C. Wood veneer facing for field transparent finish as indicated on drawings.

2.03 DOOR AND PANEL FACINGS

A. Veneer Facing for Transparent Finish: Species as specified above, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Transom Panels: Continuous match to door.
   2. Pairs: Pair match each pair; set match pairs within 10 feet (3 m) of each other when doors are closed.

B. Adhesive: Type I - Waterproof.

2.04 DOOR CONSTRUCTION

A. Vertical Exposed Edge of Stiles: Of same species as veneer facing.

B. Fit door edge trim to edge of stiles after applying veneer facing.

C. Bond edge banding to cores.

D. Panels: Flat.

E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
   1. Exception: Doors to be field finished.

G. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

H. Factory install glazing in doors in compliance with quality standards specified, using manufacturer's standard elastomeric glazing sealant.

I. 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.

J. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with NFPA 252 or UL 10B - Negative (Neutral) Pressure; listed in UL (DIR) or ITS (DIR) and without any visible seals when door is open.

K. Smoke and Draft Control Doors: In addition to required fire rating, provide stile and rail door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft (0.01524 cu m/s/sq m) of door opening at 0.10 inch water gauge (24.9 Pa) pressure at both ambient and elevated temperatures for 'S' label; if necessary, provide additional gasketing or edge sealing.

L. Smoke and Draft Control Doors: In addition to required fire rating, provide stile and rail door assemblies in compliance with WDMA I.S. 6A requirements for "S" label; if necessary, provide additional gasketing or edge sealing.

2.05 FINISHES

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Opaque:

2.06 ACCESSORIES

A. Glazing: See Section 088000.

B. Panel or Glass Retention Molding: Wood of same species as door facing, flat bead stop, with butted corners; prepared for countersink style tamper proof screws.

C. Door Hardware: See Section 087100.

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 standards.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.
   2. Install smoke and draft control doors in accordance with NFPA 105 requirements.

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

C. Field-Finished Doors: Trimming to fit is acceptable.
   1. Adjust width of non-rated doors by cutting equally on both jamb edges.
   2. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
   3. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Machine cut for hardware.

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

F. Coordinate installation of glazing.

3.03 TOLERANCES

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

B. Maximum Width Distortion (Cup): 1/8 inch (3.2 mm) measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inch (915 by 2130 mm) surface area.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS

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

B. Division 23 - HVAC: Quantities, location(s) and size(s) of access doors required for HVAC units.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

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

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

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

1.04 SUBMITTALS

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

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

1.05 QUALITY ASSURANCE

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

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

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Location: as required (regardless if shown on the drawings or not).
   2. Panel Material: Steel.
   3. Size: 12 by 12 inches (305 by 305 mm) or as needed for required access.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Fire-Rated Wall-Mounted Units:
   1. Location: As indicated on drawings.
   2. Wall Fire-Rating: As indicated on drawings.
   3. Panel Material: Steel.
   4. Size: 12 by 12 inches (305 by 305 mm).

C. Ceiling-Mounted Units with Return Air Grille:

1. Location: as required (regarless if shown on the drawings or not.
2. Panel Material: Steel.
3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
4. Size - Other Ceilings: 12 by 12 inches (305 by 305 mm) or as required for access.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

D. Fire-Rated Ceiling-Mounted Units:
1. Ceiling Fire-Rating: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

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

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 083800
TRAFFIC DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rigid and semi-rigid traffic doors for kitchen areas.

B. Door accessories.

1.02 SUBMITTALS

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

B. Product Data: Manufacturer's technical information for each type of door specified, including details about materials, components, profiles, gaskets, and finishes; include:
   1. Preparation and installation instructions and methods.
   2. Storage and handling requirements and recommendations.
   3. Operation and maintenance data.

C. Shop Drawings: Indicate installation details of doors and frames, including elevations and attachment.

D. Samples: Two color charts indicating full range of available colors and textures for each type of finish.

E. Executed warranty.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing type of work specified in this section with not less than three years of experience and approved by manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver product in manufacturer's original unopened packages with label legible and intact.

B. Store doors at project site on edge or in upright position, under cover and elevated above grade, following manufacturer's instructions.

1.05 WARRANTY

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

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for molded polyethylene doors against damage due to vehicle traffic; state limitations in executed warranty. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 RIGID AND SEMI-RIGID TRAFFIC DOORS

A. Construction: Manufacturer's standard.
   1. Door Assemblies: Double-acting, self-closing pairs of doors for installation in frame provided by others; factory fabricated and finished, complete with hinges and specified accessories.
      a. Door Swing: Minimum of 90 degrees each direction.
      b. Hinges: V-cam gravity hinges at top and pivots at bottom; mounted on bottom of header and on top of floor; maximum rise 1-1/2 inches (38 mm); vertical and horizontal adjustment in the field; manufacturer's standard lower hinge guards.
      c. Hinge Guards: Manufacturer's standard material and configuration to protect lower hingefinish floors from damage.
      d. Exposed Metal Parts: Either stainless steel, extruded aluminum, or powder coated.
      e. Dimensional Tolerances: Plus or minus 1/4 inch (6 mm) in width and height of each panel.
   2. View Windows: Factory-installed glazing in molded or extruded black thermoplastic or rubber gasket.

a. Configuration: One window in each door panel unless otherwise indicated on drawings, centered in door width, and 48 inches (1220 mm), maximum, from finished floor to bottom of viewing area.
b. Square-Shaped Window Size: 12 inches (305 mm) by 16 inches (406 mm).
c. Glazing: Manufacturer's standard; use single glazing unless otherwise indicated on drawings.
1) Single Glazing: Acrylic glazing sheet, 1/4-inch (6 mm) thick, clear.

B. Lightweight Metal-Faced Double-Acting Traffic Doors Type ___: Aluminum sheet with formed or reinforced edges for stiffness.
1. Material: Stainless steel sheet, 0.063 inches (1.6 mm) thick, No.4 finish.
2. Back Edge Spine: 1 inch (25 mm) in cross-section.
3. Products:
a. Chase Doors, a Division of Senneca Holdings: www.chasedoors.com/#sle.
b. Eliason Corporation, a Division of Senneca Holdings: www.eliasoncorp.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that jambs and frames are square and plumb.

B. Verify that opening is ready to receive work and opening dimensions and clearances are as indicated on drawings.

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

D. Commencement of work by installer indicates acceptance of opening conditions.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

A. Install doors with clearances, anchors, hardware, and accessories according to the manufacturer's instructions and as specified.

B. Install doors plumb, level, and properly aligned.

3.04 ADJUSTING

A. Clean and lubricate operating parts.

B. Adjust doors to open and close smoothly and freely without binding and for proper fit of seals.

3.05 CLEANING

A. Clean surfaces using methods as recommended by manufacturer.

3.06 PROTECTION

A. Protect installed products until completion of project.

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

END OF SECTION

SECTION 085113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows surface-applied mullions.

1.02 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022, with Errata (2023).

B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

D. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.03 SUBMITTALS

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

B. Product Data: Include component dimensions, descriptions of hardware and accessories, and profile and dimensions of mulions and finishes, and attachements.

C. Shop Drawings: Indicate opening dimensions, elevations of mullion configurations, framed opening tolerances, anchorage locations, _____, and installation requirements.

D. Samples:
   1. Mullions: two samples, 6 inches in length with finish selected.

E. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.04 QUALITY ASSURANCE

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

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.06 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.07 WARRANTY

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

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Manufacturer Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: St. Cloud Window.

B. Other Acceptable - Aluminum Window Manufacturers:
   1. Substitutions: See Section 016000 - Product Requirements.

2.02 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Frame Depth: 3-1/2 inch (89 mm).
   2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.04 FINISHES

A. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).
   1. Manufacturers:
      a. Arkema; Kynar 500: www.arkema.com/#sle, 2-coat system.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Finish Color: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 072500.

3.02 PRIME WINDOW INSTALLATION

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

B. Attached window mullions to exterior opening to accomodate construction tolerances and other irregularities.

C. Align window mullions plumb and level, fee of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 10 ft (3 mm/3 m), whichever is less.

3.04 FIELD QUALITY CONTROL

A. Provide services of aluminum window manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 014000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

3.05 CLEANING

A. Clean existing window glazing prior to and after mullions installation.

B. Remove protective material from factory finished aluminum surfaces.

END OF SECTION

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing units.

B. Plastic films.

1.02 RELATED REQUIREMENTS

A. Section 081433 - Stile and Rail Wood Doors: Glazed lites in doors.

B. SEction 102239.13 - Folding Glass Panel Partitions: Glazing for operable walls as part of assemble.

C. Section 102239.13 Folding Glass Panel Partitions: for installation of plastic film.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

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

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C1036 - Standard Specification for Flat Glass; 2021.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

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

H. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.

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

J. GANA (GM) - GANA Glazing Manual; 2022.

K. GANA (SM) - GANA Sealant Manual; 2008.

L. GANA (LGRM) - Laminated Glazing Reference Manual; 2019.

M. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

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

P. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

Q. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

1.04 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. Samples: Submit two samples 4 by 4 inch (___ by ___ mm) in size of glass units.

D. Samples: Submit up to 3 separate sample submittals of architectural image on film in 24" x 24" sizes.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

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

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

1.06 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.

1.07 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. GGI - General Glass International: www.generalglass.com/#sle.
   2. Standard Bent Glass Corp: www.standardbent.com/#sle.
   3. Tecnoglass; Insulating Glass: www.tecnoglass.com/#sle.
   4. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   5. Viracon, Inc: www.viracon.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Plastic Films Manufacturers:
   1. Solyx iQ SUPER CLEAR SR Polyester, www.decorativefilms.com.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 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. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   3. Patterned Glass Type: ASTM C1036, Type II - Patterned Flat Glass, Quality - Q5, Form 3 - Patterned glass, with color and performance characteristics as indicated.
   4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.03 INSULATING GLASS UNITS

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass.

2.04 PLASTIC FILMS

A. Safety and Security Plastic Film: Polyester type.
   1. Application: Locations as indicated on drawings.
   2. Surface Burning Characteristics: Flame Spread Index (FSI)/Smoke Developed Index (SDI) of Class A, 25/450, maximum, when tested in accordance with ASTM E84.
   3. Tensile Strength: Minimum of 32,000 psi (221 MPa) when measured in accordance with ASTM D882.
   4. Color: Clear.
   5. Thickness Without Liner: 0.002 inch (0.051 mm).

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry prior to film installation. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - PLASTIC FILM

A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.

B. Place without air bubbles, creases or visible distortion.

C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

3.05 FIELD QUALITY CONTROL

A. Glass, Glazing, and plastic film product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark 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

DIVISION

9

FINISHES

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Metal channel ceiling framing.

C. Resilient sound isolation clips.

D. Acoustic insulation.

E. Gypsum wallboard.

F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 061000 - Rough Carpentry: Building framing.

C. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

D. Section 072100 - Thermal Insulation: Perimeter exterior wall insulation.

E. Section 078400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

F. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

G. Section 093000 - Tiling: Tile backing board.

1.03 REFERENCE STANDARDS

A. AISI S201 - North American Standard for Cold-Formed Steel Framing - Product Data; 2017.

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. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

F. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

J. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

K. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

M. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2023.

N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

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

P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

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

R. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

S. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

T. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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

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

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. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches (300 by 300 mm) in size, indicating finish color and texture.

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.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

B. 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.

B. Interior Partitions: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 METAL FRAMING MATERIALS

A. Material and Product Requirements Criteria: AISI S201.

B. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

C. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. CEMCO: www.cemcosteel.com/#sle.
   2. ClarkDietrich: www.clarkdietrich.com/#sle.
   3. Jaimes Industries: www.jaimesind.com/#sle.
   4. MarinoWARE: www.marinoware.com/#sle.

5. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
6. R-stud: www.rstud.com/#sle.
7. SCAFCO Corporation: www.scafco.com/#sle.
8. Steel Construction Systems: www.steelconsystems.com/#sle.
9. Telling Industries: www.tellingindustries.com/#sle.
10. Substitutions: See Section 016000 - Product Requirements.

D. 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/Soffit Channels: as indicated on the drawings.
4. Resilient Furring Channels: Single or double leg configuration; 1/2 inch (13 mm) channel depth.
    a. Products:
        1) Same manufacturer as other framing materials.
        2) Substitutions: See Section 016000 - Product Requirements.

E. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

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. PABCO Gypsum: www.pabcogypsum.com/#sle.
6. USG Corporation: www.usg.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

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.
    a. Mold resistant board is required as indicated on the drawings.
3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
    a. Vertical Surfaces: 5/8 inch (16 mm).
    b. Ceilings: 5/8 inch (16 mm).
    c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

C. Impact Resistant Wallboard:
1. Application: High-traffic areas indicated.
2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
5. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
6. Type: Fire-resistance-rated Type X, UL or WH listed.
7. Thickness: 5/8 inch (16 mm).
8. Edges: Tapered.

D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: 5/8 inch (___ mm).
   3. Edges: Tapered.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness as required for STC.

B. Fire and Sound Attenuating Insulation: Sprayed cellulose fire-rated material for cavities in wall assemblies.
   1. Surface Burning Characteristics: Provide assemblies with Class I rating, when tested in accordance with ASTM E84.
   2. Sound Transmission Class (STC): 56, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. 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).

D. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
   1. Products:
      a. Franklin International, Inc: www.titebond.com/#sle.
      b. Liquid Nails, a brand of PPG Architectural Coatings: www.liquidnails.com/#sle.
      c. Specified Technologies Inc: www.stifirestop.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

E. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.
   2. Expansion Joints:
      a. Type: V-shaped metal with factory-installed protective tape.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Joint Compound: Drying type, vinyl-based, ready-mixed.

G. Finishing Compound: Surface coat and primer, takes the place of skim coating.

H. 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.

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.
   1. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing to structure in all locations.

2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

F. Resilient Sound Isolation Clips: Install resilient sound isolation clips, and where applicable, associated furring sections and channels, in accordance with clip manufacturer's written instructions.

G. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.

H. Blocking: Install wood blocking for support of:
1. Framed openings.
2. Wall-mounted cabinets.
3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall-mounted door hardware.

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.
1. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

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. 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.

F. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
1. Single-Layer Applications: Screw attachment.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
2. At exterior soffits, not more than 30 feet (10 meters) apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.

B. 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).

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.08 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean all surfaces in preparation for finish painting.

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. 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; 2023.

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 A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

F. 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.

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2024).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.

L. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.

M. 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).

N. 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.

O. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

P. 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.

Q. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).

R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2024.

S. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

1.04 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. 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.

D. Installer's Qualification Statement:

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

F. 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 one box of each type.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 MOCK-UPS

A. See Section 014000 - Quality Requirements for general requirements for mock-up.

B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
   1. Approved mock-up may remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. 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 indicated on the drawings .
   1. Substitutions: See Section 016000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: as indicated on the drawings, style and dimensions to suit application, set with tile mortar or adhesive.
   1. Applications as indicated on the drawings:
      a. Open edges of wall and floor tile.
      b. Inside and outside wall corners.
      c. Transition between floor finishes of different heights.
      d. Thresholds at door openings.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
   1. Products:
      a. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
   1. LATICRETE International, Inc: www.laticrete.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Color(s): As indicated on drawings.

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
   1. Applications: Between tile and plumbing fixtures.
   2. Color(s): As selected by Architect from manufacturer's full line.

2.06 ACCESSORY MATERIALS

A. Tile Underlayment: Specifically designed for bonding to thin-set setting mortar; not primarily waterproofing material and having the following characteristics:
   1. Crack Resistance: No failure at 1/16-inch (1.6 mm) gap, minimum; comply with ANSI A118.12.
   2. Suitable for installation over wood-based substrates (second floor restrooms.
   3. Products:
      a. Ditra
      b. Substitutions: See Section 016000 - Product Requirements.

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 subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

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.

3.03 INSTALLATION - GENERAL

A. Install tile and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.

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.

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 CLEANING

A. Clean tile and grout surfaces.

3.05 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 095421
METAL PAN CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal pan (tin) ceilings.

B. Metal pan (tin) soffits.

1.02 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies.

B. Section 098123 - Interior Painting of tin ceilings.

1.03 REFERENCE STANDARDS

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

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

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

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate special tin ceiling pieces (corners).

C. Manufacturer's qualification statement.

1.06 QUALITY ASSURANCE

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept factory-finished products on site in manufacturer's unopened factory packaging; reject opened packages.

B. Protect factory-finished products from damage by storing in manufacturer's unopened factory packaging in dry storage area.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tin Ceilings:
   1. As indicated on the drawings.

2.02 PERFORMANCE REQUIREMENTS

A. Design to support imposed loads of indicated elements without eccentric loading of supports. Where supported elements may induce rotation of ceiling system components, provide stabilizing reinforcement.

B. Design for maximum deflection of 1/360 of span.

C. Surface Burning Characteristics: Flame spread index of 0-25, smoke developed index of 0-450, when tested in accordance with ASTM E84.

2.03 METAL PAN (TIN) CEILING ASSEMBLIES

A. Metal Pan (Tin) Ceiling System: Panels, suspension members, trim, and accessories as required to provide a complete system.
   1. Exposed fasteners are permitted; use manufacturer's attachments (not provided by the Owner).
   2. Install on 1x furring strips.

2.04 ACCESSORIES

A. End Caps: Formed metal; same color and finish as sight-exposed surfaces of metal panels.

B. Support Channels, Carriers, and Hangers: wood backers formed to the shape of the tin panel profile(s); size and type to suit application and ceiling system flatness requirement specified.

2.05 FABRICATION

A. Shop cut metal panels to accommodate mechanical and electrical items.

B. Factory-form internal and external corners of same material, thickness, finish, and profile to match exposed metal panels; back brace internal corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Verify that field measurements are as indicated on shop drawings.

D. Start of installation constitutes acceptance of project conditions.

3.02 PREPARATION

A. Coordinate the location of hangers with other work.

B. Install after major above-ceiling work is complete.

3.03 INSTALLATION - METAL PANS (TIN)

A. Install panels and other system components in accordance with manufacturer's instructions.

B. Align end joints.

C. Lap interiro and end joints tight.

D. Set exterior end joints with 1/16 inch (2 mm) gap for expansion and contraction.

E. Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.

F. Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.

3.04 INSTALLATION OF PERIMETER "CLOUD" BRAID TRIM

A. General: Install in accordance with manufacturer's instructions.
   1. Examine the reflected ceiling layout and carefully plan the layout of the trim on the ceiling grid.
   2. Lay trim segments on top of the grid in the desired pattern and temporarily secure them in place.
   3. Temporarily splice the segments together.
   4. Assemble trim system, arranging the trim into smooth curves.
   5. Mark and cut the grid.
   6. Join trim and permanently splice the segments together.

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.

C. Maximum Variation From Dimensioned Position: 1/4 inch (6 mm).

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. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 060300 - Conservation Treatment For Period Wood: Repair of wood subflooring prior to resilient tile flooring installation.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

C. ASTM F3261 - Standard Specification for Resilient Flooring in Modular Format with Rigid Polymeric Core; 2020.

D. 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; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 12 by 12 inch (___ by ___ mm) in size illustrating color and pattern for each resilient flooring product specified.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

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 Floor Material: 5% of installed amount.
   3. Extra Wall Base Material: 5% of installed amount.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum five years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum five years documented experience.

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. Protect roll materials from damage by storing on end.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile: Surface-decorated, with wear layer.
   1. Manufacturers:
      a. ShawContract: Quiet Cover
   2. Construction: 20 mil floating LVT.
   3. Plank Tile Size: 7 inches by 48 inches (nominal) inch (___ by ___ mm).
   4. Wear Layer: 20 mil
   5. Total Thickness: .197 inch (____ mm).
   6. Pattern: as indicated on the drawings..
   7. Color: As indicated on drawings.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; style as scheduled.
   1. Height: 4 inches (100 mm).
   2. Thickness: 0.125 inch (3.2 mm).
   3. Finish: Satin.
   4. Length: Roll.
   5. Color: As indicated on drawings.

2.03 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring and/or base manufacturer.

B. Sealer and Wax: Types recommended by 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. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. 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. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Loose-Laid Installation: Set flooring in place in accordance with manufacturer's instructions.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

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. 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. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

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.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Items as indicated on the drawings.

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, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
   7. Marble, granite, slate, and other natural stones.
   8. Floors, unless specifically indicated.
   9. Ceramic and other types of tiles.
   10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   11. Glass.
   12. Concealed and exposed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting.

1.03 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1; 2024.

E. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 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(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

2. Where sheen is not specified, submit each color in each sheen available.
3. Allow 30 days for approval process, after receipt of complete samples by Architect.
4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals, have been approved.

D. 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 gallon (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.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.06 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.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

C. Paints:
1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required 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 described explicitly in manufacturer's product instructions.

B. Flammability: Comply with applicable code for surface burning characteristics.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.

2.03 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including wood soffits.
1. Two top coats and one coat primer.
2. Top Coat(s): Exterior Latex.
a. Products:
1) Sherwin-Williams SuperPaint Exterior.
2) Substitutions: See Section 016000 - Product Requirements

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali-Resistant Water-Based Primer.
a. Products:
1) Sherwin-Williams Loxon Water Blocking Primer/Finish.
2) Substitutions: See Section 016000 - Product Requirements

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

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

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

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

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

B. Apply products in accordance with manufacturer's written instructions.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 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.

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Materials for backpriming woodwork.

D. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Mechanical and Electrical:
      a. In all areas, do NOT paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items and all items mounted within a painted gypsum board wall.
      c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

E. 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. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
   10. Glass.
   11. Concealed pipes, ducts, and conduits.
   12. Wood trim unless indicated.

1.02 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 09300 - Staining and Transparent Finishing: finishing of wood trim.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 2 - Hand Tool Cleaning; 2024.

F. SSPC-SP 3 - Power Tool Cleaning; 2024.

1.05 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.
   2. Allow 30 days for approval process, after receipt of complete samples by Architect.
   3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, wood cabinets, wood doors, and stage curtains, have been approved.

D. 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.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 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.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

D. 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 used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

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 on drawings.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, uncoated steel, shop primed steel, galvanized steel, aluminum, and tin ceilings.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex.
      a. Products:
         1) Sherwin-Williams ProMar 200 HP Series
         2) Substitutions: See Section 016000 - Product Requirements

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer.
      a. Products:
         1) Sherwin-Williams Loxon Water Blocking Primer/Finish.
         2) Substitutions: See Section 016000 - Product Requirements

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

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

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

J. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

K. 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.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Wood to Receive Transparent Finishes: See Section 099300.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

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.

END OF SECTION

SECTION 099300
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field application of stains.

B. Field application of transparent finishes.

1.02 RELATED REQUIREMENTS

A. Section 060300 - Conservation Treatment For Period Wood: Stains and transparent finishes for wood flooring.

B. Section 062000 - Finish Carpentry: Stains and transparent finishes for wood trim and handrails.

C. Section 099113 - Exterior Painting:

D. Section 099123 - Interior Painting:

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

C. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

1.05 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 catalog number, and general product category.
   2. Manufacturer's installation instructions.

C. Samples: Two samples on actual wood substrate to be finished, 6 by 6 inch (____ by ____ mm) in size, indicating selected colors and sheens for each system.

D. Maintenance Data: Submit data including product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, 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 Stock Materials: Stain and transparent finish materials, 1 gal (4 L) of each color and type; store where directed.
      a. Label each container with color and type in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with at least five years of documented experience.

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

1.07 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 stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish 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.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperature: 50 degrees F (10 degrees C) unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide finishes used in any individual system from the same manufacturer; no exceptions.

B. Transparent Finishes: for
   1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Sealer and Finish: for wood floors
   1. Waterlox original resin-modified tung oil.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

A. Finishes:
   1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each finish material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood - Wood doors, trim, and handrails.:
   1. Top Coat: Polyurethane varnish, high build.
      a. Products:
         1) Sherwin-Williams MinWax High Build Polyurethane, Satin.
            (a) Field mix to match existing stain color on lower level of the building previously finished.
         2) Substitutions: Section 016000 - Product Requirements.

B. Finish on Wood - Floors:
   1. Sealer: Water based sealer for wood athletic floors, clear.
      a. Products:
         1) Waterlox, semi-gloss, quadruple (4 coats) application.
         2) Substitutions: Section 016000 - Product Requirements.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of stains and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

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

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. 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.

E. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

F. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Reinstall items removed prior to finishing.

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.

END OF SECTION

DIVISION

10

SPECIALTIES

SECTION 101423
PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.

1.02 REFERENCE STANDARDS

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

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

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

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.

D. Verification Samples: Submit samples showing colors, materials, and finishes specified.

E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

F. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum _____ years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:
   1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PANEL SIGNAGE

A. Panel Signage:
   1. Application: Interior directional and information signs.
   2. Description: Flat signs with engraved panel media, tactile characters.

3. Sign Size: As indicated on drawings.
4. Total Thickness: 1/8 inch (3 mm).
5. Color and Font, unless otherwise indicated:
    a. Character Font: Helvetica, Arial, or other sans serif font.
    b. Character Case: Upper and lower case (title case).
    c. Background Color: As scheduled.
    d. Character Color: Contrasting color.
6. Material: One-piece injection molded acrylic plastic with raised letters and braille.
7. Tactile Letters: Raised 1/32 inch minimum.
8. Braille: Grade II, ADA-compliant.
9. One-Sided Wall Mounting: Tape adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until mm-dd-yyyy; repair or replace damaged items.

END OF SECTION

SECTION 102113.19
PLASTIC TOILET COMPARTMENTS - ASI

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Solid plastic urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.

B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 ABBREVIATIONS AND ACRONYMS

A. HDPE: High-density polyethylene.

1.04 REFERENCE STANDARDS

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

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2024b.

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

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

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

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work with placement of support framing and anchors in walls and ceilings.

1.06 SUBMITTALS

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

B. Product Data: Provide data on panel construction, hardware, accessories, and finishes.

C. Shop Drawings:
   1. Indicate plans, elevations, and dimensions. Include door swings, toilet fixture centerlines, and floor drains on plans.
   2. Indicate details of wall, floor, and ceiling supports and attachments.
   3. Indicate reflected ceiling plan view of partition layout at overhead support locations.

D. Samples:
   1. For Verification: Submit two samples of partition materials, 3 inches by 3 inches (76 mm by 76 mm) in size, indicating color.

E. Manufacturer's qualification statement.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials and products in accordance with manufacturer's instructions and recommendations and industry standards.

B. Do not deliver materials or begin installation until building is enclosed, with complete protection from outside weather, and building temperature maintained at minimum of 60 degrees F (15.6 C).

C. Store products indoors in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.

D. Lay cartons flat, with adequate support to ensure flatness and prevent damage to prefinished surfaces.

E. Do not store where ambient temperature exceeds 120 degrees F (49 C).

1.09 FIELD CONDITIONS

A. Ambient Conditions: Maintain environmental conditions such as temperature, humidity, and ventilation within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Existing Conditions: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.10 WARRANTY

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

B. Manufacturer Warranty: Provide 25-year manufacturer warranty for HDPE material against breakage, corrosion, and delamination.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Scranton Products: Hindy Hinders.

B. Substitutions: See Section 016000 - Product Requirements.

C. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.02 PLASTIC TOILET COMPARTMENTS

A. Toilet Compartments: Solid plastic (HDPE), standard privacy, floor anchored, overhead braced.

B. Urinal Screens: Solid plastic (HDPE), wall hung.

C. Design Criteria:
   1. Accessibility: Design compartments indicated on drawings to comply with ICC A117.1 and ADA Standards.
   2. Fire Performance: Provide assemblies that pass when tested in accordance with NFPA 286.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less (Class B), when tested in accordance with ASTM E84.

D. Fabrication:
   1. Fabricate toilet compartment components to sizes indicated.
   2. Coordinate requirements and provide cutouts for through-partition toilet accessories.
   3. Provide shoes and caps at pilasters and posts to conceal anchorage, supports, and leveling mechanisms.
      a. Provide Easy-Stall shoes at floor anchored, overhead braced toilet compartments.
   4. Provide manufacturer's standard corrosion-resistant supports, leveling mechanisms, anchors, and anchoring assemblies for pilasters and posts.

5. Floor-Anchored, Overhead-Braced Units: Provide supports, leveling mechanisms, Easy-Stall shoes, and anchors at pilasters to suit floor conditions.

2.03 COMPONENTS

A. Doors and Panels: Single sheets of solid molded homogenous high-density polyethylene (HDPE).
   1. Finish:
      a. Color: as indicated on the drawings.
      b. Texture: Manufacturer's standard for selected color.
   2. Edges: 1/4-inch (6 mm) radius machined edges.
   3. Heat Sink: Extruded aluminum attached to bottom of doors and panels.

B. Door and Panel Dimensions:
   1. Thickness: 1 inch (25 mm).
   2. Door Width: 24 inches (610 mm).
   3. Door Width for Handicapped Use: 36 inches (915 mm), outswinging.
   4. Door Panel Height: 55 inches (1397 mm).
   5. Door Height Above Floor: 14 inches (355 mm).
   6. Panel Depth: As indicated on drawings.
   7. Urinal/Entrance Screen Panel Height: 55 inches (1397 mm).
   8. Urinal/Screen Screen Panel Height Above Floor: 14 inches (355 mm).

C. Pilasters: 1 inch (25 mm) thick, of sizes required to suit compartment width and spacing; minimum 3 inches (76 mm) wide.
   1. Pilaster Height: 82 inches (2032 mm).
   2. Pilaster Shoes: Formed 20 gauge, 0.0359 inch (0.91 mm) ASTM A666 Type 304 stainless steel with No.4 finish, 5 inches (127 mm) high, concealing floor fastenings; secured to pilaster with stainless steel tamper-resistant screws; secured to floor with concrete anchors.
   3. Easy-Stall Pilaster Shoes: Formed 20 gauge, 0.0359 inch (0.91 mm) ASTM A666 Type 304 stainless steel with No.4 finish, 3 inches (76 mm) high, concealing floor fastenings and leveling bolts; secured to pilaster with stainless steel tamper-resistant screws; secured to floor with concrete anchors.
      a. Provide height and leveling adjustment with machine thread leveling bolts and bottom of pilaster threaded inserts.
   4. Pilaster Anchors: Manufacturer's standard stainless steel mounting bars attached to pilaster and secured to building structure.

D. Head Rails: Hollow anodized aluminum tube, 1- by 1-5/8-inch (25 by 41 mm) size, with anti-grip surface and cast-socket wall brackets.

2.04 MATERIALS

A. High-Density Polyethylene (HDPE):
   1. Composition: Formed from waterproof, nonabsorbent, high-density polyethylene resins.
   2. Properties: Mark-resistant self-lubricating surface.
   3. Fire Resistance: ASTM E84, Class A.
   4. Material Fire Ratings: NFPA 286, Pass.
   5. Material Fire Ratings: ICC (IBC), Class A.

2.05 HARDWARE AND ACCESSORIES

A. Brackets:
   1. Stirrup Type: Clear anodized aluminum, three per panel connection.

B. Door Hardware: Clear anodized aluminum:
   1. Hinges: 8 inch (203 mm) wrap-around pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Latch and Keeper: 6 inch (152 mm) slide latch with wrap-around keeper.

3. Coat Hook: Chrome-plated zamac. Manufacturer's standard coat hook with rubber bumper; one per compartment, mounted on door.
4. Door Pull: Chrome-plated zamac. Provide door pull for outswinging doors. Provide on both sides of doors designated as accessible.
5. Door Bumper: Chrome-plated zamac. Provide rubber-tipped door bumpers at out-swinging doors.

C. Attachments, Screws, and Bolts: Stainless steel , tamper-resistant type..
1. For Attaching Panels and Pilasters to Brackets: Sex-type through-bolts and nuts , tamper-resistant.

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. Attach Easy Stall shoe system to floor with 1/4 by 2 inch (6 by 52 mm) screws. Insert pilaster into Easy Stall shoe and secure after height adjustment.

C. Maintain maximum 1/2-inch (13 mm) space between pilasters and panels.

D. Maintain maximum 1-inch (25 mm) space between wall and panels.

E. Attach panel brackets securely to walls using anchor devices.

F. Attach panels and pilasters to brackets. Locate head rail joints at pilaster centerlines.

G. Do not permit field touch-up of scratches or damaged finish. 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 hinges to locate doors in partially opened position when unlatched. Return outswinging doors to closed condition.

B. Adjust adjacent components for consistency of line or plane.

3.05 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 102239
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking and track support shimming.

B. Section 092116 - Gypsum Board Assemblies: soffits for track mounting of folding panel partitions.

1.03 REFERENCE STANDARDS

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

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

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

D. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).

E. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures; 2022.

F. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

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

1.04 SUBMITTALS

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

B. Product Data: Provide data on partition materials, operation, hardware and accessories, track switching components, and colors and finishes available.

C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.

D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

E. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.

F. Manufacturer's Instructions: Indicate special procedures.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.05 QUALITY ASSURANCE

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

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

1.07 WARRANTY

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

B. Correct defective Work within five year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Folding Panel Partitions - Horizontal Opening:
   1. Modernfold, a DORMA Group Company: www.modernfold.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

A. Basis of Design: Modernfold Legacy series.

B. Folding Panel Partitions: Side opening; paired panels; side stacking; manually operated.

C. Panel Construction:
   1. Frame: Manufacturer's standard thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
   2. Hinges: Continuous piano type, ___ gauge, _____ inch (_____ mm) stainless steel.
   3. Hardware: Latching door handles of cast steel, satin chrome finish; lock cylinder keyed to building keying system; pull bars.
   4. Panel Properties:
      a. Thickness With Finish: 4 inches (100 mm).
      b. Width: Equal widths.

D. Panel Finishes:
   1. Facing: Acoustical carpet.
   2. Exposed Metal Trim: Custom powder coated paint finish.

E. Panel Seals:
   1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
   2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

F. Suspension System:
   1. Track: Formed steel; 1-1/4 by 1-1/4 inch (32 by 32 mm) size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
   2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

G. Performance:
   1. Acoustic Performance:
      a. Sound Transmission Class (STC): 48 to 52 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft (9.3 sq m).
   2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
   3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

H. Accessories:
   1. Pass Door: Single door, 36 inch (____ mm) wide by 120 inch (____ mm) high opening; same design and construction as panel; fit door with perimeter acoustic gaskets, concealed closer, keyed lock, and tool operated floor seal.
      a. Panic exit hardware.
   2. Acoustic Sealant: As recommended by partition manufacturer.

2.03 MATERIALS

A. Acoustical Carpet: manufacturers standards type, color as selected from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch (6.4 mm) of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.

D. Verify wall plumbness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.

3.02 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Fit and align partition assembly and pocket doors level and plumb.

C. Lubricate moving components.

D. Install acoustic sealant to achieve required acoustic performance.

E. Coordinate electrical connections.

F. Field drill holes in steel for support rods.

3.03 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

A. Clean finish surfaces and partition accessories.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 102239.13
FOLDING GLASS-PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior aluminum-framed folding glass-panel partitions, horizontal opening.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking and track support shimming.

B. Section 08800 - Glazing: Film to be applied to glass of folding glass-panel partitions.

C. Section 092116 - Gypsum Board Assemblies: Track mounting for folding glass-panel partitions.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.

C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

D. AAMA 1801 - Voluntary Specification for the Acoustical Rating of Exterior Windows, Doors, Skylights and Glazed Wall Sections; 2021.

E. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

F. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

G. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

H. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

K. ASTM C1036 - Standard Specification for Flat Glass; 2021.

L. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

M. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2018).

N. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

O. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

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

Q. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).

R. ASTM E1425 - Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylight, and Glazed Wall Systems; 2014 (Reapproved 2023).

S. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

1.04 SUBMITTALS

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

B. Product Data: Provide data on partition materials, operation, hardware and accessories, and colors and finishes available.

C. Shop Drawings: Indicate layout, dimensions, identification of components, and interface with adjacent construction.
   1. Include elevations showing:
      a. Locations and identification of manufacturer-supplied door hardware and fittings.
      b. Locations and sizes of cut-outs and drilled holes for other door hardware.
   2. Include details of:
      a. Requirements for support and bracing of overhead track.
      b. Installation details.
      c. Appearance of manufacturer-supplied door hardware and fittings.

D. Selection Samples: Two sets, representing manufacturer's full range of available metal and glass materials and finishes.

E. Executed warranty.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

1.07 WARRANTY

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

B. Manufacturer Warranty: Provide two-year manufacturer warranty for defects and workmanship. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Aluminum-Framed Folding Glass-Panel Partitions - Horizontal Opening:
   1. Modernfold, Dormakaba Group.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 INTERIOR FOLDING GLASS-PANEL PARTITIONS - HORIZONTAL OPENING

A. Folding Glass-Panel Partitions: Top hung, factory-fabricated assemblies consisting of full-width aluminum-framed glass panels; complete with support and anchorage devices.
   1. Design to withstand normal operation without damage, racking, sagging, or deflection.
   2. Protect finished metal surfaces with strippable film.
   3. Factory assemble to greatest extent practicable; may be disassembled to accommodate shipping constraints.

B. Performance Criteria:
   1. Acoustical Performance: Provide folding glass-panel partition assemblies tested by qualified testing agency in accordance with ASTM E90, ASTM E1425, or AAMA 1801.
      a. Sound Transmission Class (STC) Rating: STC of 37, minimum, calculated in accordance with ASTM E413.
   2. Structural Performance: No glazing material breakage or permanent damage to fasteners, anchors, hardware, or actuating mechanisms, when tested in accordance with ASTM E330/E330M.

C. Configuration: As indicated on drawings.

D. Glazed Aluminum-Framed Panel Construction:
   1. Aluminum Frames: Factory finished; manufacturer's standard corner construction.
   2. Aluminum Frame Finish: PVDF coating in accordance with AAMA 2605.
   3. Tempered Glass Thickness: 1/2 inch (12.7 mm).
   4. Maximum Support Capacity: Manufacturers standard load with two carriers on each panel.
   5. Glass: Clear. With applied film.
   6. Panel hardware finish to match frame.

E. Overhead Track: Extruded aluminum box track, factory fabricated; corner, intersection, and hanger access fittings to suit partition movement and stacking indicated; track joints reinforced with stainless steel junction plates.
   1. Track Suspension System: Provide brackets, hanger rods, and hardware for attachment to structure, with at least 6-inch (152 mm) vertical adjustment range and capable of adjustments without removing panels from tracks.
      a. Field drill holes in supporting structure.

F. Sill Type: Flush sill, with sealant, shims and fasteners at necessary locations.
   1. Finish: To match the panel frame.

G. Operable Panel Hardware:

H. Panel Hinges:
   1. Stainless steel hinges and security hinge pins with set-screws.
   2. Continuous.

2.03 MATERIALS

A. Glazing:
   1. Tempered float glass meeting requirements of ASTM C1036, Type I, Quality Q3, fully tempered in accordance with ASTM C1048, Kind FT, and as follows:
      a. Comply with 16 CFR 1201, Category 2 and ANSI Z97.1, Class A.
      b. Prepare glazing panels for indicated fittings and hardware before tempering.
      c. Provide exposed glazing edges with flat polished/ground glass finish.
      d. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

B. Aluminum Components: Complying with ASTM B221 (ASTM B221M), alloy 6063, temper as indicated, with anodized finish complying with AAMA 611, and powder coating complying with AAMA 2603 or AAMA 2604 for select colors.

2.04 ACCESSORIES

A. Pass Door: Single door, 36 inch wide by 120 inch high opening; same design adn contruction as panels; fit door with perimeter acoustic gaskets, concealed closer, keyed lock, adn tool operated floor seal.
   1. Panic exit hardware.

B. Anchors: Hot-dipped galvanized or stainless steel in accordance with project and manufacturer's installation requirements.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch (6 mm) of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.

D. Do not begin installation until supports and adjacent substrates have been properly prepared.

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

3.02 PREPARATION

A. Clean substrates thoroughly prior to installation.

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

3.03 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Use anchorage devices to securely fasten assembly to adjacent construction without distortion or imposed stresses.

D. Install perimeter trim and interior closures.

E. Fit and align partition assembly and pocket doors level and plumb.

3.04 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 (3 mm) from 10 feet (3.05 m) straight edge.

3.05 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

3.06 CLEANING

A. Thoroughly clean surfaces and materials installed as part of this work.
   1. Remove protective material from factory finished surfaces.
   2. Remove labels and visible markings.
   3. Wash surfaces by method recommended and acceptable to manufacturer; rinse and wipe surfaces clean.
   4. Upon completion of installation, thoroughly clean door aluminum surfaces in accordance with AAMA 609 & 610.

3.07 CLOSEOUT ACTIVITIES

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

B. Demonstrate operation of partition and identify potential operational problems.

3.08 PROTECTION

A. Protect installed products and materials until Date of Substantial Completion.

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

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Diaper changing stations.

C. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: blocking and packing for accessories.

B. Section 093000 - Tiling: Ceramic washroom accessories.

C. Section 102113.19 - Plastic Toilet Compartments.

D. Division 220000 - Plumbing: Plumbing fixtures.

1.03 REFERENCE STANDARDS

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

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

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

D. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

E. ASTM C1036 - Standard Specification for Flat Glass; 2021.

F. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

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

H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

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

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement and concealed ceiling supports to receive anchor attachments.

1.05 SUBMITTALS

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

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Bradley Corporation: www.bradleycorp.com/#sle.
   2. Substitutions: Section 016000 - Product Requirements.

B. Diaper Changing Stations:
   1. Koala Kare Products: www.koalabear.com/#sle.
   2. Substitutions: 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 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel.

B. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, and tumbler lock.
   1. Capacity: 300 C-fold minimum.

C. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve.

D. Grab Bars: Stainless steel, peened surface.
   1. Heavy Duty Grab Bars: Floor supports are not acceptable.
      a. Push/Pull Point Load: Minimum 1000 pound-force (4448.2 N), minimum.
      b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.125 inch (3.17 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
      c. Length and Configuration: As indicated on drawings.

E. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.05 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.
   2. Mounting: Surface.
   3. Minimum Rated Load: 250 pounds (113.4 kg).

2.06 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

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.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

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

1.04 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Larsen's Manufacturing Co.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Larsen's Manufacturing Co; _____: www.larsensmfg.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Finish: as indicated on the drawings.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Configuration: Semi-recessed type.

B. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

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

D. Finish of Cabinet Interior: as indicated on the drawings.

2.04 ACCESSORIES

A. Cabinet Signage: as indicated on the drawings, affixed to the fire extinguisher cabinet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, ____ inches (____ mm) from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

END OF SECTION

SECTION 105617
WALL MOUNTED STANDARDS AND SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel shelf standards, brackets, and accessories.

B. Steel shelf support brackets.

C. Shelves.

D. Accessory hooks.

E. See drawings for locations and configurations.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking in walls for attachment of standards.

B. Section 064100 - Architectural Wood Casework: Plastic laminate shelves.

C. Section 092116 - Gypsum Board Assemblies: Blocking in metal stud walls for attachment of standards.

1.03 REFERENCE STANDARDS

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

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.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products under cover and elevated above grade.

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Shelf Standards and Brackets:
   1. Knape & Vogt Manufacturing Company; 87™/187™ Series: www.knapeandvogt.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

A. Steel Shelf Standards, Brackets, and Accessories:
   1. Heavy-Duty Shelf Standards and Brackets: Single-slotted channel standards for brackets adjustable in 1 inch (25 mm) increments along entire length of standard, drilled and countersunk for screws.
      a. Load Capacity: Recommended by manufacturer for loading of 300 to 450 pounds (135 to 200 kg) per pair of standards.
      b. Lengths: As indicated on drawings.
      c. Finish: Powder-coated.
      d. Color: To be selected by Architect from manufacturer's full line.
      e. Brackets: Double tab type, locking into slots; size to suit shelves; same finish as standards.

f. Bracket Quantity: Provide one bracket for each 12 inches (305 mm) of standard length.

B. Shelving:
1. Laminate Faced Shelves: Particleboard or medium density fiberboard covered with high pressure decorative laminate on both sides.
a. Edge Finish: Matching laminate, all four edges.
b. Substrate Thickness: 3/4 inch (19 mm), nominal.
c. Length: As indicated on drawings.
d. Laminate: NEMA LD 3 Type HGL.
e. Laminate Color and Pattern: As indicated on drawings.

C. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions. Finish of exposed to view fasteners to match finish of standards and other components.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

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

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount standards or brackets to solid backing capable of supporting intended loads.

C. Install brackets, shelving, and accessories.

3.04 PROTECTION

A. Protect installed products until completion of project.

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

END OF SECTION

DIVISION

11

EQUIPMENT

SECTION 115213
PROJECTION SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Front projection screen assemblies.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking in walls and ceilings.

B. Section 11 6143 - Stage Curtains: Coordination with stage curtains installation.

C. Section 260583 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

D. Division 16 0000 - Wiring Connections: Electricla supply, conduit and wiring for electric motor.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.

D. Manufacturer's Qualification Statement.

E. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F (10 degrees C), and stack in accordance with manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Maintain interior of building between 60 degrees F (15 degrees C) and __ degrees F (__ degrees C) during and after installation of projection screens.

1.07 WARRANTY

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

B. Provide two year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.01 FRONT PROJECTION SCREENS

A. Manufacturers:

1. Da-Lite Screen Company; _____: www.da-lite.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Front Projection Screens: Factory assembled unless otherwise indicated.
1. Dimensions: As indicated on drawings.
2. Located in Banquet Room: Motorized, matte light diffusing fabric screen, horizontally tensioned, wall mounted.
a. Screen Viewing Area: as indicated on the electrical drawings.

C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
1. Material: High contrast acoustically transparent gray vinyl without backing, with nominal gain of 0.8 over viewing angle not less than 70 degrees from axis, horizontally and vertically.
2. Seams: No seams permitted in fabric up to 96 inch (2438 mm) high by 72 inch (1829 mm) wide.

D. Exposed Screen Cases: Steel, with integral roller brackets.
1. Finish: Baked enamel.
2. Color: White.
3. End Caps: Steel; finished to match case.
4. Mounting: Wall.

E. Electrically-Operated Screens:
1. Roller: Steel, 2 inch (51 mm) in diameter, with locking device.
2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar and plastic end caps.
3. Horizontal Tensioning: Tab-guided cable system.

F. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.02 ELECTRICAL COMPONENTS

A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Motors: Direct drive, 110/120 V, 60 Hz.
1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type and lifetime lubricated; equipped with thermal overload cut-off, internal junction box, electric brake, and pre-set accessible limit switches.

C. Controls: Three (3) position control switch with plate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

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

C. Verify type and location of electrical connections.

D. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and as indicated on drawings.

D. Install plumb and level.

E. Install electrically operated screens ready for connection to power and control systems by others.

F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

G. Test electrical screens for proper working condition. Adjust as needed.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Protect rigid rear projection screens with temporary covering over optical coating side of screen.

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

END OF SECTION

SECTION 116143
STAGE CURTAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stage curtain fabrics.

B. Linings.

C. Scrims and drops.

D. Stage curtain track support systems.

1.02 PRICE AND PAYMENT PROCEDURES

A. Alternates: See Section 012300 - Alternates, for product alternatives affecting this section.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

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

C. ASTM A391/A391M - Standard Specification for Grade 80 Alloy Steel Chain; 2021.

D. ASTM A413/A413M - Standard Specification for Carbon Steel Chain; 2021.

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

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

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

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

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

J. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

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

1.04 SUBMITTALS

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

B. Product Data: Provide for each type of product as follows:
   1. Stage Curtains: Provide information on type of curtain, weight, location for use on project, and type of flame retardancy.
   2. Draw-Curtain and Fly-Curtain Operators: Provide rated capacities, and operating and electrical characteristics.
   3. Tracks: Provide capacity of each curtain track to support curtain weight and control curtain operation.

C. Shop Drawings: Indicate installation information for components not dimensioned or detailed in product data.
   1. Submit floor plans, elevations, sections, attachment details of curtains and operating clearances.
   2. Submit fabric assembly and support details.
   3. Submit documentation indicating load capacity of each batten, track, attachment, and rigging components.
   4. Submit attachment locations for grand drape, backdrop curtain, and proscenium curtain, and corresponding loads imposed on structure.

D. Verification Samples: Submit fabric full width by at least 12-inch (305 mm) long section of each selected fabric from dye lot to be used for this work, with specified treatments applied and showing repeat of patterns; mark top and face of fabric.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum five years of documented experience.

1.06 FIELD CONDITIONS

A. Ambient Conditions: Do not install stage curtains until spaces are fully enclosed and watertight, and the following:
   1. Wet work in adjacent areas is complete and surfaces are dry.
   2. Work at and above ceiling level has been completed.
   3. Ambient temperatures and humidity of adjacent areas are maintained at levels when occupied for intended use.

B. Field Measurements: Confirm supporting structural element locations and adjacent construction for stage curtains and rigging, and complete field measurements prior to fabrication and include these dimensions on shop drawings.

1.07 WARRANTY

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

B. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Defective Work includes, but is not limited to, stage curtain support and rigging that is not operating properly.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stage Curtain Fabrics:
   1. KM Fabrics, Inc: www.kmfabrics.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Stage Curtain Track Systems:
   1. H&H Products (previously H&H Specialties)
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Stage Curtain Systems Design: Engage qualified designer to develop design of stage curtain system, including comprehensive project specific analysis of necessary structural system attachments in compliance with performance requirements.

B. Structural Performance: Ensure attachment of stage curtain system to structure withstands material weight and operational loads applicable for this project and in compliance with local building codes and authorities having jurisdiction.
   1. Design Loads: Weight of stage curtains and track system.

C. Fire-Test Characteristics: Stage curtain fabrics in compliance with NFPA 701 flame propagation fire test requirements conducted by authorized testing agency, listed by UL (DIR), ITS (DIR), or FM (AG) and acceptable to authorities having jurisdiction.
   1. Permanently attach label to fabric of each curtain assembly indicating fabric treatment as follows:

a. Inherently Flame Retardant (IFR), fibers/yarns that are non-combustible for life of fabric.

2. Permanently attach swatch of matching fabric from same dye lot, at least 12 inches (305 mm) square, to backside of curtain assembly for use as fire-resistance test strip.

D. Electrical Components: Devices that are listed and labeled in compliance with NFPA 70, by a qualified testing agency, and marked for designated application.

2.03 STAGE CURTAIN FABRICS

A. Provide curtains of matching fabric and color from single dye lot, and when size and quantity of curtains exceeds maximum dye lot size, provide curtain or adjacent pair of curtains from only one dye lot, and arrange curtain dye lots to minimize exposure of any differences.

B. Type B - Polyester Velour: Weighing at least 22 oz/linear yd (683 g/linear m), napped fabric of 100 percent polyester with minimum pile height of 75 mil, 0.075 inch (1.9 mm) and minimum width of 62 inches (1.57 m).

1. Application: all curtains.
2. Color: As indicated on drawings.
3. Pattern: none.

2.04 CURTAIN TRACK

A. Steel Track: Commercial quality, roll-formed, galvanized steel sheet, ASTM A653/A653M, with G60 (Z180) coating designation; with continuous bottom slot and each half of track in single continuous piece; black paint finish; including support and operation accessories.

1. Thickness: As recommended by manufacturer for curtain loads and operation.
   a. Heavy-Duty: 14-gauge, 0.0747-inch (1.90 mm) minimum thickness.

B. Curtain Rails: Provide single or double curtain capacity as indicated on drawings, and end stops.

C. Curved-Suspended-Track Stiffener: Steel pipe, 1-1/2-inch (38 mm) nominal diameter, Grade A, Schedule 40 in accordance with ASTM A53/A53M; support both sections of curved suspended tracks, with curve to match track.

D. Clamp and Bracket Hangers: Steel clamps and brackets of required strength to support loads for attaching track to overhead support.

E. Track-Lap Clamp: Clamp that matches track channel finish as necessary for attaching two tracks at center overlap.

F. Folding Guide: Carriers, as indicated on drawings, with rear-fold or backpack guide and rubber spacers to fold curtain from offstage end of curtain; size for use with operating line as required.

G. Operation:

1. Manual Walk-Along Operation: Curtain track without a cord, cable, pulleys, or floor pulley; must walk with curtain to open and close.

H. Track System: Provide heavy-duty curtain track with components as recommended by manufacturer for loads and operation, including track end stops.

1. Carriers: Standard plated-steel carriers with a pair of nylon tired ball-bearing wheels riveted parallel to body, and equip carriers with rubber or neoprene bumpers to reduce noise and plated-steel swivel eye and trim chain for attaching curtain snap or S-hook, and required number of curtain carriers for track length and curtain fabrication.
   a. Master Curtain Carriers: One plated-steel master carrier for each leading curtain edge, with two pairs of nylon tired ball-bearing wheels and with two line guides per carrier.
2. Pulleys: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable pulley to maintain proper tension on operating line; each with gas-filled-nylon-tired ball-bearing sheaves enclosed in steel housings; pulleys with steel housing finished to match track and with bracket for securing off-stage end of curtain.

2.05 FABRICATION - CURTAINS

A. General: Provide vertical seams unless otherwise indicated, locate vertical seams so they do not fall on faces of pleats, and only use fabric that is cut greater than half the width of fabric.
   1. Facing the full width of material at center meeting edges.
   2. Curtains that are tabled square, and hems that don't pucker.

B. Vertical and Top Hems: Machine sew hems as follows, unless otherwise indicated:
   1. Vertical Hems: Fabricate at least 2 inches (51 mm) wide, and at least 4 inches (102 mm) wide at borders, valances, teasers, and tormentors with at least 1-inch (25.4 mm) tuck and without visible selvedge material from front of curtain; sew open ends of hems closed.
   2. Turnbacks: Fabricate leading-edge and trailing-edge turnbacks for traveler curtains by folding back at least 12 inches (305 mm) of face fabric, with at least 1-inch (25.4 mm) tuck, and vertically secured by sewing.
   3. Top Hems: Fabricate by double-stitching 3-1/2-inch (89 mm) wide heavy jute or laminated synthetic webbing to top edge at back side of curtain, and with at least 2 inches (51 mm) of face fabric turned under.

C. Fullness:
   1. 100 Percent Fullness: Provide this fullness, exclusive of turnbacks and hems, along top hem reinforcement as follows:

D. Grommets:

E. Bottom Hems: Machine sew hems as follows, unless otherwise indicated:
   1. For Curtains With Fullness:
      a. Curtains That Don't Hang to Floor: Hems at least 3 inches (76 mm) deep, with weight tape, 3/4 inch (19 mm), and open ends of hems sewn closed.
      b. Floor Length Curtains: Provide hems at least 6 inches (152 mm) deep, with individual weights in individual closed pockets sewn above finished bottom edge of curtain, and open ends of hems sewn closed.

2.06 ACCESSORIES

A. S-Hooks: Manufacturer's standard heavy-duty plated wire hooks, at least 2 inches (51 mm) long.

B. Tie Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, colored to best match curtain; at least 5/8 inch (15.9 mm) wide by 36 inches (914 mm) long and threaded through grommets.

C. Battens: Fabricate using steel pipe and minimize the number of joints; connect pipe at joints using 18-inch (457 mm) long internal splice sleeve secured with four flush rivets, plug welds, threaded couplings, or equally strong method.
   1. Steel Pipe: 1-1/4-inch (31.8 mm) nominal diameter, Grade A, Schedule 40 in accordance with ASTM A53/A53M.
   2. Finish: Matte black with 1-inch (25.4 mm) wide yellow-colored stripe along center of each batten.

D. Support, Clamps, and Anchors: Galvanized after fabrication sheet steel, Class B in accordance with ASTM A153/A153M; manufacturer's standard thickness.

E. Trim and Support Cable: 1/4-inch (6.4 mm) diameter, 7x19 galvanized steel cable with minimum breaking load (MBL) of 7,000 lb (3175 kg).

F. Trim and Support Chain: Hardened alloy steel chain rated for overhead lifting, Grade 80 in accordance with ASTM A391/A391M.

G. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard and corrosion-resistant.

H. Individual Curtain Bottom Weights: Curtain manufacturer's standard segmented weights in compliance with requirements for curtain type and location.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with installer present, for compliance with requirements for supporting structural members, blocking, clearances, installation tolerances, and other conditions that may impact performance of stage curtain assembly.

B. Examine placement and condition of inserts, clips, blocking, or other supports installed by others and for use in supporting track and battens of stage curtain assembly.

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

3.02 INSTALLATION, GENERAL

A. Install stage curtain assembly in accordance with curtain and track manufacturers written instructions.

3.03 INSTALLATION - CURTAIN

A. Track Hung: Secure curtains to track carriers with S-hooks.

3.04 INSTALLATION - BATTENS

3.05 INSTALLATION - TRACK

A. Mounting of Track Assembly:
   1. Wall Mounted: Install track by suspending from brackets securely mounted to wall construction and within intervals indicated in manufacturer's written instructions for on center spacing.

B. Track Support Spacing: Comply with manufacturer's recommendations for applied loads, and not to exceed the following dimensions between track supports:
   1. Heavy-Duty Track: 3 feet (___ m), maximum.

C. Install track for center-parting curtains with at least 24-inch (610 mm) overlap of track sections at center-line, and supported with track lap clamps.

3.06 CLOSEOUT ACTIVITIES

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

B. Demonstrate proper operation of equipment to Owner's designated representative.

C. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

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 one hour of training.
   3. Location: At project site.

3.07 PROTECTION

A. Protect installed stage curtain assembly from subsequent construction operations until Date of Substantial Completion.

END OF SECTION

DIVISION

12

FURNISHINGS

SECTION 122400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

C. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

B. 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.

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.

D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

E. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

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.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.

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 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. Fabric: One year.
   3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Budget Blinds, Inc.
   2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com/#sle. E Screen 7501 Charcoal / Charcoal 1% openness.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

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. Basis of Design: as indicated on the drawings.
   2. Description - Interior Roller Shades: Single roller, manually 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: Window jamb mounted - inside, between jambs.
      d. Size: verify all sizes; to cover all portions of window(s).
      e. Fabric: As indicated under Shade Fabric article.
   3. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Material: Stamped steel.
   4. Roller Tubes: As required for type of shade operation.
      a. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      b. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
      c. Take-Up Roller: Manufacturer's standard roller tube pretensioned for winding lift cable in bottom-up type shades.
   5. 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.
   6. Manual Operation for Interior Shades:
      a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
      b. Drive Chain: Continuous loop, beaded ball chain with restraining device, 95 lb (43 kg) minimum breaking strength; comply with WCMA A100.1. Provide upper and lower limit stops.

c. Chain Retainer:
1) Manufacturer's standard clip.

2.03 SHADE FABRIC

A. Fabric: 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.
3. Color: as indicated on the drawings.
4. Fabrication:
a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.

2.04 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 - Inside Mounting: Fill openings from jamb to jamb.
3. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch (19.05 mm) total.

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

C. 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 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

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

B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

C. 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.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

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

3.07 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

DIVISION

20

FACILITY SERVICES

SECTION 20 0500 - GENERAL PLUMBING AND HVAC

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work to be performed under the Plumbing, HVAC, and/or BAS sections of the specification shall include all supervision, labor, equipment, and materials required and incidental to providing and installing complete and adjusted systems, as shown on the drawings and described herein.

B. All specification requirements shall be considered complementary to other specification sections for the project. Where conditions of this section conflict with bidding instructions and/or other general conditions, the contractor shall request clarification throughu the engineer prior to bidding the work.

C. The contractor shall plan the work in advance and coordinate all installation requirements with other trades. Contractors shall be held to have checked all construction documents for possible interference caused by work of other trades, conditions of the premises, and obstructions. Where conflicts occur, the contractor shall request clarification through the general contractor.

D. Note that the term "general contractor" as used through-out these specifications may apply to a prime contractor, or a construction manager, or another term as appropriate for the particular delivery method. Where the primary contract holder is not performing the function of a general contractor, the term will apply to this contractor.

E. Execution of the work shall be governed by the construction documents: architectural, structural, plumbing, hvac, and electrical drawings, where applicable, as well as drawings of associated trades. Locations of piping, equipment, ducts, etc on the drawings are diagrammatic; indicated positions shall be followed as closely as possible, however exact locations shall be subject to building construction conditions and interferences with other work.

1.2 CODES RULES PERMITS AND FEES

A. Materials furnished and work installed shall comply with all state and locally adopted nationally recognized and consolidated building codes and standards, with requirements of local utility companies, and with the requirements of all governmental authorities having jurisdiction.

B. The contractor shall give all necessary notices, obtain all permits and pay all sales taxes, fees, and other costs, including utility connections or extensions, in connection with his work; file all necessary plans, prepare documents and obtain all necessary approvals of governmental departments having jurisdiction; obtain all required certificates of inspection and deliver same to the engineer before request for acceptance and final payment.

C. The contractor shall include in the work, without extra cost to the owner, any labor, materials, services, apparatus, etc to comply with all applicable laws, ordinances, rules and regulations, whether indicated or not on the drawings. Where materials or installations that are specified or detailed in a way that conflicts with or is perceived to conflict with governing regulations, the contractor shall request clarification from the engineer prior to bidding.

1.3 CONSTRUCTION DRAWINGS

A. The drawings and the specifications are intended to be complimentary. Where conflicts exist on the drawings or between the drawings and the specifications, and the contractor fails to notify the engineer prior to issuance of the final addendum, the contractor will be held to have considered and included the most expensive option in the bid. No changes or extras will be given for one option over the other.

B. Drawings indicate suggested routing of pipes, ducts, and other conduits. It is not intended that drawings indicate all offsets that may be necessary to avoid conflicts with structure, work of other trades, or other conflicts. The contractor shall plan installation to conform to the structure, avoid obstructions, and preserve clearance, without additional cost to the project.

C. Drawings are diagrammatic and generally indicative of the work. The contractor shall follow the drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Confirm conditions in the field and coordinate with other trades prior to rough-in. All equipment shall be installed such that access is maintained for serviceability.

D. Before fabrication, piping and ductwork shall be checked with the building construction for dimensions, locations, clearances, etc. Ductwork and piping shall be made up with the necessary variations to conform to the details of the construction of the building. Ductwork and piping that is made up before hand and found that it will not fit into allocated spaces shall be re-constructed at no additional expense to the project.

E. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, the engineer shall be notified before proceeding with installation to prevent conflict with work of other trades and for proper execution of the work.

F. Existing equipment, conduit, and device locations, including piping and ductwork are shown approximate. Confirm actual locations in the field and coordinate with other trades prior to rough-in. No extras will be given for removal, relocation, rerouting, or other changes resulting from a failure to adequately investigate prior to starting the work.

1.4 SURVEYS AND MEASUREMENTS

A. The contractor shall base all measurements, both horizontal and vertical from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements on site and check the correctness of same as related to the work.

B. Should any discrepancy be discovered between actual measurements and those indicated, which prevents following good practice or the intent of the drawings, the contractor shall request clarification through the general contractor, and shall not proceed with the work until instructions are received from the engineer.

1.5 SUBSTITUTIONS

A. A specification in which a manufacturer's product is named and accompanied by the words "basis of design", including make or model number or other designation, shall establish significant qualities and other characteristics for purposes of evaluating comparable products of additional manufacturers.

B. Where specifications name a basis of design product, or refer to a basis of design product indicated on the drawings, and other products or manufacturers are not listed, provide the specified or indicated product or an approved comparable product. Equipment scheduled on the drawings shall be considered the "basis of design".

C. Wherever the word "equal", or words to the same effect are used in connection with a specified product, it is to be understood that such words mean any product claimed to be an equal shall be reviewed and accepted in writing by the engineer. Products and materials not specifically identified as accepting “equals”, and which have not been submitted for prior review, will be summarily rejected.

D. Pre-bid requests for substitution must be received by the engineer one calendar week prior to the bid date (or as otherwise specified in the instructions to bidders), so that they may be processed and included by addendum for the benefit of all bidders. Requests received after the deadline will not be considered. A substitution request form must accompany each individual application with undersigned certification as described below.

E. Requests shall indicate the paragraphs and/or drawing details from which the proposed construction and/or function varies from the items specified, and shall provide complete data showing and explaining all such changes or variations the bidder proposes to make from the drawings and specifications.

F. It is further understood that no material or work shall be presented to the engineer as equal to that specified without the full understanding on the part of the manufacturer, the supplier, and the contractor, that the engineer is to use his own judgment in determining equivalency, and the decision is final.

1.6 SUBSTITUTION REQUESTS

A. Document each request with complete point-by-point comparative data substantiating compliance of the proposed substitution with the contract documents. Submit shop drawings, product data, etc, attesting to the proposed product equivalence. Burden of proof is on the proposer. Clearly indicate all salient points.

B. A request for substitution constitutes a representation that the submitter certifies the following:

1. Proposed product has been fully investigated and determined to be equal or superior in all respects to specified product.
2. Proposed product is consistent with the design and/or design intent and will not require revisions to the contract documents.
3. Proposed product is compatible with other portions of the work, and will produce the intended results.
4. Proposed product will not affect dimensions and functional clearances, and will have no adverse effects on other trades.
5. Claims for additional costs or time extension that may subsequently become apparent will be waived.
6. Payment will be made to the engineer and/or other trades for changes to building design and/or construction.

C. Equipment may have been originally selected with certain capabilities for safety factor, future considerations, adjustment beyond scheduled values, etc. Substituted equipment submitted as equal shall be capable of achieving the basis of design performance and/or capacities, regardless of how it is scheduled.

D. Acceptance of a proposed manufacturer for bidding does not constitute final approval of the substitution to imply that it meets all specific and significant qualities of the scheduled or specified product. The specified product shall remain the “basis of design” and all substitute product or equipment manufacturers remain subject to requirements therein.

E. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved, neither the project specifications nor the drawings will be revised to reflect the substitution.

1.7 EQUIPMENT DEVIATIONS

A. Where the contractor has proposed to use an item or equipment other than that specified or detailed on the drawings, which requires any redesign of the structure or any other part of the design, all such redesign, and all new drawings and detailing required thereof, shall be prepared by the contractor at his own expense and submitted for approval by the engineer.

B. Where such accepted deviation requires a different quality, capacity, or arrangement of related equipment, ductwork, piping, wiring, or conduit from that specified or indicated on the drawings, the contractor shall furnish and install all such material and equipment required at no additional cost and with no additional time added to the contract.

1.8 SUBMITTALS FOR REVIEW

A. Prior to delivery of any equipment or material to the jobsite, the contractor shall submit for review, detailed shop drawings and/or product data cut sheets of all equipment and materials required to complete the project. No material or equipment may be delivered to the jobsite or installed until the contractor has in his possession the reviewed submittals for the particular material or equipment.

B. Submittals shall include detailed, dimensioned cut sheets showing manufacturer, model, construction, quantity, size, arrangements, operating clearances, performance characteristics, and capacity. Each item of equipment proposed shall be a standard catalog product or custom modified version of an established manufacturer, and of equal quality, fit, finish, durability, and performance to those specified or scheduled.

C. Unless otherwise approved in advance, all submittals and resubmittals for each division shall be transmitted to the engineer at one time. Submittals shall be transmitted sufficiently in advance to allow ample time for review. Review will not commence until all submittals for a particular division are received. Partial submittals will be returned without review. Failure to submit with ample time for checking shall not entitle an extension of contract time.

D. Samples, drawings, specifications, catalogs, etc submitted for review, shall be properly labeled indicating contractors name and title of project, section/article number of specifications governing, and specific service and size range for which material or equipment is to be used, with model numbers and accessories clearly marked.

E. The purpose of submittals is to demonstrate the way by which the contractor proposes to conform to information given in the contract documents. There is no alleged responsibility of the engineer for failing to catch the contractor's errors in submittals.

F. The work shall be in accordance with approved submittals, except that the contractor shall not be relieved of responsibility for deviations from requirements of the contract documents by the engineer's approval of shop drawings, product data, or other submittals.

G. Review rendered shall not be considered as a guarantee of building conditions. The contractor is responsible for dimensions, which shall be confirmed at the job site; coordination of his work with that of other trades, quantities required, and the satisfactory performance of his work.

1.9 DIGITAL SUBMITTALS

A. At the contractor's option, paperless electronic submittals may be transmitted in an Adobe PDF formatted file. Electronic submittals and resubmittals are subject to all outlined requirements listed above. Submittals shall be arranged according to individual sections and submitted separately by section. Do not combine into a comprehensive package. Do not split individual sections. File names shall include the specification number and title.

B. When resubmitting submittals, transmit the full and complete submittal section, such that a single reviewed and accepted submittal file will exist on the record and with the general contractor on the jobsite. Partial resubmittals and/or loose cut sheets will be rejected.

C. Remove all rejected pages, pages not applicable to the submittal, and/or pages that are being changed for the resubmittal. Insert all new pages into the digital file in the appropriate locations, labeled and indicated as specified above.

D. Return the digital file with the same or similar identifying file name, including the specification section number and title, and article or paragraph numbers where applicable.

E. Where these instructions are not followed, submittals will be summarily rejected. The contractor is responsible for providing properly formatted submittals with sufficient time for review.

1.10 DELEGATED DESIGN SUBMITTALS

A. Where indicated, the contractor shall provide professional services or certifications by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, shop drawings, and other submittals prepared by such professional.

B. Shop drawings and other submittals related to the work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted for review.

C. The Owner and the engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by such design professionals.

D. The engineer will review, approve, or take other appropriate action on submittals only for the limited purpose of checking for conformance with the information given and the design intent expressed in the contract documents.

E. Work on the project shall not begin until submittals have been accepted by the engineer, and the Authority Having Jurisdiction where applicable.

1.11 COOPERATION WITH OTHER TRADES

A. This contractor shall give full cooperation to other trades and shall furnish in writing to said trades, with copies to the engineer, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. Where work of this contractor will be installed in close proximity, or will interfere with work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. In general, sanitary waste and vent and roof drains shall have precedence; ductwork shall have precedence over all other plumbing and piping; piping shall have precedence over conduit, etc.

C. If so directed by the engineer, the contractor shall prepare composite working drawings and sections at a suitable scale not less than a quarter inch, clearly showing how his work is to be installed in relation to the work of other trades. If the contractor installs his work before coordinating with other trades, so as to cause any interference with work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.

D. The contractor shall furnish other trades all approved submittals, necessary templates, patterns, setting plans, and shop details for the purpose of coordinating adjacent work or for the proper installation of common work and equipment.

1.12 MATERIAL AND WORKMANSHIP

A. All material and apparatus required for the work, except as specified otherwise, shall be newly manufactured, of best quality, and shall be furnished, delivered, erected, connected and finished in every detail. Where no specific kind of quality of material is given, a best-in-class standard article as approved by the engineer shall be furnished.

B. The contractor shall furnish the services of an experienced superintendent, who shall be continuously in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers, and labor required to unload, transfer, erect, connect, adjust, start, operate, and test each system.

1.13 GUARANTEES AND WARRANTEES

A. The contractor shall guarantee, in writing, that all work installed will be free from any and all defects in workmanship and/or materials; that all apparatus will develop capacities and characteristics specified; and that if, during a period of one year, or as otherwise specified from the date of substantial completion, any such defects in equipment, workmanship, material or performance appear, the contractor will remedy such defects within a reasonable time and without additional cost to the owner.

B. The manufacturer shall guarantee that individual items or groups of items furnished shall have capacities equal to or greater than that specified and shall be suitable for the intended application. All warranties commence on the date of substantial completion, unless noted otherwise. Furnish manufacturer's written warranties on all equipment to the owner stating the effective date of warranty.

C. In default thereof, the Owner may have such work done and charge cost to the contractor.

1.14 EXISTING CONDITIONS

A. The construction documents reflect the engineer's best understanding of existing conditions. All information portrayed in the plans and specs shall be verified in the field by the contractor prior to submitting a proposal.

B. Indicated locations of existing utilities, piping, ductwork, etc, underground or overhead, are approximate and are not to be relied upon as accurate or complete. The contractor shall locate all existing piping prior to excavation or construction in a given area and protect against damage to lines intended to remain.

C. Existing equipment and conditions shown on the drawings are indicated for informational purposes only. The contractor shall be responsible for visiting the site, and verifying conditions as they exist, and shall include all costs and provisions necessary to complete the general scope of work described.

D. The contractor shall provide for the removal, relocation and/or reworking of any equipment affected (whether indicated or not), by the removal, addition, or reworking of existing equipment, pipes, ducts, walls, ceilings, etc.

E. No allowance shall be made on behalf of any contractor for conditions that should be reasonably expected for the extent of work shown.

1.15 PRE-BID SITE INVESTIGATIONS

A. All bidders shall carefully examine the contract documents and perform a reasonable site investigation before submitting a proposal. A bidder may also arrange for supplemental site visits as necessary to prepare a responsive proposal.

B. Bidders shall come to the pre-bid site conference prepared with a copy of the project manual, tools of the trade, measuring devices, competent personnel, etc, as desired to gather all onsite information necessary for preparing a proposal.

C. If a contractor discovers discrepancies in the plans and specs as a result of pre-bid investigations, they are obligated to inform the owner of the discovery before submitting a bid.

D. Submitting a proposal is considered an affirmative statement that the contractor has examined the contract documents and the project site, investigated the nature and location of the work, and are satisfied as to the character, quality, and general conditions to be encountered that can affect the work or the cost thereof.

E. No allowance shall be made on behalf of any contractor for conditions where the contractor should have taken steps resonably necessary to ascertain the nature of the work.

1.16 MANUFACTURER'S SPECIFICATIONS

A. Manufacturer's installation instructions shall have the same force and effect as though written in full in these specifications. Where conflicts occur between the manufacturer's instructions and the documents, the contractor shall seek clarification from the engineer prior to installation.

1.17 FIRE RATED ASSEMBLIES

A. The contractor shall be responsible for maintaining the integrity of all fire rated ceiling and wall assemblies. Where penetrations are required into ceilings or sections of ceilings are removed to install support members, the contractor shall be responsible for patching the ceiling with an approved fire rated wallboard. Tape, seal, texture and paint to match all surrounding surfaces. This shall apply to all new penetrations and any existing penetrations through-out the project.

PART 2 EXECUTION

2.1 EXCAVATION AND TRENCHING

A. Mass excavation to approximate building levels will be carried out under a section of the architectural specifications. Except as otherwise noted on drawings, this contractor shall be responsible for trench and pit excavations and backfilling required for work under this section of the specifications, inside and outside the building, including all required shoring, bracing, and/or pumping, and all protection for safety of persons and property. Local or state safety codes shall be strictly observed.

B. It shall be the responsibility of this contractor to check the indicated elevations of utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the engineer shall be notified of such conditions and approval shall be made before excavations are commenced. It is also the responsibility of the contractor to make excavations at the minimum required depths and locations to prevent undercutting the footing.

C. Verify locations of all existing and/or new underground utilities prior to trenching and, if damaged by this contractor, replace immediately in an approved manner and at no expense to the project. Piping and electrical work shall not be installed in the same ditch.

D. When rock is encountered during excavation, it shall be addressed as outlined under the architectural section of these specifications.

2.2 HANDLING AND PROTECTION

A. The contractor shall protect all work and material from damage by his work or workmen, and shall be liable for all damage thus caused. The contractor shall be responsible for work and equipment until finally inspected, tested, and accepted. The contractor shall protect material and equipment received on site which is not immediately installed.

B. All open ends of piping, ducts, and equipment shall be closed with temporary covers or plugs during storage and construction to prevent entry of dirt or obstructing material. Where this has not been done, the contractor shall provide cleaning services at no additional cost to the project.

2.3 ACCESSIBILITY AND PANELS

A. The contractor shall be responsible for the size of shafts and chases, and adequate clearance in partitions and ceiling space for the proper installation of the work. Advise the general contractor of any requirements and cooperate with all other trades whose work is in the same

space, and shall advise the general contractor of his requirements. Such spaces and clearances shall be kept to the minimum size required.

B. The contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Accessible equipment shall include but not be limited to, fire and smoke dampers, volume dampers, coils, valves, traps, clean-outs, motors, controllers, and drain points. Provide clearances at all electrical panels in accordance with the NEC.

C. Furnish metal access panels with screwdriver cam-locking device of required size and type to provide access to devices concealed in walls, ceilings, or furred-in spaces. Furnish access panels to the general contractor for installation as directed by this contractor. Location of these panels shall be communicated in sufficient time to be installed in the normal course of work.

D. Panel size shall be minimum 12-inches x 12-inches and larger as conditions may demand. Panel size shall be 22-inches x 22-inches where shoulder access is needed. Panels shall be of the type necessary for the particular construction in which they occur and shall be approved for fire-rated assemblies where required. See architectural specifications for panel types.

2.4 FOUNDATIONS AND SUPPORTS

A. Unless noted on the drawings, this contractor shall be responsible for installation of all necessary foundations, supports, curbs, pads, bases, and piers required for all air conditioning equipment, piping, pumps, tanks, compressors, and for all other equipment furnished under this contract, and shall submit drawings to the engineer for approval before purchase, fabrication, or construction.

B. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the engineer, not strong enough shall be replaced as directed.

C. This contractor shall furnish all temporary equipment such as ladders, scaffolding, rigging, hoisting, and services necessary for proper and safe execution of the work, and delivery onto the premises of any equipment and apparatus furnished.

2.5 CUTTING AND PATCHING

A. The general contractor will typically provide for all openings in construction. The mechanical contractor shall coordinate sizes and locations of openings and shall be responsible for all cutting and patching as necessary when sizes or locations are incorrectly communicated. No structural members shall be cut without the approval of the engineer, and all such cutting shall be done in a manner directed by him. Patching shall match adjacent surfaces.

B. Damages to new and existing masonry or brick veneers as the result of cutting or core drilling for penetrations of ductwork, grilles, louvers, piping, etc shall be repaired by an independent contractor without additional cost to the owner. Said contractor shall be regularly engaged in the masonry business with documented experience of at least five years.

2.6 SLEEVES AND PLATES

A. Sleeves shall be provided for all conduits passing through concrete floor slabs and masonry, tile, gypsum, and concrete wall construction. Locate all sleeves and inserts required before the floors and walls are built, or be responsible for the cost of cutting and patching required for pipes where sleeves and inserts penetrate existing construction, or where they were not installed or incorrectly located.

B. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes the sleeves shall be large enough to pass the and the insulation.

C. Where sleeves are located in fire-rated assemblies, fill space between pipe and sleeve with a listed and approved "fire stop" material. Where sleeves are placed in exterior walls, the space between the pipe and the sleeve shall be sealed with a weather tight caulk.

D. Check floor and wall construction finishes to determine proper length of sleeves for various locations. Terminate sleeves flush with walls, partitions and ceilings. In chase areas where pipes are concealed, terminate sleeves flush with floor. In all mechanical rooms and chases where pipes are exposed, extend sleeves 2-inches above finished floor.

E. Fasten sleeves securely in floors and walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the sleeve during construction.

F. Escutcheon plates shall be provided for all exposed uninsulated pipes passing through walls, floors, and ceilings. Plates shall be nickel plated, of the spring ring type, sized to match the pipe. Where plates are provided for pipes passing through sleeves that extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

G. This contractor shall be responsible for providing flashing for all required exterior penetrations. It is this contractor's responsibility to have reviewed design team drawings for roof and wall construction types and to provide the appropriate penetration flashings for installation by the general contractor. All penetrations shall be sealed weather-tight.

2.7 FIRE SAFE SEALANTS

A. Provide and install an elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct and piping penetrations through walls and floors, and having a UL tested and approved fire-resistance rating for the intended construction.

2.8 LUBRICATION OF EQUIPMENT

A. Properly lubricate all pieces of equipment before turning the building over to the owner. A tag shall be attached to each motor showing the date of lubrication and lubricant needed.

2.9 QUIET OPERATION AND VIBRATION

A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the engineer. In the case of moving machinery, sound or vibration noticeable outside the room where the equipment is located, will be considered objectionable.

B. Conditions shall be corrected in an approved manner by the contractor at no additional cost to the project. Vibration control shall be by means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

2.10 MOTORS

A. Motors shall be built in accordance with the latest NEMA standards and as specified. Motors shall be tested in accordance with standards of ASA C50 and conform thereto for insulation resistance and dielectric strength.

B. Each motor shall be provided with a conduit terminal box and adequate starting and protective equipment as specified or required. The capacity shall be sufficient to operate associated driven devices under all conditions of operations and load without overload, at the horsepower indicated or specified.

C. All motors rated greater than 1000 watts shall have a power factor of not less than 85% at rated load.

2.11 ELECTRICAL CONNECTIONS

A. The electrical contractor will furnish and install all wiring except temperature control wiring, equipment control wiring which does not conduct full load motor current, and interlock wiring.

B. The electrical contractor will furnish and install all power wiring complete from the power source to the motor or equipment junction box, including power wiring through starters.

C. Control relay and control transformers shall be furnished under the mechanical contract except where furnishing such items is specifically required under the electrical contract.

D. The electrical contractor will furnish and install all starters not factory mounted on equipment.

PART 3 CLOSEOUT

3.1 CLEANING AND FINISHING

A. The contractor shall go over the work and clean all equipment, fixtures, duct, piping, etc. Wipe down exterior surfaces; vacuum, wash, and clean interiors of all fan cabinets, air handlers, etc.

B. The contractor shall clean all dirt and debris from mechanical spaces, within and around all equipment (regardless of fault, pre-condition, or who the mess belongs to).

3.2 SYSTEM OPERATION

A. The contractor shall provide allowance in his bid to demonstrate that each system operates according to the specification. The contractor shall arrange to have all subcontractors (temperature control, sheet metal, plumbing, balancing, etc.) available to demonstrate to the engineer that each system performs properly.

B. If the equipment is installed improperly, is found to be faulty, or the contractor's personnel or subcontractors are not available and the demonstration requires more than one visit to the site,

this contractor shall be responsible for additional time incurred by the engineer and agrees that the owner may deduct hourly fees from the amount otherwise due the contractor.

3.3 RECORD DRAWINGS

A. The contractor shall maintain a complete set of plumbing and mechanical drawings at the site, with all changes marked neatly thereon in a contrasting color. This set shall not be used for any other purpose. Keep the drawings current at all times.

B. At the completion of the project, the contractor shall record all changes on a clean set of drawings and present this set to the engineer. This set shall be dated and clearly marked "Record Drawings".

3.4 OPERATING INSTRUCTIONS

A. Upon completion of all work and all tests, the contractor and his subcontractors shall furnish the necessary skilled labor and helpers for demonstrating operation of the system and equipment for at least one 8-hour day, or as otherwise specified in individual sections.

B. During this period, instruct the Owner or his representative fully in the operation, adjustment, and maintenance of all equipment furnished. Give at least one week notice to the Owner and the engineer in advance of this period.

3.5 MAINTENANCE MANUAL

A. This contractor shall furnish a minimum of three (3) operation and maintenance manuals. Each manual shall include a title sheet showing the engineering firm, general contractor, plumbing contractor, sheet metal contractor, and temperature control contractor. List phone numbers and addresses for all firms. Each manual shall also consist of the following, but is not limited to:

1. Table of contents.
2. Mechanical written guarantees.
3. List of all mechanical equipment suppliers.
4. Maintenance items and frequency of maintenance.
5. Equipment shop drawings and manufacturer service books.
6. Balancing and start-up reports.
7. Cleaning and treatment certifications.
8. Air and water filter replacement list.

B. The contractor shall supply all shop drawings, part lists, and manufacturer's operation and maintenance literature. All type written pages shall be inserted in “plastic sheet protectors” and each section separated with tabbed dividers. Three-ring or D-ring "presentation type" binders shall be used, with the project title and date in protected plastic sleeves under the cover and the end.

C. Paperless operation and maintenance manuals will be accepted with prior approval from the engineer. Manuals shall be submitted in a single, bound, Adobe PDF formatted file, complete

with all outlined sections and requirements listed above. Multiple loose files will not be acceptable.

END OF SECTION

SECTION 20 0505 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selective demolition and removal of plumbing, hvac, and controls systems, and related components and incidentals.

B. Demolition and removal of selected portions of the building or structure.

C. Salvage of existing items to be reused or recycled.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and [deliver to Owner ready for reuse] [store].

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure owner's on-site operations are uninterrupted.
2. Coordination of owner's continuing occupancy of portions of existing building and of owner's partial occupancy of completed work.
3. Interruption of utility services: Indicate how long utility services will be interrupted.
4. Coordination for shutoff, capping, and continuation of utility services.

C. Predemolition Photographs or Video:

1. Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations.
2. Show existing equipment or materials indicated for reuse that might be misconstrued as receiving damage caused by demolition or construction operations.

D. Statement of Refrigerant Recovery:

1. Signed by technician responsible for recovering refrigerant, stating that all present refrigerant was recovered and that recovery was performed according to regulations.
2. Include name and address of technician and date refrigerant was recovered.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 MATERIALS OWNERSHIP

A. Demolition waste becomes property of the contractor, unless otherwise indicated.

B. The owner will have first claim to keep any items or materials indicated for removal.

C. Carefully salvage in a manner to prevent damage and promptly return to the owner.

D. Historic items, relics, antiques, and similar objects or other items of interest or value to the owner that may be uncovered during demolition remain the property of the owner.

1.7 PREINSTALLATION MEETINGS

A. Inspect and discuss condition of construction to be selectively demolished.

B. Review and finalize selective demolition schedule and verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays.

C. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

D. Review areas where existing construction is to remain and requires protection.

1.8 FIELD CONDITIONS

A. Where the owner will occupy portions of building immediately adjacent to the selective demolition area, conduct selective demolition so the owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by the owner as far as practical.

C. Notify the design team of discrepancies between existing conditions and the drawings before proceeding with selective demolition.

D. It is not expected that hazardous materials will be encountered in the work. If suspected hazardous materials are encountered, do not disturb; immediately notify the design team and the owner. Hazardous materials will be removed by the owner under separate contract.

E. Maintain existing utilities indicated to remain in service and protect against damage during selective demolition operations.

F. Maintain fire-protection facilities in service during selective demolition operations.

G. Storage or sale of removed items or materials on-site is not permitted.

1.9 WARRANTY

A. Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials, and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with the owner's operations.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Patching and Repair Materials: Use only new materials matching materials damaged during performance of the work. New materials are required to meet assembly or system characteristics as existing systems indicated to remain, and carry approval labels required by authorities having jurisdiction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Review record documents of existing construction or other existing condition and hazardous material information provided by the owner. The owner does not guarantee that existing conditions are same as those indicated in the project record documents.

B. Verification of Existing Conditions:

1. Visit the project site to thoroughly examine and become familiar with conditions that may affect the work before tendering the bid.
2. The Owner will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a thorough site visit.

C. Survey existing conditions by use of measured drawings, preconstruction photographs or video.

D. Inventory and record the condition of items to be removed and salvaged.

E. Identify on-site removal of walls and ceilings required to facilitate work.

F. Identify on-site testing of piping to facilitate work.

G. Identify risks from hazardous materials prior to commencing work.

H. Ensure hazardous materials are removed or abated prior to commencing demolition.

I. Verify that utilities have been disconnected and capped before starting selective demolition operations.

J. For components intended to for relocation and reuse; remove, protect, store, clean, reinstall and connect to plumbing system. Recommission as originally intended.

3.2 PREPARATION

A. Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the owner and users is minimized and as follows:

1. Prevent debris from endangering safe access to and egress from occupied buildings.
2. Notify owner and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this section.

B. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PROTECTION

A. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

B. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

C. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

D. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

E. Cover and protect furniture, furnishings, and equipment that have not been removed.

F. Strengthen or add new supports when required during progress of selective demolition.

3.4 UTILITY SERVICES AND SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

C. The owner will arrange to shut off indicated services/systems when requested by the contractor. The contractor will arrange to shut off utilities with utility companies.

D. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity to other parts of building.

E. Disconnect, demolish, and remove fire-suppression systems, plumbing, and hvac systems, equipment, and components indicated on the drawings to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
7. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

3.5 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the work within limitations of governing regulations and as follows:

B. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

C. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings.

D. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

E. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, verify condition and contents of hidden space before starting flame-cutting operations.

F. Maintain portable fire-suppression devices during flame-cutting operations. Maintain fire watch during and after flame-cutting operations.

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

H. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

I. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

J. Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

K. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to the owner.
4. Transport items to the owner's off-site storage area.
5. Protect items from damage during transport and storage.

L. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.

M. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

N. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the design team, items may be removed to a suitable, protected storage location and reinstalled in their original locations after selective demolition operations are complete.

3.6 SPECIFIC MATERIALS

A. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Roofing: Remove existing roofing system down to substrate. Remove existing roof membrane, flashings, copings, and roof accessories.

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing, and so that building interior remains watertight and weathertight.

3.7 DISPOSAL

A. Do not allow demolished materials to accumulate on-site. Do not burn demolished materials.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

D. Remove demolition waste materials from the project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to the condition existing before selective demolition operations began.

END OF SECTION

SECTION 20 0510 - MOTOR REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single phase electric motors

B. Three phase electric motors.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer's catalog literature for each type of product indicated.

C. Operation and Maintenance Data: For field-installed motors to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Source Limitations: Obtain field-installed motors through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.
5. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.
6. Matched to torque and horsepower requirements of the load.
7. Matched to ratings and characteristics of supply circuit and required control sequence.

B. Coordinate motor support with requirements for driven load; access for maintenance and motor replacement; installation of accessories, belts, belt guards; and adjustment of sliding rails for belt tensioning.

PART 2 PRODUCTS

2.1 MOTOR CHARACTERISTICS

A. Motors 3/4 HP and Larger: Three Phase (or as scheduled).

B. Motors Smaller Than 3/4 HP: Single Phase (or as scheduled).

C. Frequency Rating: 60Hz.

D. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.

E. Service Factor: 1.15 for open drip-proof motors; 1.0 for totally enclosed motors.

F. Duty: Continuous duty at ambient temperature of 105F and at altitude of 3300-ft above sea level.

G. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.2 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium as defined in NEMA MG 1.

C. Stator: Copper windings, unless otherwise indicated.

D. Rotor: Squirrel cage, unless otherwise indicated.

E. Bearings: Re-greasable, shielded, anti-friction ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating, unless otherwise indicated.

G. Insulation: Class F, unless otherwise indicated.

H. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.

2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure: Cast iron for motors 7.5 HP and larger; rolled steel for motors smaller than 7.5 HP.

2.3 ADDITIONAL REQUIREMENTS

A. Motor Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Designed with critical vibration frequencies outside operating range of controller output.

2. Energy and premium efficiency motors: Class B temperature rise; Class F insulation.

3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

4. Provide optional motor shaft grounding rings on all motors 5 HP and larger.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor installation.

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

3.2 FIELD-INSTALLED MOTOR INSTALLATION

A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

3.3 QUALITY CONTROL FOR FIELD-INSTALLED MOTORS

A. Prepare for acceptance tests.

1. Align motors, bases, shafts, pulleys, and belts. Tension belts according to manufacturer's written instructions.

2. Verify bearing lubrication.

3. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.

4. Test interlocks and control and safety features for proper operation.

5. Verify that current and voltage for each phase comply with nameplate rating and NEMA MG 1 tolerances.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections and to assist in field testing. Report results in writing.

END OF SECTION

SECTION 20 0513 - COMMON MOTOR REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single phase electric motors

B. Three phase electric motors.

1.2 DEFINITIONS

A. Factory-Installed Motor: A motor installed by motorized-equipment manufacturer as a component of equipment.

B. Field-Installed Motor: A motor installed a Project site and not factory installed as an integral component of motorized equipment.

1.3 SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data for Field-Installed Motors: For each type and size of motor, provide nameplate data and ratings; shipping, installed, and operating weights; enclosure type and mounting arrangements; size, type, and location of winding terminations; conduit entry and ground lug locations; and information on coatings or finishes.

C. Shop Drawings for Field-Installed Motors: Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Include diagrams of power, signal, and control wiring. Provide schematic wiring diagram for each type of motor and for each control scheme.

D. Operation and Maintenance Data: For field-installed motors to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Source Limitations: Obtain field-installed motors through one source from a single manufacturer.

C. Product Options for Field-Installed Motors: Drawings indicate size, profiles, and dimensional requirements of motors and are based on the specific system indicated.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:

1. Compatible with the following:

a. Magnetic controllers.

b. Multispeed controllers.

c. Reduced-voltage controllers.

2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.

3. Matched to torque and horsepower requirements of the load.

4. Matched to ratings and characteristics of supply circuit and required control sequence.

B. Coordinate motor support with requirements for driven load; access for maintenance and motor replacement; installation of accessories, belts, belt guards; and adjustment of sliding rails for belt tensioning.

PART 2 PRODUCTS

2.1 MOTOR CHARACTERISTICS

A. Motors 3/4 HP and Larger: Three Phase (or as scheduled).

B. Motors Smaller Than 3/4 HP: Single Phase (or as scheduled).

C. Frequency Rating: 60Hz.

D. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.

E. Service Factor: 1.15 for open drip-proof motors; 1.0 for totally enclosed motors.

F. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

G. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.2 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium as defined in NEMA MG 1.

C. Stator: Copper windings, unless otherwise indicated.

D. Rotor: Squirrel cage, unless otherwise indicated.

E. Bearings: Re-greasable, shielded, anti-friction ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating, unless otherwise indicated.

G. Insulation: Class F, unless otherwise indicated.

H. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.

2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure: Cast iron for motors 7.5 HP and larger; rolled steel for motors smaller than 7.5 HP.

2.3 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motor Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Designed with critical vibration frequencies outside operating range of controller output.

2. Energy and premium efficiency motors: Class B temperature rise; Class F insulation.

3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

4. Provide optional motor shaft grounding rings on all motors 5 HP and larger.

2.4 FINISH: CHEMICAL-RESISTANT PAINT OVER CORROSION-RESISTANT PRIMER.

2.5 SINGLE-PHASE MOTORS

A. Type: One of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.

2. Split-phase start, capacitor run.

3. Capacitor start, capacitor run.

B. Shaded-Pole Motors: For motors 1/20 HP and smaller only.

C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

D. Bearings: Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, pre-lubricated-sleeve type for other single-phase motors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor installation.

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

3.2 FIELD-INSTALLED MOTOR INSTALLATION

A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

3.3 FIELD QUALITY CONTROL FOR FIELD-INSTALLED MOTORS

A. Prepare for acceptance tests.

1. Align motors, bases, shafts, pulleys, and belts. Tension belts according to manufacturer's written instructions.
2. Verify bearing lubrication.
3. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
4. Test interlocks and control and safety features for proper operation.
5. Verify that current and voltage for each phase comply with nameplate rating and NEMA MG 1 tolerances.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections and to assist in field testing. Report results in writing.

END OF SECTION

SECTION 20 0515 - COMMON WORK RESULTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rubber packless expansion joints.

B. Grooved-joint expansion joints.

C. Sleeves and sleeve-seal systems.

D. Escutcheons and plates.

E. Access doors and covers.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer’s catalog literature for each type of product indicated.

1. Include construction details, material descriptions, and dimensions of individual components, and finishes.

2. Include operating characteristics and furnished accessories.

1.5 COORDINATION

A. Coordinate installation of expansion devices with installation of piping, pumps, and other equipment.

B. Coordinate installation of sleeves with the installation of concrete walls, masonry walls, and concrete floor and roof slabs.

C. Coordinate installation of sleeves with size, location, and installation of service utilities.

D. Coordinate installation of escutcheons and plates with installation of piping and ductwork.

E. Coordinate installation of access doors with size and location of serviceable devices.

PART 2 PRODUCTS

2.1 RUBBER EXPANSION JOINTS

A. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."

B. Material: Twin reinforced EPDM-rubber spheres with external restraining cables.

C. Minimum Pressure Rating: 150 psig at 200 deg F.

D. End Connections: Full-faced, integral steel flanges with steel retaining rings.

2.2 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop unless otherwise indicated.

B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

C. Molded-PE or PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to forms.

2.3 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

B. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Carbon steel.

D. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed or exposed rivet hinge, and spring-clip fasteners.

2.5 ACCESS COVERS

A. Furnish and install access covers for all concealed valves, water hammer arrestors, and other serviceable equipment not accessible from utility spaces.

B. All doors to be minimum 16-gauge construction. All doors to be removable from frames. All hinges shall be concealed type; exposed piano hinges are not permitted.

C. All doors and covers located in rated construction shall be supplied with a fire rating equal to or greater than the rated assembly.

D. See architectural divisions for access door specifications that supercede these. Provide access doors to the general contractor for installation in construction.

E. Access door schedule:

1. Masonry surfaces - Prime coated steel with cylinder lock.
2. Painted surfaces - Prime coated steel with cylinder lock.
3. Tiled surfaces - Satin finish stainless steel with cylinder lock.
4. Fire rated walls - Prime coated steel with self-latching bolt and flush key.

PART 3 EXECUTION

3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install rubber packless expansion joints at pump connections.

C. Install rubber packless expansion joints according to FSA-PSJ-703.

D. Install grooved-joint expansion joints to grooved-end steel piping.

E. Install line size flexible pipe connectors on pipes connected to vibration isolated equipment.

3.2 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in concrete and masonry walls, concrete floors, and concrete roof slabs as new walls and slabs are constructed.

1. Extend sleeves installed in floors of mechanical equipment areas, plumbing and piping chases, or other wet areas 2 inches above finished floor level.
2. In all other locations, cut sleeves to length for mounting flush with both surfaces. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
4. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

C. Escutcheon Plates: Install one-piece or split hinge metal plates for pipes passing through floors, walls, and ceilings in exposed areas. Provide polished stainless steel or chrome plated escutcheons in finished spaces and metal plates with paint finish in unfinished areas.

3.3 SLEEVE-SEAL SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building. Sleeves are not required for core drilled holes.

B. Select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls. Sleeves are not required for core drilled holes.

C. Select type, size, and number of sealing elements required for piping material and size, and for sleeve ID or hole size.

1. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve.

D. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

E. Sleeve and sleeve-seal schedule

1. Exterior Concrete Walls below Grade:
    a. Piping NPS 6 and Smaller: Cast-iron wall sleeves with sleeve-seal system.
    b. Piping Larger than NPS 6: Not applicable.
2. Concrete Slabs-on-Grade:
    a. Piping NPS 6 and Smaller: Cast-iron wall sleeves with sleeve-seal system.
    b. Piping Larger than NPS 6: Not applicable.
3. Concrete and Masonry Walls above Grade:
    a. Piping NPS 6 and Smaller:
        1) Cast-iron wall sleeves.
        2) Galvanized-steel-pipe sleeves.
    b. Piping Larger than NPS 6: Not applicable.
4. Concrete Slabs above Grade:
    a. Piping NPS 6 and Smaller:
        1) Galvanized-steel-pipe sleeves for wet areas.
        2) Molded-PE or -PP sleeves for all others.
    b. Piping Larger than NPS 6: Not applicable.

3.4 ESCUTCHEON INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install floor plates for piping penetrations of equipment room floors.

C. Install escutcheons with inside diameter to closely fit around pipe, tube, and insulation of insulated piping and with outside diameter that completely covers opening.

D. Escutcheon schedule:

1. Escutcheons for Exposed New Piping in Finished Areas:

a. Bare Piping: One-piece, cast-brass type with polished, chrome-plated finish.

b. Insulated Piping: One-piece, stamped-steel type.

c. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

d. Escutcheons are not required for concealed piping, piping in unfinished service areas, or piping in equipment rooms.

2. Escutcheons for Exposed Existing Piping:

a. Bare Piping: Split-casting brass type with polished, chrome-plated finish.

b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.

c. Escutcheons are not required for concealed piping, piping in unfinished service areas, or piping in equipment rooms.

END OF SECTION

SECTION 20 0516 - EXPANSION COMPENSATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rubber packless expansion joints.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer’s catalog literature for each for each type of product indicated.

1.4 COORDINATION

A. Coordinate installation of expansion devices with installation of piping, pumps, and other equipment.

PART 2 PRODUCTS

2.1 RUBBER EXPANSION JOINTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

1. Flexicraft Industries; flexicraft.com.
2. Mason Industries; mason-industries.com.
3. Metraflex Company; metraflex.com

B. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."

C. Material: Twin reinforced EPDM-rubber spheres with external restraining cables.

D. Minimum Pressure Rating: 150 psig at 200 deg F.

E. End Connections: Full-faced, integral steel flanges with steel retaining rings.

PART 3 EXECUTION

3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install rubber packless expansion joints at pump connections.

C. Install rubber packless expansion joints according to FSA-PSJ-703.

D. Install grooved-joint expansion joints to grooved-end steel piping.

E. Install line size flexible pipe connectors on pipes connected to vibration isolated equipment.

3.2 SWING JOINT CONNECTION INSTALLATION

A. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

B. Install loops, pipe offsets, and swing joints where required to control expansion and contraction of piping.

END OF SECTION

SECTION 20 0517 - SLEEVES AND SEALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sleeves.

B. Sleeve-seal systems.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer’s catalog literature for each for each type of product indicated.

1.4 COORDINATION

A. Coordinate installation of sleeves with size, location, and installation of service utilities.

B. Coordinate installation of sleeves with the installation of concrete walls, masonry walls, and concrete floor and roof slabs.

PART 2 PRODUCTS

2.1 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. Advance Products & Systems, Inc; apsonline.com.
2. Metraflex Company; metraflex.com.
3. Pipeline Seal and Insulator, Inc; gptindustries.com.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

C. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

D. Pressure Plates: Carbon steel.

E. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.2 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop unless otherwise indicated.

B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

C. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to forms.

PART 3 EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in concrete and masonry walls, concrete floors, and concrete roof slabs as new walls and slabs are constructed.

1. Extend sleeves installed in floors of mechanical equipment areas, plumbing and piping chases, or other wet areas 2 inches above finished floor level.
2. In all other locations, cut sleeves to length for mounting flush with both surfaces. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
4. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

C. Escutcheon Plates: Install one-piece or split hinge metal plates for pipes passing through floors, walls, and ceilings in exposed areas. Provide polished stainless steel or chrome plated escutcheons in finished spaces and metal plates with paint finish in unfinished areas.

3.2 SLEEVE-SEAL SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building. Sleeves are not required for core drilled holes.

1. Select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls. Sleeves are not required for core drilled holes.
2. Select type, size, and number of sealing elements required for piping material and size, and for sleeve ID or hole size.
3. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve.

4. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Exterior Concrete Walls below Grade:
   1. Piping NPS 6 and Smaller: Cast-iron wall sleeves with sleeve-seal system.
   2. Piping Larger than NPS 6: Not applicable.

B. Concrete Slabs-on-Grade:
   1. Piping NPS 6 and Smaller: Cast-iron wall sleeves with sleeve-seal system.
   2. Piping Larger than NPS 6: Not applicable.

C. Concrete and Masonry Walls above Grade:
   1. Piping NPS 6 and Smaller:
      a. Cast-iron wall sleeves.
      b. Galvanized-steel-pipe sleeves.
   2. Piping Larger than NPS 6: Not applicable.

D. Concrete Slabs above Grade:
   1. Piping NPS 6 and Smaller:
      a. Galvanized-steel-pipe sleeves for wet areas.
      b. Molded-PE or -PP sleeves for all others.
   2. Piping Larger than NPS 6: Not applicable.

END OF SECTION

SECTION 20 0518 - ESCUTCHEONS AND PLATES

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Escutcheons.

B. Floor plates.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer’s catalog literature for each for each type of product indicated.

1.4 COORDINATION

A. Coordinate installation escutcheons and plates with installation of piping and ductwork.

PART 2 PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed or exposed rivet hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install floor plates for piping penetrations of equipment room floors.

C. Install escutcheons with inside diameter to closely fit around pipe, tube, and insulation of insulated piping and with outside diameter that completely covers opening.

3.2 ESCUTCHEON SCHEDULE

A. Escutcheons for Exposed New Piping in Finished Areas:

1. Bare Piping: One-piece, cast-brass type with polished, chrome-plated finish.
2. Insulated Piping: One-piece, stamped-steel type.
3. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
4. Escutcheons are not required for concealed piping, piping in unfinished service areas, or piping in equipment rooms.

B. Escutcheons for Exposed Existing Piping:

1. Bare Piping: Split-casting brass type with polished, chrome-plated finish.
2. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
3. Escutcheons are not required for concealed piping, piping in unfinished service areas, or piping in equipment rooms.

END OF SECTION

SECTION 20 0520 - METERS AND GAUGES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Liquid-in-glass thermometers.

B. Thermal wells.

C. Dial-type pressure gages.

D. Gage attachments.

E. Test plugs.

F. Test-plug kits.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer’s catalog literature for each for each type of product indicated.

1.5 COORDINATION

A. Coordinate installation of meters and gauges with installation of piping and ductwork.

PART 2 PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Standard: ASME B40.200.

2. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
3. Case Form: Adjustable angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass.
7. Stem: Aluminum.
8. Stem Length: To suit installation.
9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMAL WELLS

A. Thermal wells:
1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: Copper nickel.
4. Material for Use with Steel Piping: Steel.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAUGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gauges:
1. Standard: ASME B40.100.
2. Case: Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Connection: Brass, with NPS 1/4 ASME B1.20.1 pipe threads and bottom-outlet.
5. Movement: Mechanical, with link to pressure element and connection to pointer.

6. Dial: Non-reflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAUGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass with NPS 1/4 ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Tee or lever handle, Brass quarter-turn ball cock with NPS 1/4 ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

A. Description: Test-station fitting made for insertion into piping tee fitting.

B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

C. Thread Size: NPS 1/4 ASME B1.20.1 pipe thread.

D. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

E. Core Inserts: EPDM self-sealing rubber.

2.6 TEST-PLUG KITS

A. Furnish one test-plug kit containing two thermometers, one pressure gauge and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

B. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

C. Pressure Gauge: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

D. Carrying Case: Metal or plastic, with formed instrument padding.

2.7 STATIC PRESSURE GAUGES

A. Dial Gauges: Metal case, 3-1/2 inch diameter, diaphragm actuated, black figures on white background, front recalibration adjustment, with tubing and static pressure tips.

B. Magnahelic Gauges: Cast aluminum housing and baked enamel finish suitable for indoor or outdoor installation. Provide optional signal flag for visual reference to maximum pressure drop.

C. Accessories: Brass or copper static pressure tips with integral compression fittings, aluminum tubing, and vent valves.

D. Static pressure gauges shall be calibrated in inches of water gauge and have ranges suitable for service intended.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install thermal wells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermal wells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermal wells with extension on insulated piping.

D. Fill thermal wells with heat-transfer medium.

E. Install direct-mounted thermometers in thermal wells and adjust vertical and tilted positions.

F. Install direct-mounted pressure gauges in piping tees with pressure gauge located on pipe at the most readable position.

G. Where installing one pressure gauge per pump, provide taps before strainers and on suction and discharge of pump. Connect NPS 1/4 inch piping to gauge.

H. Install valve and snubber in piping for each pressure gauge.

I. Install test plugs in piping tees.

3.2 ADJUSTING

A. After installation, calibrate meters according to manufacturers written instructions.

B. Adjust faces of meters and gauges to proper angle for best visibility.

3.3 THERMOMETER SCHEDULE

A. Install industrial-style, liquid-in-glass type thermometers in the following locations:

1. Outlet of each domestic water heater, heat exchanger, and storage tank.
2. Domestic hot water recirculating header from building.
3. Header piping to central heating and chilled water equipment.
4. Other locations detailed on Drawings.

B. Provide the following thermometer scale-ranges:

1. Domestic Water Piping: 30 to 180 deg F.
2. Heating Water Piping: 30 to 240 deg F.

3.4 PRESSURE GAUGE SCHEDULE

A. Install direct-mounted, dial-type pressure gauges in the following locations:

1. Building water service entrance.
2. Inlet to each expansion tank.
3. Discharge of each pressure-reducing valve.
4. Suction and discharge of each heating water pump.
5. Suction and discharge of each chilled water pump.
6. Other locations detailed on Drawings.

B. Provide the following pressure gauge scale-ranges:
1. Domestic Water Piping: 0 to 100 psi.
2. Heating Water Piping: 0 to 100 psi.

3.5 TEST PLUG SCHEDULE

A. Install test plugs with EPDM self-sealing rubber insert in the following locations:
1. Inlet and outlet of each hydronic coil.
2. Inlets and outlets of each heat exchanger.
3. Other locations detailed on the Drawings.

3.6 STATIC PRESSURE GAUGE SCHEDULE

A. Install dial-type static pressure gauges in the following locations:
1. All air handler filter banks (included with air handlers).

END OF SECTION

SECTION 20 0525 - GENERAL DUTY VALVES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ball valves.

B. Butterfly valves.

C. Check valves.

D. Drain valves.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer’s catalog literature for each for each type of product indicated.

1.5 COORDINATION

A. Coordinate installation of ball valves, butterfly valves, and check valves with installation of piping.

1.6 STORAGE AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, and soldered ends.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature.
3. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads on threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valves.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: Comply with NSF 61 and NSF 372 for potable-water applications.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Actuator Types: Hand-lever for quarter-turn valves NPS 6 and smaller.

I. Valves in Insulated Piping: Include 2-inch stem extensions/extended necks.

J. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. Conbraco: apollovalves.com.
2. Milwaukee: milwaukeevalve.com.
3. Nibco: nibco.com.

2.2 BALL VALVES

A. Size 2 inch and Smaller: MSS SP-110, Class 150, 600 psi CWP, bronze two-piece body, chrome plated brass or stainless steel ball, TFE seats and stuffing box ring, blow-out proof bronze or stainless steel stem, with lever handle. Suitable for water, oil, or gas (WOG) services. Threaded or soldered ends.

2.3 BUTTERFLY VALVES

A. Size 2-1/2 inch and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, stainless steel stem, aluminum bronze with resilient replaceable EPDM or NBR seat, lever operated with 10-position throttling plate. Lug style or grooved ends capable for use as dead-end service isolation valves at full pressure without the use of additional flange.

2.4 CHECK VALVES

A. Size 2 Inch and Smaller: MSS SP-80, Class 125, wye-pattern swing type, bronze body, bronze trim, renewable TFE seat disc. Soldered or threaded ends.

B. Size 2-1/2 Inch and Larger: MSS SP-71, Class 125, swing type, iron body, bronze trim, bronze seat disc, renewable disc seal and seat. Threaded, flanged, or grooved ends.

C. For vertical lines or pump discharge: MSS-SP126, Class 125, spring-actuated, iron body, bronze trim, bronze disc, renewable seals, and stainless steel spring. Threaded, flanged, or grooved ends.

2.5 DRAIN VALVES

A. Drain valves shall be ball valves as specified herein or ball valves as part of an integral flange isolator product. All drain valves shall be fitted with American standard hose thread fitting with cap and chain.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Spring Loaded Check Valves: In horizontal or vertical position, between flanges.

3.3 VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered ends.

2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded ends.

3. For Steel Piping, NPS 2 and Smaller: Threaded ends.

4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded ends.

5. For Steel Piping, NPS 5 and Larger: Flanged ends.

END OF SECTION

SECTION 20 0530 - HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal pipe hangers and supports.

B. Trapeze pipe hangers.

C. Metal framing systems.

D. Thermal shield inserts.

E. Fastener systems.

F. Equipment supports.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer’s catalog literature for each for each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates where applicable.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations, including product data for components.

1.6 QUALITY ASSURANCE

A. General: All materials shall meet or exceed all applicable referenced standards; federal, state, and local requirements, and conform to codes and ordinances of authorities haing jurisdiction.

B. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, Structural Welding Code - Steel.

C. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer. Retain analysis data, signed and sealed, and submit upon request.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. Anvil International
2. Cooper Industries
3. Unistrut Corporation
4. Erico International

2.3 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.4 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.5 METAL FRAMING SYSTEMS

A. Description: Shop or field fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

1. Standard: Comply with MFMA-4.
2. Channels: Minimum 12-gauge, 1-5/8-inch, continuous slotted steel channel with inturned lips and epoxy-coated finish.
3. Channel Nuts: Formed or stamped steel nuts designed to fit into channel slot and, when tightened, prevent slipping along channel.
4. Pipe Clamps: Electro-galvanized carbon steel strut clamp with welded fastener and nylon locknut.
5. Coupling: High-strength thermoplastic polypropylene insulation insert molded to fit clamp halves.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.6 THERMAL SHIELD INSERTS

A. Insert Material: ASTM C533, Type I calcium silicate with 100-psig minimum compressive strength, ASTM C1136 ASJ vapor barrier jacket, and ASTM A527 galvanized steel shield.

1. For Clevis or Band Hangers: Insert and shield shall cover lower half of pipe.
2. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference.
3. Insert Length: Extend 2 inches beyond sheet metal shield .

2.7 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded shop or field fabricated equipment support made from structural carbon-steel shapes.

2.9 OUTDOOR SUPPORTS

A. Description: Individual foot supports with elevated adjustable channel cross bars and clamps/fasteners/bolts for ground or roof supported outdoor equipment components, without roof membrane penetration, in a pre-fabricated system that can be modularly-assembled on site.

1. Foot Material: Rubber or polypropylene.
2. Rail Material: Hot dip galvanized carbon steel.

2.10 MISCELLANEOUS MATERIALS

A. Carbon Steel: ASTM A1011.

B. Structural Steel: ASTM A36, carbon-steel plates, shapes, and bars; black and galvanized.

C. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

D. Grout: ASTM C1107, factory-mixed and packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Coordination: Coordinate installation of hangers and supports with installation of piping, equipment, and ductwork.

B. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

C. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

E. Fastener System Installation: Install for use in lightweight concrete or concrete slabs after concrete is placed and completely cured. Install fasteners according to manufacturer's instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Install hangers and supports level, plumb, and true. Plan piping layout accordingly. Do not support piping from other piping. Do not support piping from valves or other devices.

H. Plan and install piping such that insulation clearance to ductwork, conduit, other piping, combustibles, etc is maintained.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, and at changes in direction of piping.

K. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Install lateral bracing with pipe hangers and supports to prevent swaying.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap. Remove welding flux immediately.

3. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in sections specifying piping and ductwork systems and equipment.

B. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

D. Use thermal-hanger shield inserts for insulated piping and tubing. Provide sufficient clearance within the hanger to accommodate continuous insulation.

E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
4. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

H. Building Attachments: Unless otherwise indicated and except as specified in piping system sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
5. C-Clamps (MSS Type 23): For structural shapes.
6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system sections, install the following types:
   1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system sections, install the following types:
   1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
   2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
   3. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
      a. Horizontal (MSS Type 54): Mounted horizontally.
      b. Vertical (MSS Type 55): Mounted vertically.
      c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

K. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system sections.

L. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system sections.

END OF SECTION

SECTION 20 0550 - MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment labels.

B. Pipe and duct labels.

C. Warning labels.

D. Ceiling grid tags.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide manufacturer’s catalog literature for each for each type of product indicated.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve Numbering Schedule: For each piping system to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ANSI A13.1 for lettering size, length, colors, and viewing angles of identification devices.

1.6 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustic ceilings and similar concealment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. Brimar Industries; pipemarkers.com.
2. Carlton Industries; carltonusa.com.
3. Craftmark Pipe Markers; craftmarkid.com
4. Graphic Products; graphicproducts.com
5. Seton Company; seton.com.

2.2 EQUIPMENT LABELS

A. Description: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

1. Color: Black background with white lettering.
2. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
3. Minimum Label Size: Length and width vary for required label content, but not less than 3 by 1 inch.
4. Minimum Letter Size: 1/2 inch. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Contents: Include equipment's Drawing designation or unique equipment number.

C. Equipment Label Schedule: Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified.

2.3 PIPE AND DUCT LABELS

A. Description: Preprinted, color-coded, fade-resistant, vinyl material with lettering indicating service, and showing flow direction.

1. Colors and Lettering Size: Comply with ANSI A13.1 for piping; White lettering on green background for air ducts.
2. Flow-Direction Arrows: Integral with piping or duct system service lettering to accommodate both directions or as separate unit on each pipe or duct label to indicate flow direction.

3. Adhesive: Contact-type, permanent-adhesive backing, compatible with carbon steel piping, plastic pipe, all service jackets, aluminum jacketing, and galvanized sheet steel.

B. Pipe Label Contents: Include identification of piping using same designations as used on Drawings and arrows indicating flow direction.

C. Duct Label Contents: Include identification of air service using same designations as used on Drawings and arrows indicating flow direction.

2.4 WARNING SIGNS AND LABELS

A. Description: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

1. Color: Red background with white lettering.
2. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
3. Minimum Label Size: Length and width vary for required label content.
4. Minimum Letter Size: 3/4 inch. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Contents: Include caution and warning information plus emergency notification instructions.

2.5 CEILING GRID TAGS

A. Description: Vinyl self-adhesive labels, for installation on ceiling grid for equipment located above lay-in ceiling.

1. Color: Black lettering on a white background.
2. Size: 3/4-inch wide by 3-mil thick, variable length.

B. Label Contents: Include equipment's drawing designation or unique equipment number.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, and paints.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment using fasteners or adhesive.

B. Identify control panels, major control components, fire dampers and smoke dampers.

C. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; mechanical rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals in areas of congested piping and equipment.

3.5 DUCT LABEL INSTALLATION

A. Locate duct labels in mechanical rooms near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling systems.

3.6 CEILING TAG INSTALLATION

A. Affix ceiling grid tags to locate valves, dampers, control devices, and other concealed equipment above panel type ceilings. Locate in corner of grid closest to equipment/device.

END OF SECTION

SECTION 20 0590 - TESTING ADJUSTING AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjusting, and balancing of lsystems and equipment.

B. Balancing Air Systems:

1. Constant-volume air systems.
2. Variable-air-volume systems.

C. Balancing Hydronic Piping Systems:

1. Constant-flow hydronic systems.
2. Variable-flow hydronic systems.

D. Balancing Plumbing Piping Systems:

1. Domestic hot water flow systems.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

B. Associated Air Balance Council:

1. AABC MN-1 - AABC National Standards for Total System Balance.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

D. National Environmental Balancing Bureau:

1. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems.

E. Sheet Metal and Air Conditioning Contractors' National Association:

1. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Qualification Data: Submit documentation that the testing and balancing agency and field specialists meet the qualifications specified in the quality assurance article.

1.5 INFORMATIONAL SUBMITTALS

A. 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.

B. Instrument Calibration Reports: To include instrument type and make, serial number, application, dates of use, and dates of calibration.

C. Field Deficiency Reports: Include defects and deficiencies that will or could prevent proper testing and balancing. Beginning or continuing with the work indicates acceptance of examined conditions.

1.6 CLOSEOUT SUBMITTALS

A. Final Report: Prepare a certified written report to meet the requirements specified in the final report article at the end of this section.

1. Tabulate and divide the report into separate sections for tested systems and balanced systems.

2. The report shall be submitted to the engineer, with adequate time for thorough review, prior to the substantial completion visit.

1.7 QUALITY ASSURANCE

A. TAB Agency Qualifications:

1. An independent company specializing in the measurement, testing, adjusting, and balancing of plumbing and mechanical systems, not affiliated with any other contractor or equipment supplier on the project.

2. Having a minimum of 5-years documented experience with installations of similar size and complexity. Submit a list including reference contacts.

3. Certified by one of the following:

a. AABC: Associated Air Balance Council: aabchq.com.

b. NEBB: National Environmental Balancing Bureau: nebb.org.

c. TABB: Testing, Adjusting, and Balancing Bureau: tabbcertified.org.

4. TAB Field Supervisor and Technician: Employee of the TAB agency and certified by the same organization.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

1.8 PRE-QUALIFIED TAB SPECIALISTS

A. Subject to compliance with requirements, provide services by one of the following:

1. Bighorn Corporation, Billings, MT; (406) 248-5299.
2. Balancing Professionals, Rapid City, SD; (605) 348-8298.
3. Substitutions: See Section 20 0050 for substitution procedures.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one or more of the following:

1. AABC National Standards for Total System Balance.
2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
3. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
4. 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 the date of substantial completion of the project, phases or sub-phases.

C. Where hvac systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling, testing, and inspection procedures with the authorities having jurisdiction.

D. BAS Coordination:

1. In addition to the settings specified herein, collaborate with the BAS contractor any settings that will be determined by the TAB Agency. Settings may include but are not limited to: flow coefficients, airflow conditions, damper positions, static and differential pressure setpoints, variable speed drives, etc.
2. The TAB Agency's equipment shall include a PC for interface to the BAS. Utilize operator interface software and any special hardware (cables, signal converters) provided to allow for the PC to interface to the BAS.
3. The TAB Agency shall engage with the BAS contractor for adequate training so that they can utilize the operator interface without ongoing assistance from the BAS contractor.

E. Minimum Drive Speed:

1. The minimum fan speed setting within each variable speed drive itself shall be optimized in the field to be as low as possible while avoiding inertial stalling.
2. The minimum pump speed setting within each variable speed drive itself shall be no less than 30% to protect the seal from premature failure.

F. Flow Rate Verification: This contractor shall review the drawings and coordinate with the heating and/or plumbing contractor and the controls contractor to confirm that a means of flow rate verification is provided at each coil circuit and/or other indicated locations.

1. Verify by measuring differential pressure across the flow control valve or the pressure independent control valve, and comparing to manufacturer's published flow charts.
2. Where no means is provided, instruct the mechanical contractor to install a venturi valve on the supply or return side of the coil, and verify flow rate accordingly above.

3.2 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 t. Adjust outlets and inlets in the space to within plus or minus 10-percent of design.

C. Hydronic Systems: Adjust heating and/or cooling water flow rates to within plus or minus 10 percent of design.

D. Maintaining design pressure relationships shall have priority over the tolerances specified above.

3.3 EXAMINATION

A. Examine the contract documents to become familiar with project requirements and to discover conditions in system designs that may preclude proper testing and balancing of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, manual volume dampers, etc. Verify that locations of these devices are applicable for intended purpose and are accessible.

C. Examine ceiling air plenums used for return or relief air, to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

D. Examine approved equipment submittal performance data including fan curves and pump curves. Relate performance data to project conditions and requirements, to evaluate undesired or unpredicted conditions that may cause reduced capacities in all or part of a system.

E. Examine system and equipment installations and verify that field quality control testing, cleaning, and adjusting specified in individual sections have been performed.

F. Examine equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

G. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

H. Examine strainers and verify that permanent screens with indicated perforations have replaced startup screens.

I. Examine control valves and control dampers for proper installation for their intended function of throttling, diverting, or mixing fluid and/or air flows.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine system pumps to ensure absence of entrained air in the suction piping.

L. Examine operating safety interlocks and controls on HVAC equipment.

M. Examine test reports specified in individual system and equipment sections.

3.4 PREPARATION

A. Prepare a test and balance plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Sample forms with specific identification for all equipment.
4. Instrumentation to be used.

B. Perform checks of systems and equipment to verify system readiness for testing and balancing work. At a minimum, include the following:

1. Airside:
    a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
    b. Duct systems are complete with terminals installed.
    c. Volume, smoke, and fire dampers are open and functional.
    d. Fans are operating, free of vibration, and rotating in correct direction.
    e. Variable-frequency controller startup is complete and safeties are verified.
    f. Automatic temperature control systems are operational.
    g. Suitable access to balancing devices and equipment is provided.
    h. Clean filters are installed.
2. Hydronics:
    a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
    b. Piping is complete with all coils connected and terminals installed.
    c. Systems are flushed, filled, and air purged. Water treatment is complete.
    d. Control valves are functioning per the sequence of operation.
    e. Shutoff and balance valves are verified to be 100-percent open.
    f. Pumps are started and proper rotation is verified.
    g. Pump gauge connections are installed at inlet and outlet flanges.
    h. Test ports are installed at inlet and outlet piping to coils, valves, and/or strainers.

i. Variable-frequency controller startup is complete and safeties are verified.

j. Suitable access to balancing devices and equipment is provided.

k. Strainers are pulled and cleaned.

3.5 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Cut insulation at ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for the TAB procedures.

1. After testing and balancing, patch probe holes in ducts with the same material and thickness as used to construct the ducts.

2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to applicable specifications.

B. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable permanent identification material to show final settings.

C. Measure and report testing and balancing measurements in inch-pound (IP) units only.

3.6 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Measure and adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

C. Vary total system air quantities by adjustment of fan speeds. Provide drive changes (sheaves and/or belts) as required. Vary branch air quantities by damper regulation.

D. Adjust for air quantities shown on the drawings with the proper relationship between supply and exhaust established.

E. For variable-air-volume systems, develop a plan to simulate diversity. Full flow in one section of the system may be simulated by temporary restriction of flow to other sections.

F. Determine the best locations in main and branch ducts for accurate airflow measurements.

G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

H. Verify that motor starters are equipped with properly sized thermal protection.

I. Check dampers for proper position to achieve desired airflow path.

J. Check ductwork and equipment for airflow blockages.

K. Check condensate drains for proper connections and function.

L. Check air-handling-unit components for proper seals.

3.7 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by the fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.

    b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.

    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

    d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.

    b. Measure static pressure directly at the fan inlet or through the flexible connection.

    c. Measure static pressure across each component that makes up the air-handling system.

    d. Report artificial loading of filters at the time static pressures are measured.

3. Measure fan-motor amperage to ensure that no overload occurs.

    a. Do not make fan-speed adjustments that result in motor overload.

    b. Consult equipment manufacturers about fan-speed safety factors.

    c. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

4. Exchange or replace sheaves and/or belts as required to adjust the speed of all fans to deliver the specified air quantity.

B. Adjust volume dampers for main duct and major branch ducts to indicated airflows.

1. Measure airflow of main and branch ducts.

2. Adjust branch duct volume dampers for specified airflow.

3. Re-measure each main and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.

2. Measure and adjust inlets and outlets for specified airflow.

3. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.

2. Re-measure and confirm that total airflow is within design.

3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Test system in economizer mode. Verify proper operation and adjust if necessary.
5. Measure and record all operating data.
6. Record final fan-performance data.
7. Mark all final settings.

3.8 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge. Verify that the system is under static pressure control.
2. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Calibrate and balance each terminal unit for maximum and minimum design airflow:
    a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
    b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
    c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
    d. Adjust controls so that terminal is calling for minimum and heating airflows.
    e. Measure airflow and adjust calibration factor as required for design minimum and heating airflows. Record calibration factors. If no calibration is available, note any deviation from design airflows.
4. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
    a. Set outside air, return air, and relief air dampers for proper position that simulates minimum outdoor air conditions.
    b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
    c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

5. Measure fan static pressures as follows:
   a. Measure static pressure directly at the fan outlet or through the flexible connection.
   b. Measure static pressure directly at the fan inlet or through the flexible connection.
   c. Measure static pressure across each component that makes up the air-handling system.
   d. Report any artificial loading of filters at the time static pressures are measured.
6. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
   a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
   b. Verify that terminal units are meeting design airflow under system maximum flow.
7. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
8. Verify final system conditions as follows:
   a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
   b. Re-measure and confirm that total airflow is within design.
   c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
   d. Test system in economizer mode. Verify proper operation and adjust if necessary.
   e. Measure and record all operating data.
   f. Record final fan-performance data.
   g. Mark all final settings.

3.9 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Where flow-metering devices are not installed, base flow balance on pressure drop or temperature difference across various heat transfer elements in the system. Do not use service or shut-off valves for balancing.

C. For variable-flow systems, develop a plan to simulate diversity. Full flow in one part of the system may be simulated by temporary restriction of flow to other parts.

D. For primary-secondary hydronic systems, balance the primary circuit flow first, then the secondary circuits.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check liquid level in the expansion tank.

H. Check highest vent for adequate pressure.

I. Check flow-control valves for proper position.

J. Check that air has been purged from the system.

3.10 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Adjust pumps to deliver total design gpm.

1. Measure total water flow.

a. Position valves for full flow through the coils.

b. Determine flow by pump total dynamic head or exchanger pressure drop.

c. Compare flow to that measured by main flow meter, where installed.

2. Measure pump total dynamic head as follows:

a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.

b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.

c. Convert pressure to head and correct for differences in gauge heights.

d. Verify pump impeller size by measuring the total dynamic head with the discharge valve closed. Note the point on the manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.

e. With valves open, read pump total dynamic head. Adjust pump discharge valve until design water flow is achieved.

3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

B. Adjust flow-measuring devices installed in mains and branches to design water flows.

1. Measure flow in main and branch pipes.

2. Adjust main and branch balance valves for design flow.

3. Re-measure each main and branch after all have been adjusted.

C. Adjust flow-measuring devices installed at terminals for each space to design water flows.

1. Measure flow at terminals.

2. Adjust each terminal to design flow.

3. Re-measure each terminal after it is adjusted.

4. Where applicable, adjust the bypass valve to maintain design flow.

5. Perform temperature tests after flows have been balanced.

D. For systems with pressure-independent valves at terminals:

1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after flows have been verified.

E. For systems without pressure-independent valves or flow-measuring devices at terminals:
1. Measure and balance coils by flow control valve pressure drop and manufacturer's data.
2. Perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pump operating data, total dynamic head, volts, amps, and static profile.
3. Mark final settings.

3.11 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:
1. Verify that the differential pressure sensor is located as indicated.
2. Determine whether there is diversity in the system.

C. For systems with no flow diversity:
1. Adjust pumps to deliver total design gpm.
a. Measure total water flow.
1) Position valves for full flow through the coils.
2) Determine flow by pump total dynamic head or exchanger pressure drop.
3) Compare flow to that measured by main flow meter, where installed.
b. Measure pump total dynamic head as follows:
1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
3) Convert pressure to head and correct for differences in gauge heights.
4) Verify pump impeller size by measuring the total dynamic head with the discharge valve closed. Note the point on the manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
5) With valves open, read pump total dynamic head. Adjust pump discharge valve until design water flow is achieved, with the variable frequency controller at 60 Hz (or manufacturer's max design speed for "smart" pumps).
c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

2. Adjust flow-measuring devices installed in mains and branches to design water flows.
    a. Measure flow in main and branch pipes.
    b. Adjust main and branch balance valves for design flow.
    c. Re-measure each main and branch after all have been adjusted.
3. Adjust flow-measuring devices installed at terminals for eac to design water flows.
    a. Measure flow at terminals.
    b. Adjust each terminal to design flow.
    c. Re-measure each terminal after it is adjusted.
    d. Where applicable, adjust the bypass valve to maintain design flow.
    e. Perform temperature tests after flows have been balanced.
4. For systems with pressure-independent valves at terminals:
    a. Measure differential pressure and verify that it is within manufacturer's specified range.
    b. Perform temperature tests after flows have been verified.
5. For systems without pressure-independent valves or flow-measuring devices at terminals:
    a. Measure and balance coils by control valve pressure drop and manufacturer's data.
    b. Perform temperature tests after flows have been verified.
6. Prior to verifying final system conditions, determine the system differential pressure set point.
7. At completion, open discharge valve 100-percent and allow variable-frequency controller to control system differential pressure setpoint. Record pump data under both conditions.
8. Verify final system conditions as follows:
    a. Re-measure and confirm that total water flow is within design.
    b. Re-measure final pump operating data, total dynamic head, volts, amps, and static profile.
    c. Mark all final settings.

3.12 GENERAL PROCEDURES FOR PLUMBING SYSTEMS

A. Prepare test reports for pumps and heat exchangers. Obtain approved submittals and manufacturer recommended testing procedures.

B. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

C. Verify that motor starters are equipped with properly sized thermal protection.

D. Check flow-control valves for proper position.

3.13 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating, rpm, phase and hertz.
3. Nameplate and measured voltage, each phase.
4. Nameplate and measured amperage, each phase.
5. Starter size and thermal-protection-element rating.
6. Service factor and frame size.

3.14 PROCEDURES FOR HYDRONIC BOILERS

A. Balance water flow through each heat exchanger to within specified tolerances of the indicated flow with all pumps running. Measure and record the following data with each boiler operating at design conditions:
   1. Heat exchanger entering and leaving water temperatures.
   2. Heat exchanger pressure drop and water flow.
   3. Record relief valve pressure setting.
   4. Fan, motor, and motor controller operating data.

3.15 PROCEDURES FOR AIR COOLED CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure and record entering and leaving air temperatures.

C. Measure and record entering and leaving refrigerant pressures.

D. Measure and record operating data of compressors, fans, and motors.

3.16 PROCEDURES FOR WATER-TO-WATER HEAT EXCHANGERS

A. Adjust and record water flow to within specified tolerances.

B. Measure and record inlet and outlet water temperatures.

C. Measure and record pressure drops.

D. Check and record settings and operation of safety and relief valves.

3.17 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:
   1. Airflow.
   2. Water flow rate.
   3. Entering and leaving water temperature.
   4. Water pressure drop for air handler coils.
   5. Dry-bulb temperature of entering and leaving air.

6. Wet-bulb temperature of entering and leaving air for cooling coils.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Airflow.
2. Entering and leaving air temperature at full load.
3. Voltage and amperage input of each phase at full load.
4. Fuse or circuit breaker rating for overload protection.
5. Calculated kilowatt at full load.
6. Nameplate data.

C. Measure, adjust, and record the following data for each refrigerant coil:

1. Airflow.
2. Dry-bulb temperature of entering and leaving air.
3. Wet-bulb temperature of entering and leaving air.

3.18 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Confirm that the sequences of operation are in compliance with the Contract Documents.
2. Verify that controllers are calibrated and function as intended.
3. Verify that controller set points are as indicated.
4. Verify the operation of lockout or interlock systems.
5. Verify the operation of valve and damper actuators.
6. Verify that controlled devices are properly installed and connected to correct controller.
7. Verify that controlled devices travel freely and are in the position indicated by the controller: open, closed, or modulating.
8. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Report: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.19 DUCT AND PIPE LEAKAGE TESTS

A. Witness the duct and/or pipe pressure leakage testing performed by the installer.

B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

C. Report deficiencies observed.

3.20 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Report Contents: In addition to certified field-report data, include the following:

1. Manufacturers test data.
2. Pump curves and fan curves.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, excluding shop drawings and product data.

C. Report Data: In addition to form titles and entries, include the following data:

1. Title page with project name, address, and altitude, name and contact information of the TAB agency, project engineer and contractors list, and the report date.
2. Signature of the TAB supervisor who certifies and is responsible for the report.
3. Table of Contents with pages defined for each section of the report.
4. Nomenclature sheets for each item of equipment.
5. Data for terminal units, including manufacturer's name, type, size, and fittings.
6. Notes to explain why certain final data in the body of reports vary from indicated values.
7. Test conditions for fan performance forms including the following:
    a. Conditions of filters.
    b. Cooling coil, wet and dry bulb conditions.
    c. Settings for static pressure controllers.
    d. Face and bypass damper settings at coils.
    e. Settings for outdoor, return, and exhaust air dampers.
    f. Variable frequency controller settings for variable flow systems.
    g. Fan drive settings including percentage of maximum pitch diameter.
    h. Other system operating conditions that affect performance.
8. Test conditions for pump performance forms including the following:
    a. Variable frequency controller settings for variable flow systems.
    b. Settings for differential pressure controllers.
    c. Other system operating conditions that affect performance.
9. Include a detailed description of all settings established in conjunction with the building automation system contractor.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
    1. Quantities of outdoor, supply, return, and exhaust airflows.
    2. Hydronic heating and cooling water flow rates.
    3. Duct, outlet, and inlet sizes.
    4. Pipe and valve sizes and locations.
    5. Terminal units.
    6. Balancing stations.
    7. Position of balancing devices.
E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
    1. Unit Data:
        a. Unit identification and location.
        b. Make, model, and unit size.
        c. Manufacturer's serial number.
        d. Unit arrangement and class.
        e. Sheave make, size in inches, and bore.
        f. Center-to-center dimensions of sheave and adjustments in inches.
        g. Number, make, and size of belts.
        h. Number, type, and size of filters.
    2. Motor Data:
        a. Motor make, and frame type and size.
        b. Horsepower and rpm.
        c. Volts, phase, and hertz.
        d. Full-load amperage and service factor.
        e. Sheave make, size in inches, and bore.
        f. Center-to-center dimensions of sheave and adjustments in inches.
    3. Test Data (Indicated and Actual Values):
        a. Fan speed in rpm.
        b. Total airflow rate in cfm.
        c. Total system static pressure in inches wg.
        d. Discharge static pressure in inches wg.
        e. Filter static-pressure differential in inches wg.
        f. Preheat-coil static-pressure differential in inches wg.
        g. Cooling-coil static-pressure differential in inches wg.

h. Heating-coil static-pressure differential in inches wg.

i. Outdoor airflow in cfm.

j. Return airflow in cfm.

k. Outdoor-air damper position.

l. Return-air damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification and location.

b. Coil make and model number.

c. Coil type, number of rows, fins per inch.

d. Face area in square feet.

e. Circuiting arrangement.

f. Tube size in NPS.

g. Tube and fin materials.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.

b. Average face velocity in fpm.

c. Air pressure drop in inches wg.

d. Outdoor air, wet and dry-bulb temperatures in deg F.

e. Return air, wet and dry-bulb temperatures in deg F.

f. Entering air, wet and dry-bulb temperatures in deg F.

g. Leaving air, wet and dry-bulb temperatures in deg F.

h. Water flow rate in gpm.

i. Water pressure differential in feet of head or psig.

j. Entering-water temperature in deg F.

k. Leaving-water temperature in deg F.

l. Refrigerant expansion valve and refrigerant type.

m. Refrigerant suction pressure in psig.

n. Refrigerant suction temperature in deg F.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification and location.

b. Make, model number, and size.

c. Manufacturer's serial number.

d. Arrangement and class.

e. Sheave make, size in inches, and bore.

f. Center-to-center dimensions of sheave and adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Number, make, and size of belts.

g. Center-to-center dimensions of sheave, and adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan speed in rpm.

d. Discharge static pressure in inches wg.

e. Suction static pressure in inches wg.

f. Variable frequency controller setpoints in Hz.

H. Duct Traverse Reports:

1. Report Data:

a. System and air-handling-unit number.

b. Location and zone.

c. Traverse air temperature in deg F.

d. Duct static pressure in inches wg.

e. Duct size in inches.

f. Duct area in square feet.

g. Indicated airflow rate in cfm.

h. Indicated velocity in fpm.

i. Actual airflow rate in cfm.

j. Actual average velocity in fpm.

k. Barometric pressure in psig.

l. Diagram with duct cross-section grid.

I. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone served.
c. Apparatus used for test.
d. Number from system diagram.
e. Make, type, size, and model number.
f. Effective area in square feet.

2. Test Data (Indicated and Actual Values):
a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

J. System-Coil Reports:
1. Unit Data:
a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flow-meter type.

2. Test Data (Indicated and Actual Values):
a. Airflow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

K. Pump Test Reports:
1. Unit Data:
a. Unit identification, location, and service.
b. Make, model, size, and serial number.
c. Water flow rate in gpm.
d. Water pressure differential in feet of head or psig.

e. Pump speed in rpm.

f. Impeller diameter in inches.

2. Motor Data:

a. Motor make and frame size.

b. Motor horsepower and rpm.

c. Voltage at each connection.

d. Amperage for each phase.

e. Full-load amperage and service factor.

f. Seal type.

3. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.

b. Pump shutoff pressure in feet of head or psig.

c. Actual impeller size in inches.

d. Full-open flow rate in gpm .

e. Full-open pressure in feet of head or psig.

f. Final discharge pressure in feet of head or psig.

g. Final suction pressure in feet of head or psig.

h. Final total pressure in feet of head or psig.

i. Final water flow rate in gpm.

j. Voltage at each connection.

k. Amperage for each phase.

l. Variable frequency controller setpoints in Hz.

L. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.

b. Serial number.

c. Application.

d. Dates of use.

e. Dates of calibration.

M. BAS Coordination: Document all settings established in conjunction with the building automation system contractor. Settings may include but are not limited to: flow coefficients, airflow conditions, damper positions, static and differential pressure setpoints, variable speed drive settings and limits, etc.

END OF SECTION

SECTION 20 0710 - MECHANICAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Ductwork insulation.

C. Insulation jackets and accessories.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Qualifications Statement: Submit name and qualifications of insulation applicator and name of supervisor for approval within 30-days after award of Contract.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified in this section, having a mnimum of 5-years experience and approval of the manufacturer.

B. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL723.

1.6 STORAGE AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

B. Store in clean, dry, indoor conditions. Protect from moisture, dirt, dust, and damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. Armacell: armacell.us.
2. CertainTeed Corporation: certainteed.com.
3. Johns Manville Corporation: jm.com.
4. Knauf Insulation: knaufusa.com.
5. Owens Corning Corporation: ocbuildingspec.com.
6. Substitutions: See Section 20 0500 for substitution procedures.

B. Source Limitations: Obtain insulation of each type through one source from a single manufacturer.

2.2 PIPING INSULATION

A. Rigid Glass Fiber Insulation: ASTM C547 rigid molded, noncombustible. K value = 0.24 at 75 degrees F. White all service vapor barrier jacket, kraft paper with glass fiber yarn bonded to aluminized film; moisture vapor transmission of 0.02 perm inches. Vapor barier lap adhesive compatible with insulation. ASTM C195 insulating mastic.

B. Flexible Elastomeric Cellular Insulation: ASTM C534 Grade 3 preformed flexible elastomeric cellular rubber insulation. K value = 0.27 at 75 degrees F. Molded tubular material with preformed fittings; no field fabricated fittings. Waterproof vabor barrier adhesive compatible with insulation.

2.3 DUCT INSULATION

A. Flexible Glass Fiber Insulation: ASTM C533 flexible, noncombustibe blanket insulation. K-value = 0.36 at 75 degrees F. Vapor barrier jacket, foil skim kraft paper with glass fiber yarn bonded to aluminized film; moisture vapor transmission of 0.02 perm inches. Secure with 2-inch vapor barrier pressure sensitive tape.

B. Rigid Glass Fiber Insulation: ASTM C612 rigid, non-combustible insulation. K-value = 0.24 at 75 degrees F. Vapor barrier jacket, foil skim kraft paper with glass fiber yarn bonded to aluminized film; moisture vapor transmission of 0.02 perm inches. Secure with 4-inch vapor barrier pressure sensitive tape.

2.4 PIPING INSULATION JACKETS

A. PVC or ABS Plastic: One-piece molded type fitting covers and sheet material, 10-mil thick, white color. Connections with pressure sensitive color matching vinyl tape.

B. Aluminum Jacket: ASTM B209 formed aluminum sheet, 0.016 inch thick, embossed finish, 3/8 inch wide aluminum metal bands. Longitudinal slip joints with 2 inch laps. Die shaped 0.016 inch thick fitting covers.

C. Stainless Steel Jackets: ASTM A666 type 304 stainless steel, 0.010 inch thick, smooth finish, 3/8 inch wide stainless metal bands.

2.5 DUCT INSULATION JACKETS

A. Aluminum Jacket: ASTM B209 formed aluminum sheet, factory applied polyethylene and kraft paper moisture barrier inside, 0.016-inch thick, embossed finish, 3/8-inch wide aluminum metal bands. Longitudinal slip joints with 2-inch laps.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Verify that piping and/or ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

C. Maintain ambient conditions required by manufacturers of each product.

D. Maintain temperature before, during, and after installation for minimum of 24-hours.

3.2 PIPING INSULATION INSTALLATION

A. Install in accordance with NIA and MICA insulation standards and the manufacturer's instructions.

B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including all fittings, valves, unions, flanges, strainers, pump bodies, drain sump bodies, etc.

C. Insulated pipes conveying fluids above ambient temperature and less than 140-deg F: Do not insulate flanges and unions at equipment. Bevel and seal ends of insulation.

D. Insulated pipes conveying fluids above ambient temperature and greater than 140-deg F: Insulate entire system including fittings, valves, unions, flanges, strainers, etc.

E. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with PVC fitting covers.

F. Hydrous calcium silicate inserts shall be used with all piping 2-inch diameter or larger when supported with hangers or all piping diameters when strut mounted. Use same thickness and contour as adjoining insulation, installed under finished jacket.

G. Galvanized steel shields shall be installed between all pipe hangers and insulation. Tape all shields in place with pressure sensitive color matching vinyl tape.

H. Continue pipe insulation through walls, sleeves, hangers, and other penetrations. Finish at clamps, protrusions, and other interruptions. Bevel and seal open ends of insulation.

I. Where piping is exposed, locate insulation and cover seams in the least visible locations. Cover all insulation with protective PVC or aluminum covers within 10-ft of the floor (or as noted).

J. Exterior Applications: Insulate fittings, joints, and valves with pre-formed insulation of like material and thickness as adjoining pipe. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Seal weather tight.

K. Extend insulation into and within all equipment enclosures, including chillers, air handlers, etc.

L. Insulate all above grade storm drainage piping, including roof drain sump bodies.

M. Insulate all plumbing vent piping within 10-feet of the exterior penetration.

3.3 DUCT INSULATION INSTALLATION

A. Install in accordance with NIA and MICA insulation standards and the manufacturer's instructions.

B. Insulate all concealed supply air ducts where not lined. Insulate entire system including fittings, joints, flanges, dampers, flexible connections, and expansion joints. Do not wrap exposed ducts.

C. Install without sag on underside of duct. use adhesive and/or mechanical fasteners where necessary. Lift ducts off trapeze hangers and insert insulation spacers.

D. Secure insulation with vapor barrier and seal joints with vapor barrier tape to match the jacket. Seal vapor barrier penetrations with mechanical fasteners and vapor barrier adhesive.

E. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. Insulate all relief or exhaust air ducts within 10-ft of an exterior wall or roof opening.

G. Insulate all rectangular ducts within mechanical spaces with rigid insulation only.

H. Exterior Applications: Build upand slope insulation on the top of ductwork to allow water-shed and prevent ponding. Cover insulation with caulked aluminum jacket with seams located on the bottom side of horizontal duct sections. Seal weather tight.

3.4 PIPE INSULATION SCHEDULES

A. Indoor Domestic Cold Water:

1. Glass fiber pipe insulation:

    a. All pipe sizes: 1.0-inch thick.

B. Indoor Domestic Hot and Recirc Water:

1. Glass fiber pipe insulation:

    a. All pipe sizes: 1.0-inch thick.

C. Indoor Domestic Water Pex Piping:

1. Flexible Elastomeric Pipe Insulation:

    a. All pipe sizes: 1.0-inch thick.

D. Indoor Storm Drainage Piping:
    1. Glass Fiber Pipe Insulation:
        a. All pipe sizes: 0.5-inch thick.
E. Indoor Sanitary Vent Piping:
    1. Glass Fiber Pipe Insulation:
        a. All pipe sizes: 0.5-inch thick.
F. Indoor Heating Water 200F and below:
    1. Glass fiber pipe insulation:
        a. Pipe size 4.0-inch and smaller: 1.0-inch thick.
        b. Pipe size 5.0-inch to 6.0-inch: 1.5-inch thick.
G. Indoor Chilled Water 60F and below:
    1. Glass fiber pipe insulation:
        a. Pipe size 4.0-inch and smaller: 1.0-inch thick.
        b. Pipe size 5.0-inch to 6.0-inch: 1.5-inch thick.
H. Refrigerant Suction and Liquid Piping:
    1. Flexible elastomeric cellular pipe insulation:
        a. All pipe sizes: 0.75-inch thick.

3.5 DUCT INSULATION SCHEDULES

A. Combustion Air Duct:
    1. None.
B. Outside Air Ducts:
    1. Rigid glass fiber duct insulation: 2.0-inch thick.
C. Supply Air Ducts:
    1. Flexible glass fiber duct insulation: 1.5-inch thick.
    2. Rigid glass fiber duct insulation: 21.5-inch thick.
D. Supply Ducts After Terminal Boxes:
    1. Flexible glass fiber duct insulation: 1.0-inch thick.
E. Exhaust Air Ducts:
    1. Flexible glass fiber duct insulation: 1.0-inch thick.
F. Ducts Within Mechanical Rooms:
    1. Rigid glass fiber duct insulation: 2.0-inch thick.

END OF SECTION

DIVISION

21

FIRE SUPPRESSION

SECTION 21 1300 - FIRE SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Automatic wet-pipe sprinkler system.

B. Automatic dry-pipe fire sprinkler system.

C. Design, installation, and certification.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

B. National Fire Protection Association:

1. NFPA 13 – Standard for the Installation of Fire Sprinkler Systems.
2. NFPA 25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
3. NFPA 70 – National Electric Code.

C. Regulatory Agencies:

1. City of Casper Fire Dept.
2. State of WY Fire Marshal.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data:

1. Full catalog data on all products and materials intended for use on this project shall be submitted to the jurisdictional authority and the design team for review. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings:

1. Floor plans and detailed working drawings, showing dimensions, equipment, ductwork, lighting, or other items affecting the fire protection systems shall be submitted to the jurisdictional authority for review and approval.
2. Comply with all items identified in NFPA 13 for proper working drawings. After approvals from jurisdictional agencies have been returned to the contractor, they shall be submitted to the design team for review.
3. Design team review will be general in nature. It will be the contractor's responsibility to check drawings for interferences, to coordinate with other building trades, and to perform shop fabrication from measurements taken at the job site.
4. Shop drawings shall be signed and sealed by the professional engineer responsible for their preparation.

D. Hydraulic Calculations:

1. Hydraulic calculations shall be submitted to the jurisdictional authority and the design team for review. Calculations shall be provided to substantiate the pipe sizes shown on the shop drawings.
2. Hydraulic calculations shall be signed and sealed by the professional engineer responsible for their preparation.

E. Delegated Design:

1. The contractor shall provide professional services or certifications by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, shop drawings, and other submittals prepared by such professional.
2. Shop drawings and other submittals related to the work designed or certified by such professional, if prepared by others, shall bear such professional’s written approval when submitted for review.
3. The Owner and the design team shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by such design professionals.
4. The design team will review, approve, or take other appropriate action on submittals only for the limited purpose of checking for conformance with the information given and the design concept expressed in the Contract Documents.
5. Work on the project shall not begin until submittals have been accepted by the Authority Having Jurisdiction (AHJ) and the design team.

1.5 INFORMATIONAL SUBMITTALS

A. Installer’s Qualifications:

1. All fire protection systems shall be installed by a fire protection contractor, licensed in the jurisdiction of installation, and fully experienced in fire protection installation as required and specified herein.

2. Fire protection contractors may be required to provide in writing, specific information as to successfully completed projects and references to show cause as to why they should be considered acceptable.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include manufacturer's catalog data, equipment maintenance manuals, hydraulic calculations, spare parts lists, exploded assembly views, contractor's guarantee, etc.

B. Project Record Documents: Record actual locations of installed piping, valves, sprinkler heads, and other devices.

C. Test Certificates: Provide a copy of the contractor's material and test certificates for above ground piping, signed by the authority having jurisdiction.

D. Provide one original copy of the most current version of NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Sprinkler Cabinets:

1. Finished, wall-mounted, steel cabinet with hinged cover and space for a minimum of six spare sprinklers plus a sprinkler wrench.

2. Include a separate cabinet with sprinklers and wrench for each type of sprinkler used.

3. Include the number of sprinklers required by NFPA 13.

1.8 QUALITY ASSURANCE

A. Installer's Responsibilities: Includes designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility.

B. Engineering Responsibility: This contractor is responsible for preparation of drawings, calculations, and field test reports by a qualified professional engineer.

C. Welding Qualifications: Qualify procedures and operators according to the most current ASME Boiler and Pressure Vessel Code.

1.9 WARRANTY

A. Correction Period: The contractor shall correct any work found to be defective within 12-months from the date of substantial completion at no additional cost to the Owner. The contractor shall replace any equipment, products, or materials under warranty and found to be defective during this period.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Design, furnish, and install an automatic fire sprinkler system, which meets or exceeds the minimum requirements of nationally recognized standards, to protect all areas of the building, unless otherwise indicated on the drawings. Water supply shall conform to NFPA water supply requirements.

B. Furnish an automatic wet-pipe system in all heated areas of the building. Furnish an automatic dry-pipe system in all unheated areas, areas subjected to freezing temperatures, and exterior canopies or overhangs if/where required by construction.

C. Connect the system to a water supply of sufficient pressure to ensure full and sustained water discharge from sprinkler heads upon activation. Consideration shall be given to the reliability of the available water supply, including seasonal fluctuations in water pressure. The contractor shall verify site water pressures and flow prior to design.

2.2 AUTOMATIC SPRINKLERS

A. All sprinklers shall be through one source from a single manufacturer. All sprinklers shall be quick-response glass bulb type. The operating temperature of sprinklers shall be as required by the specific location of installation in accordance with NFPA 13 requirements.

B. Sprinklers shall conform to the following schedule:

1. Brass upright or pendent sprinklers may be used in attics, mechanical, storage, or other non-public spaces; or in areas where piping and sprinklers are installed exposed.
2. Chrome plated or white recessed pendent sprinklers with chrome or white escutcheons shall be used in all finished areas.
3. Recessed installation shall be used whenever possible. Pendent sprinklers with two-piece escutcheons may be used to extend sprinklers to a maximum deflector distance as allowed by NFPA or the UL listing.
4. Chrome plated or white recessed sidewall sprinklers with chrome or white escutcheons may be used in accordance with listing and jurisdictional requirements.
5. Dry sidewall or dry pendent heads shall be used in all areas subject to freezing (coolers, freezers, vestibules, combustible overhangs, etc) when the heads are supplied from a heated area wet system or as required when connected to the dry system.

2.3 PIPE AND FITTINGS

A. Interior piping for automatic sprinkler system shall conform to NFPA 13.

B. Automatic wet sprinkler system piping:

1. ASTM A53 or ASTM A795 Schedule 40 black steel pipe, with cast iron, malleable iron, or ductile iron threaded fittings joined with Teflon tape thread sealing compound or pipe joint compound. Pressure rating of fittings shall be as required for application.
2. ASTM A135 or ASTM A795 Schedule 10 black steel pipe, with painted grooved fittings.

C. Automatic dry sprinkler system piping:

1. ASTM A53 or ASTM A795 Schedule 40 galvanized steel pipe with galvanized malleable iron threaded fittings joined with Teflon tape thread sealing compound or pipe joint compound. Pressure rating of fittings shall be as required for application.
2. ASTM A135 or ASTM A795 Schedule 10 galvanized steel pipe, with painted grooved fittings.

D. Light wall Schedule 40 and/or Schedule 10 alternative sprinkler piping is not acceptable unless approved in writing.

E. All drain and fire department connection piping and fittings down-stream of valves shall be galvanized with galvanized malleable iron threaded fittings or painted grooved fittings.

F. Flexible piping drop assemblies with stainless steel braided hose coverings shall be used to connect piping to sprinklers located in suspended acoustical tile ceilings.

G. Pipe hangers shall conform to NFPA 13 requirements and shall be FM/UL approved for use in fire sprinkler systems.

2.4 SPECIALTIES

A. Backflow Prevention Devices: Furnish and install FM/UL approved backflow prevention devices as required by the authority having jurisdiction. Reduced pressure backflow devices shall be provided with an air gap drain and piped to the exterior or an adequate floor drain.

B. Fire Department Connections: Furnish and install a polished brass fire department connection, complete with identification plate, clapper, plugs and chains. Install in a location where approved by the authority having jurisdiction.

C. Wet Pipe Valves: Gate valves shall be approved indicating type per NFPA-13 abd NFPA-20. Butterfly valves may be used in lieu of OS&Y valves. Check valves shall be per NFPA-13 and NFPA-20. Inspectors test and drain valves shall be approved brass, globe, angle, or ball type valves. Locate system isolation valves complete with tamper alarm switch.

D. Fire Seals: Where piping passes through walls, floors, or other building construction which by code requires a fire rating, approved fire rated assemblies shall be used. Shop drawings shall clearly indicate details and locations of required protection.

E. Escutcheon Plates: Where exposed piping passes through finish work, chrome plated, painted, or other finish wall plates acceptable to the architect shall be installed. Escutcheons shall be installed to fit snugly around piping. All wall plates shall be metal. Solid galvanized wall plates shall be used at both sides of exterior walls.

F. Valve Identification: All valves within the building shall have permanently marked identification signs (manufactured not hand written) provided in accordance with NFPA 13. Signs shall be hung with galvanized or chrome chain.

G. Spare Head Supply: Furnish and install a supply of extra sprinklers for each type and degree link installed in the project, complete with mountable box and head wrench. Mount box on the wall next to the sprinkler riser. Provide spare head supply.

H. Sprinkler Head Guards: Furnish and install head guards on any sprinklers installed within IT rooms, electrical rooms, gymnasiums, or within seven feet of the finished floor. Head guards shall be chrome finished and listed for the sprinkler on which they are installed.

I. Dry Pipe Valves: Where dry-pipe systems are necessary, furnish and install low pressure type differential dry-pipe valves complete with water flow and low air alarm pressure switches for connection to the fire alarm system.

J. Air Compressors: Where dry-pipe systems are necessary, furnish and install an automatic air compressor and accessories with flexible hose connection to the dry-pipe system. Coordinate power and connection requirements with the electrical contractor.

K. Earthquake Protection: Furnish and install all earthquake bracing and seismic restraint as required by the International Building Code, NFPA 13, and the authority having jurisdiction.

L. Electrical Devices: All electrical devices shall be coordinated with Electrical specifications and Fire Alarm System requirements for compatibility of voltages and manufacturer.

PART 3 EXECUTION

3.1 DESIGN CRITERIA

A. The contractor is responsible for the design of the fire protection systems and complying will all applicable standards and codes. The fire sprinkler systems design is a Delegated Design submittal.

1. Preparation of all shop drawings and hydraulic calculations shall be accomplished by a professional engineer licensed in Wyoming and competent in fire protection.

2. The professional engineer responsible for the fire protection system design shall seal and sign the shop drawings and hydraulic calculation submittals.

B. Perform fire-hydrant flow tests according to NFPA 13 and NFPA 291. Use results for system design calculations required herein. Record date, time, and location of flow test; static pressure, measured flow, and residual pressure. Include test results in writing with submittals.

C. The intent is for the contractor to provide complete fire sprinkler systems as required. The contractor shall be responsible for surveying the site, existing and new construction, and providing the complete fire protection system.

D. The contractor shall design the fire sprinkler piping system. Piping shall be installed by the contractor so as not to interfere with the installation of other piping, ductwork, light fixtures, equipment, or other devices. The contractor shall coordinate with all other construction trades prior to installing the fire protection system piping.

E. Piping layout shall not interfere with maintenance clearance requirements for mechanical or electrical equipment. Maintain 36-42 inch clearance as necessary, including equipment above ceilings (terminal units, heating coils, fan coils, etc.).

F. All piping shall be run concealed wherever possible. Where piping is run exposed, special notation shall be evident and conspicuous on the drawings.

1. Exposed piping shall be routed as high as practical and coordinated with the architect to minimize aesthetic impact on the building.

2. Any exposed piping determined to be a problem by the architect shall be relocated by the contractor at no additional cost to the project.

G. Pipe shall not be routed through or above vestibule ceilings wherever possible. Vestibules shall be protected with dry sidewall sprinklers or dry pendent sprinklers from piping above where necessary.

3.2 JOB SITE CONDITIONS

A. The contractor shall investigate the structural, mechanical, electrical, and finished conditions affecting the piping, and shall install the piping and equipment accordingly; furnishing fittings, offsets and accessories as required for a complete installation. Route fire protection piping to avoid interference with ductwork, piping, lighting and structure.

B. In the event it becomes necessary to make field changes in pipe locations due to construction, the contractor shall consult with the engineer responsible for the design before making any changes. Any such changes required shall be made with approval from the architect and without added cost to the Owner.

C. The contractor shall determine and be responsible for, the proper types and locations of inserts for hangers, sleeves, chases, and other openings in construction required for fire protection work; and shall obtain this information well in advance of the construction progress to avoid delay of the work.

D. The contractor is responsible for final locations of piping and equipment as well as field routing which shall be coordinated with all other trades. Coordinate exposed pipe routing with the architect to minimize aesthetic impact to the building.

3.3 INSTALLATION

A. Installation shall meet or exceed all applicable referenced standards, federal, state and local codes and ordinances, and referenced standards, and shall conform to requirements of authorities having jurisdiction.

B. Where details of installation are not given, the installation shall be made using manufacturer's recommended practices or at the direction of the architect or design team.

C. Install sprinklers in suspended ceilings in the center of acoustical ceiling panels. Where sprinkler heads fall near terminal units or their working clearance,install with flexible pipe drop assemblies for temporary relocation.

D. Install dry-type sprinklers with water supply from the heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

E. Install listed fire protection valves and trim, drain valves, controls, and specialties according to NFPA-13 and the authorities having jurisdiction.

F. Install listed fire protection shut-off valves supervised open. Locate to control cources of water supply. Install permanent identification indicating portion of system controlled by each valve.

G. Install check valves in each water supply connection. Install backflow prevention devices instead of check valves in potable water supply sources.

H. Install hangers and supports for sprinkler piping in accordance with NFPA-13. Comply with requirements for hanger materials.

I. Install pressure gauges on riser or source main, at each sprinkler test connection, and at the top of each standpipe. Install with soft-seated globe valve for draining and removal.

J. Install piping in an orderly manner and maintain gradient. Route perpendicular and parallel to building structure. Install to maintain headroom, conserve space, and avoid interference.

K. Sleeve all piping passing thru walls and floors. Extend sleeves 1-inch above floor level in mechanical rooms, plumbing and piping chases, and other wet areas. Install escutcheons on exposed finished side of penetrations.

L. The surface of all piping shall be cleaned and left ready for painting. This includes the removal of any pipe tags from the piping.

M. Install engraved equipment labels and pre-printed, color-coded pipe markers according to requirements in NFPA 13.

N. Install fire-stopping to preserve fire resistance ratings of partitions, walls, and other assemblies.

O. Install seismic restraints on piping where required. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

P. Complete the fire protection systems ready for operation in all respects, and activate the system for its intended use.

Q. Instruct the Owner in the operation of the systems. Instruction shall continue until the Owner is fully satisfied that he understands operation of the systems.

3.4 TESTING

A. All testing shall be accomplished in accordance with NFPA standards and requirements.

B. This contractor shall call for inspection and complete contractor’s material and test certificates signed by the authority having jurisdiction. Furnish copies of the above ground test certificates with the close-out documentation.

C. The automatic wet-pipe system shall be hydrostatically tested at not less than 200 psig pressure for a period of two-hours or 50-psi above static pressure in excess of 150-psi for two hours with no pressure drop in the system.

D. In addition to the standard hydrostatic test, the automatic dry pipe system shall have an air pressure leakage test at 40-psi conducted for 24-hours. Any leakage that results in a loss of pressure in excess of 1.5-psi for the 24-hours shall be corrected.

E. Where jurisdictional authority's standards are more stringent, they shall prevail.

F. All testing shall be witnessed by a representative of the Owner.

END OF SECTION

DIVISION

22

PLUMBING

SECTION 22 1010 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, and connections for plumbing piping systems within five feet of the building.

1. Sanitary sewer.
2. Domestic water.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

B. Provide materials and installation in accordance with the City of Powell standard specifications for public works construction. Note specific requirements for sacrificial anodes, underground nuts/bolts and restraining rods, epoxy coated fittings, etc.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 INFORMATIONAL SUBMITTALS

A. Test Reports: Provide evidence of piping system pressure and leak tests. Include date, section tested, test pressure, and results.

B. Test Reports: Provide evidence of disinfection and bacteriological results of each outlet tested conforming to standards of State and Federal safe drinking water acts.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves.

B. Operation and Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views, etc.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

D. NSF Standard: Comply with NSF 61 and NSF 372 - Drinking Water System Components (Health Effects and Lead Content), for materials that will be in contact with potable water. Label pipe and fittings.

1.8 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

2.1 SANITARY AND GREASE SEWER PIPING, ABOVE AND BELOW GRADE

A. Solid Wall PVC Pipe: ASTM D2665 or ASTM D3034, Schedule 40.

1. PVC Socket Fittings: ASTM D2665, to fit Sch 40 pipe.
2. Joints: Solvent welded, with ASTM F565 adhesive primer and ASTM D2564 solvent cement.

2.2 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.

B. Cross-Linked Polyethylene Pipe (PEX): ASTM F876 or ASTM F877.

1. Fittings: Lead-free brass or engineered polymer.
2. Joints: Mechanical compression fittings.

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 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" and Over:

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 with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

1. Precision Plumbing Products (PPP) Clearflow Dielectric Waterway or equal.

2.4 HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.

3. Trapeze Hangers: Welded steel channel frames attached to structure with U-bolt guides.

4. Hanger Rods: Mild steel threaded both ends or continuous threaded.

5. Vertical Pipe Support: Steel riser clamp.

B. Hangers for Pipe Sizes 1/2 Inch to 2 Inches: Malleable iron, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2-1/2 Inches and Over: Carbon steel, adjustable, clevis.

D. Rigidly mounted domestic piping (where allowed) shall be secured to 12 gauge 1-5/8 inch slotted channel framing with insulated strut clamps.

E. Install steel safety plates on upright stud members to prevent drills and fasteners from penetrating piping.

F. Metal stud insulating pipe clamps shall be used to isolate piping from steel stud framing.

G. All insulated piping shall be installed with sufficient clearance to accept continuous insulation.

2.5 SERVICE LINE RISERS

A. Factory fabricated and leak-tested, anodeless service line riser consisting of an underground PE pipe complying with ASTM D2513, SDR 11 inlet connected to a steel pipe complying with ASTM A53, Schedule 40 black steel, Type E, S, or B, with corrosion protective covering.

1. Outlet shall be threaded or flanged or suitable for welded connection.

2. Bridging sleeve over mechanical coupling.

3. Factory connected anode.

4. Tracer wire connection.

5. Ultraviolet shield.

6. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.6 DRAIN VALVES

A. Drain valves shall be ball valves as specified herein or ball valves as part of an integral flange isolator product. All drain valves shall be fitted with American standard hose thread fittings and blind hose caps.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 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 flanges or unions.

D. Where modifications to layouts are proposed, the contractor shall include wall cleanouts after every 135-degrees of turn. Floor cleanouts will be considered as a last resort only.

3.3 PLUMBING PIPING INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Do not install below grade piping when bedding is wet or frozen.

C. Provide non-conducting dielectric connections wherever joining dissimilar metals.

D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

E. Install piping to maintain headroom, conserve space, and not interfere with use of space.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

I. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with the general contractor. Coordinate size and location of access doors with architectural specification sections.

J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

K. Excavate and backfill in accordance with applicable civil specifications.

L. Install bell and spigot pipe with bell end upstream.

M. Install water piping to ASME B31.9.

N. Sleeve all piping passing through partitions, walls, and floors. Install escutcheons on exposed, finished side of penetrations.

O. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Install inserts to extend 1-inch above the finished floor elevation in plumbing chases and mechanical equipment rooms.
3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

P. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9 and MSS SP-89.
2. Support all piping in accordance with Chapter 3 of the most current International Plumbing Code (IPC). Install sway bracing and restraints to resist movement.
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 other 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. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, shafts, and suspended ceilings are not considered exposed.
9. Provide hangers adjacent to motor driven equipment with vibration isolation.
10. Support cast iron drainage piping at every joint.
11. Provide galvanized hangers, supports, and accessories in locations exterior to the building.

Q. Install valves with stems upright or horizontal, not inverted.

R. Plug all open ends of incomplete piping work prevent the entrance of dirt and debris.

S. Install all pipe mounted temperature control devices (thermowells, valves, flow meters, etc).

T. Pex Piping Limitations:

1. The use of pex piping shall be limited to 1" size and below, serving vertical run-outs to individual fixtures or bathrooms groups within the wall framing and downstream of isolation valves, with firmly secured copper ell stub-outs at the fixtures.
2. Main branch piping shall not be installed with pex. Do not install pex piping to flush valve water closets and urinals. Do not install pex piping within a return air plenum (rated or otherwise).
3. Support pex piping at all changes in direction and at 32 inch intervals consistent with code requirements and/or local ordinace.

U. Install permanent labels designating "overflow" at all appropriate discharge spout locations.

V. Provide drain valves at all equipment, at all low spots in the systems, at the base of all risers, and on the downstream side of all section valves so any given section may be drained.

W. Where buried polyethylene water piping is used, install 10-gauge solid copper tracer wire suitable for direct bury, with the piping.

X. Install a minimum of 10-ft of stainless steel piping from floor sinks in the kitchen to withstand hot water temperatures. Coordinate with food service requirements where applicable.

3.4 GAS PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Install piping in accordance with all appliance or equipment manufacturer instructions.

C. Install underground natural-gas piping buried at least 36-inches below finished grade. If installed less than 36-inches, install within a containment conduit.

D. Install underground polyethylene natural-gas piping according to ASTM D2774. Install free of splices or joints unless otherwise approved in writing.

E. Install factory fabricated and leak tested anodeless service line risers at all locations where natural-gas piping transitions from above and below ground installation.

F. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

G. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

J. Locate valves for easy access.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Verify final equipment locations for roughing-in.

N. Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying.

O. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped.

P. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe.

Q. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

R. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

S. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

T. Connect branch piping from top or side of horizontal piping.

U. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

V. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in these specifications.

X. Plug all open ends of incomplete piping work prevent the entrance of dirt and debris.

3.5 CONNECTIONS

A. Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following: PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Apply appropriate tape or thread compound to external pipe threads.

D. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

E. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.6 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, parts of systems, or vertical risers.

D. Provide spring loaded check valves on discharge of water pumps.

E. Provide plug valves in natural gas systems for shut-off service.

F. Provide flow controls in water recirculating systems where indicated.

G. Provide brass or copper nipples at trap arms and dirty arms. Galvanized piping is not permitted.

H. Provide brass nipples at all domestic piping equipment connections. Galvanized piping is not permitted.

I. Exposed accessories beneath sinks and lavatories shall include chrome plated brass p-traps and extensions, quarter-turn angle stops, and braided stainless steel flexible supplies.

3.7 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 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.

3.8 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.

3.9 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter, pressure reducing valve. Install ball type drain valve at service low point (and/or strainer blow-down).

C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 2 psi. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspection:

1. General: All new, altered, extended, or replaced plumbing piping systems shall be tested and inspected in accordance with the following requirements and the authority having jurisdiction.

2. Tests shall be applied to systems in their entirety or in completed sections. Repair any leaks that may occur and repeat the test procedure.

3. Record and submit test and inspection reports for each system, complete with diagram or description of section tested and any corrective action taken.
4. Drainage Piping: Sanitary and storm systems shall be filled with water and tested with no less than a 10 foot head of water. The pressure shall be held for not less than 15 minutes.
5. Water Piping: Supply systems shall be tested under a water pressure not less than 125% of the expected working pressure of the system. The pressure shall be held for not less than 6 hours.
6. Gas Piping: Gas piping systems shall be installed, examined, inspected, and tested in accordance with requirements of the International Fuel Gas Code and the authority having jurisdiction.

3.11 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe size: 1/2 inches to 1-1/4 inches:
         1) Maximum hanger spacing: 6 feet.
         2) Hanger rod diameter: 3/8 inches.
      b. Pipe size: 1-1/2 inches to 2 inches:
         1) Maximum hanger spacing: 10 feet.
         2) Hanger rod diameter: 3/8 inch.
      c. Pipe size: 2-1/2 inches to 3 inches:
         1) Maximum hanger spacing: 10 feet.
         2) Hanger rod diameter: 1/2 inch.
      d. Pipe size: 4 inches to 6 inches:
         1) Maximum hanger spacing: 10 feet.
         2) Hanger rod diameter: 5/8 inch.
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum hanger spacing: 6 feet.
         2) Hanger rod diameter: 3/8 inch.

END OF SECTION

SECTION 22 1020 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof and floor drains.

B. Wall and floor cleanouts.

C. Hydrants and hose bibs.

D. Water hammer arrestors.

E. Temperature limiting valves.

F. Trap primers and seals.

G. Backflow preventers.

H. Grease interceptors.

I. Access covers.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Manufacturer's standard data sheets describing components including materials, dimensions, relationship to adjacent construction, and attachments. Provide component sizes, rough-in requirements, service sizes, and finishes.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of cleanouts, backflow devices, water hammer arrestors, and other equipment and accessories.

B. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.6 QUALITY ASSURANCE

A. NSF Standard: Comply with NSF 372 - Drinking Water System Components - Lead Content, for materials that will be in contact with potable water.

1.7 STORAGE AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. See equipment and accessories schedules on the drawings for Basis of Design. Other acceptable manufacturers are listed herein, provided a model of equivalent design is available.

2.2 ROOF AND FLOOR DRAINS

A. Manufacturers:
   1. Jay R Smith Manufacturing Company: jayrsmith.com.
   2. Josam Company: josam.com.
   3. Zurn Industries: zurn.com.
   4. Substitutions: See Section 20 0500 for substitution procedures.

B. General:
   1. Precise locations of drains shall be detailed by the architectural drawings. Where drain locations conflict with structural elements, confirm locations with architect prior to rough-in.
   2. Furnish flashing flange for all structural type membrane floors.

C. Floor Drain:
   1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

D. Floor Sink:
   1. ASME A112.6.3; 12 inch square cast iron flanged receptor with seepage holes, acid resistant coated interior, and loose set acid resistant coated cast iron grate, body with dome strainer. Provide 6 inch depth unless noted otherwise.

2.3 WALL AND FLOOR CLEANOUTS

A. Manufacturers:
   1. Jay R Smith Manufacturing Company: jayrsmith.com.
   2. Josam Company: josam.com.
   3. Zurn Industries: zurn.com.

4. Substitutions: See Section 20 0500 for substitution procedures.

B. General:

1. Furnish and install cleanouts where indicated on the drawings and at all bends, angles, upper terminals, and not over 50 feet apart.
2. All cleanouts to have bronze countersunk rectangular slotted plugs lubricated with non-hardening thread lubricant.
3. Flush-with-floor cleanout tops shall have non-skid covers.
4. Furnish flashing flange for all structural type membrane floors.

C. Interior Finished Floors:

1. Cast iron adjustable floor level cleanout assembly with round nickel bronze top.

D. Exterior Unfinished Floors:

1. Cast iron adjustable floor level cleanout assembly with round heavy duty cast iron top.

E. Interior Finished Walls:

1. Cast iron ferrule with lead seal plug, round stainless steel cover with center screw.

2.4 HYDRANTS AND HOSE BIBS

A. Manufacturers:

1. Jay R Smith Manufacturing Company: jayrsmith.com.
2. Wooford Manufacturing Company: woodfordmfg.com
3. Zurn Industries: zurn.com.
4. Substitutions: See Section 20 0500 for substitution procedures.

B. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with polished bronze wall plate, hose thread spout, removable key, and integral vacuum breaker.

C. Hose Bibs:

1. ASSE 1011; Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, with handwheel, and integral vacuum breaker.

2.5 WASHING MACHINE BOXES AND VALVES

A. Manufacturers:

1. IPS Corporation: ipscorporation.com
2. Oatay: oatay.com
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Valve Box: Powder-coated metal preformed rough-in box with brass valves and lever handles, socket for 2 inch waste, slip in finishing cover.

C. Dryer Box:

2.6 REFRIGERATOR VALVE AND RECESSED BOX

A. Manufacturers:

1. IPS Corporation: ipscorporation.com
2. Oatay: oatay.com
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Description: Powder-coated metal preformed rough-in box with brass valves and lever handle, slip in finishing cover.

2.7 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R Smith Manufacturing Company: jayrsmith.com.
2. Watts Regulator Company: wattsregulator.com.
3. Zurn Industries: zurn.com.
4. Substitutions: See Section 20 0500 for substitution procedures.

B. Water Hammer Arrestors:

1. ASSE 1010; Copper construction, lead-free, piston type sized in accordance with PDI-WH 201, pre-charged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.
2. Install in an upright position at all quick closing valves, solenoids, and plumbing fixtures. Locate and size in accordance with PDI-WH 201.

2.8 TEMPERATURE LIMITING VALVES

A. Manufacturers:

1. Powers: powerscontrols.com
2. Substitutions: See Section 20 0500 for substitution procedures.

B. Temperature Limiting Valves:

1. ASSE 1070; constructed of solid brass, with internal components of corrosion resistant material, integral checks to prevent cross flow, and inlet screens to filter debris.
2. The valve must control each performance standard down to 0.5 gpm. Control temperature must be adjustable between 80 to 100 degrees F with a locking nut to prevent unauthorized or accidental adjustment.
3. Install at all sinks and lavatories subject to public use. Do not install at kitchen sinks or mop basins.

2.9 TRAP SEALS

A. Manufacturers:

1. ProVent Systems: trapguard.com.
2. Jay R Smith Manufacturing Company: jayrsmith.com.
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Trap Seals:

1. ASSE 1072; elastomeric, normally closed, floor drain evaporation resistant sealing system.
2. Trap seals may be installed in lieu of trap primers with approval of the authority having jurisdiction.
3. Trap seals may not be used in kitchens or other areas subject to wax or grease.

2.10 BACKFLOW PREVENTERS

A. Manufacturers:

1. Wilkins Valve Company: zurn.com.
2. Watts Regulator Company: www.wattsregulator.com.
3. Substitutions: See Section 20 0500 for substitution procedures.

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 service valves, strainer, test cocks, and supplied with an air gap fitting.

2.11 INTERCEPTORS

A. Manufacturers:

1. Forterra: cretexconcreteproducts.com.
2. Vaughn Concrete Products: vaughnconcreteproducts.com.
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Grease Interceptors:

1. Provide pre-cast reinforced concrete grease interceptor of the size and capacity as shown on the drawings.
2. Provide interceptors with minimum of two compartments, baffle arrangement, water seal trapped inlet, crossover, and outlet piping as required by NSPC and/or local requirements. Coat inner and outer surfaces with heavy coating of bituminous mastic.
3. Provide gas-tight heavy-duty H20 highway load rated cast iron manhole lids, frames, and concrete adjusting rings.

2.12 ACCESS COVERS

A. General:

1. Furnish and install access covers for all concealed valves, cleanouts, trap primers, water hammer arrestors, and other concealed equipment not accessible from utility spaces.
2. See architectural divisions for access door specifications. Provide to the general contractor for installation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install all plumbing specialties in a readily accessible location. Install access doors where required.

C. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding of drainage system.

D. Encase exterior cleanouts in concrete flush with grade. Size to be 24" by 24" by 6" thick minimum.

E. Install floor cleanouts at elevation to accommodate finished floor.

F. Install approved portable 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.

G. Pipe relief from backflow preventer to nearest drain.

H. Install water hammer arrestors complete with accessible isolation valve on cold water supply piping to all quick closing valves, solenoids, and other locations indicated. Size and install in accordance with the mfgr's instructions.

I. Install temperature limiting valves at all single or multiple point-of-use lavatories and sinks serving public use fixtures or where required by the local authority having jurisdiction. Do not install at kitchen prep sinks.

J. Install trap primer valves with accessible isolation valves upstream and 1/2 inch pex tubing downstream to a threaded connection at each floor drain or floor sink p-trap. Sleeve tubing where it will pass thru the concrete floor.

K. Protect drains and other specialties during construction period to avoid clogging with dirt or debris, and to prevent damage from traffic or other construction work. Plug all open ends of incomplete piping at the end of each day's work.

L. In lieu of trap primer valves and with permission of the local authority having jurisdiction, install listed and approved trap primer seals at each floor drain and floor sink. Do not install in kitchens or where waxed floor surfaces will be installed.

M. Where not indicated by architectural drawings:

1. Set floor drains for individual restrooms, custodial closets, and other small areas depressed into slabs 1/4-inch.

2. Set floor drains for gang restrooms and other larger areas depressed into slabs 1/2-inch.
3. Set floor sinks such that grate is flush with the floor level.
4. Install floor drains with the slab installation.

N. Grease Interceptor Installation:

1. Install grease interceptors as shown on the drawings, in accordance with the manufacturer's instructions, and in compliance with all applicable codes.
2. Excavate to depth required and tamp bedding hard in accordance with civil engineer's requirements. Position grease interceptor in ground with inlet/outlet piping set to invert elevations consistent with sewer piping exiting the building.
3. Where piping passes through interceptor walls, provide water tight seals and joints. provide cleanouts with test ports as shown on the drawings or required by the authority. Vent to the roof level. Backfill only after interceptor lines have been tested, inspected, and approved.

END OF SECTION

SECTION 22 1110 - DOMESTIC WATER PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Domestic water piping and fittings.

B. Unions, flanges, and couplings.

C. Hangers and supports.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Include data on pipe and fittings, joining materials, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1. Piping must be clearly identified with intended service and range of sizes indicated.

2. Valves and other accessories shall be identified to correspond with the piping submittals.

1.5 INFORMATIONAL SUBMITTALS

A. Test Reports: Provide evidence of piping system pressure tests. Include date, section tested, test pressure, and results.

B. Test Reports: Provide evidence of disinfection and bacteriological results of each outlet tested conforming to standards of State and Federal safe drinking water acts.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping and valves.

1.7 QUALITY ASSURANCE

A. Provide piping, pipe fittings, solder and flux, etc, that comply with NSF 61 and NSF 372 for maximum lead content. Label pipe and fittings.

B. Identify pipe with marking including size, material classification, potable water certification, and water pressure rating.

1.8 STORAGE AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings delivered to the jobsite. Maintain in place until installation.

C. 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

2.1 WATER PIPING, BELOW GRADE

A. Polyethylene Pipe: ASTM D3035 CTS 200 psi.

1. Fittings: ASTM D2683 socket fusion type.
2. Joints: Fusion welded.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: Ductile or grey iron, standard thickness.
2. Joints: AWWA C111/A21.11, rubber gasket with 3/4-inch diameter rods.

2.2 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88, Type L, hard drawn.

1. Solder Fittings and Joints: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze. ASTM B32, alloy Sn95 solder.
2. Mechanical Press Fittings: ASME B16.51 cast copper alloy, wrought copper, or wrought copper alloy press-connect pressure fittings. EPDM synthetic rubber sealing elements.

B. Cross-Linked Polyethylene Pipe (PEX): ASTM F876 or ASTM F877.

1. Fittings: Lead-free brass or engineered polymer.
2. Joints: Mechanical compression fittings.

2.3 EQUIPMENT DRAINS

A. Copper Tube: ASTM B88, Type M.

1. Fittings: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper.
2. Solder Joints: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.

1. Fittings: ASTM D2466 or D2467, PVC.
2. Joints: Solvent welded in accordance with ASTM D2855.

2.4 UNIONS FLANGES AND COUPLINGS

A. Unions for Pipe Sizes 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 and Over:

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.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

B. Hangers for Pipe Sizes 1/2 to 2-inch: Carbon steel, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2-1/2 to 6-inch: Carbon steel, adjustable, clevis.

D. Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Supports: Slotted channel framing with insulated strut clamps.

F. Vertical Supports: Steel riser clamps.

G. Hanger Rods: Mild steel continuous threaded.

2.6 DRAIN VALVES

A. Drain valves shall be ball valves as specified herein or ball valves as part of an integral flange isolator product.

B. All drain valves shall be fitted with American standard hose thread fittings and blind hose caps.

PART 3 EXECUTION

3.1 PREPARATION

A. Examine piping interior for cleanliness, freedom from foreign matter, and corrosion.

B. Remove scale and dirt on inside and outside before assembly.

C. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

D. Prepare piping connections to equipment with flanges or unions.

E. Protect open ends of pipe with temporary plugs or caps.

F. Do not install below grade piping when bedding is wet or frozen.

3.2 GENERAL PIPING INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Drawing plans indicate general location and arrangement of piping systems. Install piping as closely as possible to that indicated unless deviations to layout are approved.

C. Route piping in an orderly manner, parallel and perpendicular to building structure.

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 firestopping to preserve fire resistance rating of partitions and other elements.

G. Install piping free of sags and bends. 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. Sleeve all piping passing through partitions, walls, and floors. Install escutcheons on exposed, finished side of penetrations.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

K. Provide galvanized hangers and supports and accessories in locations exterior to the building.

L. Provide access doors where valves and fittings are not exposed or otherwise inaccessible.

M. Install piping to permit valve servicing. Install valves with stems upright or horizontal, not inverted.

N. Install piping adjacent to equipment to allow service and maintenance access. Install unions and shut-off valves at all equipment inlets and outlets. Provide appropriate equipment grounding.

O. Wall mounted piping is permitted only where indicated, and shall be secured to 12-gauge 1-5/8 inch slotted channel framing with insulated strut clamps.

P. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

3.3 PLUMBING PIPING INSTALLATION

A. Install water piping to ASME B31.9.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install ball valves for shut-off and to isolate equipment, parts of systems, or vertical risers.

E. Provide flow controls in each circuit of water recirculating systems.

F. Slope water piping at a minimum of 1/32-inch per foot and arrange to drain at low points.

G. Install piping penetrating roofed areas to maintain integrity of roof assembly.

H. Provide support for utility meters in accordance with requirements of utility companies.

I. Provide brass nipples at all domestic piping equipment connections. Galvanized piping is not permitted.

J. Exposed accessories beneath sinks and lavatories shall include chrome plated brass p-traps and extensions, quarter-turn angle stops, and braided stainless steel flexible supplies.

K. Pex Piping Limitations:

1. The use of pex piping shall be limited to 1-inch size and below, serving vertical run-outs to individual fixtures or single bathrooms groups within the wall framing and downstream of isolation valves, with firmly secured copper ell stub-outs at the fixtures.

2. Main branch piping shall not be installed with pex. Do not install pex piping to flush valve water closets and urinals. Do not install pex piping within a return air plenum (rated or otherwise).

3. Support pex piping at all changes in direction and at 32-inch intervals consistent with code requirements and/or local ordinanace.

L. Provide materials and installation in accordance with the local City or utility standard specifications for public works construction. Note specific requirements for sacrificial anodes, underground nuts/bolts and restraining rods, epoxy coated fittings, etc.

3.4 PIPE CONNECTIONS

A. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20. Apply appropriate tape or thread compound to external pipe threads.

B. Soldered Joints: Join copper tube and fittings with soldered joints according to ASTM B828. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.

C. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 PIPE AND HANGER SUPPORTS

A. Install pipe hangers and supports in accordance with ASME B31.9.

B. Install hangers to provide 1-inch space between finished covering and adjacent work.

C. Place hangers adjacent to fittings, within 12-inches of each horizontal elbow, and within 24-inches of connected equipment. Do not support piping from equipment.

D. Use hangers with 1-1/2-inch vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

E. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

F. Install hangers adjacent to motor driven equipment with vibration isolation.

G. Prime coat exposed steel hangers and supports.

H. Utilize floor cleats where slotted steel channels are secured to the structure.

3.6 DISINFECTION OF DOMESTIC WATER PIPING

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. Analyze in accordance with AWWA C651.

3.7 FIELD QUALITY CONTROL

A. Testing and Inspection:

1. General: All new, altered, extended, or replaced plumbing piping systems shall be tested and inspected in accordance with the the authority having jurisdiction.

2. Tests shall be applied to systems in their entirety or in completed sections. Repair any leaks that may occur and repeat the test procedure.

3. Record and submit test and inspection reports for each system, complete with diagram or description of section tested and any corrective action taken.

4. Supply systems shall be tested under a water pressure not less than 125% of the expected working pressure of the system. The pressure shall be held for not less than 6 hours.

3.8 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

a. Pipe size: 1/2 inches to 1-1/4 inches:

1) Maximum hanger spacing: 6 feet.

2) Hanger rod diameter: 3/8 inches.

b. Pipe size: 1-1/2 inches to 2 inches:

1) Maximum hanger spacing: 10 feet.

2) Hanger rod diameter: 3/8 inch.

c. Pipe size: 2-1/2 inches to 3 inches:

1) Maximum hanger spacing: 10 feet.

2) Hanger rod diameter: 1/2 inch.

d. Pipe size: 4 inches to 6 inches:

1) Maximum hanger spacing: 10 feet.

2) Hanger rod diameter: 5/8 inch.

2. Plastic Piping:

a. All Sizes:

1) Maximum hanger spacing: 6 feet.

2) Hanger rod diameter: 3/8 inch.

3. Pex Piping:

a. All Sizes:

1) Maximum hanger spacing: 32 inches.

END OF SECTION

SECTION 22 1120 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water hammer arrestors.

B. Temperature limiting valves.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Manufacturer's standard data sheets describing components including materials, dimensions, relationship to adjacent construction, and attachments. Provide component sizes, rough-in requirements, service sizes, and finishes.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of backflow devices, water hammer arrestors, and other equipment and accessories.

B. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.6 QUALITY ASSURANCE

A. NSF Standard: Comply with NSF 372 - Drinking Water System Components - Lead Content, for materials that will be in contact with potable water.

1.7 STORAGE AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 WASHING MACHINE BOXES AND VALVES

A. Manufacturers:

1. IPS Corporation.
2. Oatay.
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Valve Box: Powder-coated metal preformed rough-in box with brass valves and lever handles, socket for 2 inch waste, slip in finishing cover.

C. Dryer Box: needed

2.2 REFRIGERATOR VALVE AND RECESSED BOX

A. Manufacturers:

1. IPS Corporation.
2. Oatay.
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Description: Powder-coated metal preformed rough-in box with brass valves and lever handle, slip in finishing cover.

2.3 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R Smith Manufacturing Company.
2. Watts Regulator Company.
3. Zurn Industries.
4. Substitutions: See Section 20 0500 for substitution procedures.

B. Water Hammer Arrestors:

1. ASSE 1010; Copper construction, lead-free, piston type sized in accordance with PDI-WH 201, pre-charged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.
2. Install in an upright position at all quick closing valves, solenoids, and plumbing fixtures. Locate and size in accordance with PDI-WH 201.

2.4 TEMPERATURE LIMITING VALVES

A. Manufacturers:

1. Powers.

2. Substitutions: See Section 20 0500 for substitution procedures.

B. Temperature Limiting Valves:

1. ASSE 1070; constructed of solid brass, with internal components of corrosion resistant material, integral checks to prevent cross flow, and inlet screens to filter debris.

2. The valve must control each performance standard down to 0.5 gpm. Control temperature must be adjustable between 80 to 100 degrees F with a locking nut to prevent unauthorized or accidental adjustment.

3. Install at all sinks and lavatories subject to public use. Do not install at kitchen sinks or mop basins.

2.5 TRAP PRIMER VALVES

A. Manufacturers:

1. Precision Plumbing Products.

2. Watts Regulator Company.

3. Substitutions: See Section 20 0500 for substitution procedures.

B. Trap Primer Valves:

1. ASSE 1018; pressure drop activated brass trap seal primer with filter screen.

2. Provide with upstream quarter-turn service valve and distribution unit as required.

PART 3 EXECUTION

3.1 GENER INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install all plumbing specialties in a readily accessible location. Install access doors where required.

C. Install approved backflow 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, hose bibbs, etc. Pipe relief to the nearest drain.

D. Install water hammer arrestors complete with accessible isolation valve on cold water supply piping to all quick closing valves, solenoids, and other locations indicated. Size and install in accordance with the mfgr's instructions.

E. Install temperature limiting valves at all single or multiple point-of-use lavatories and sinks serving public use fixtures or where required by the local authority having jurisdiction. Do not install at kitchen prep sinks.

3.2 SCHEDULES

A. See equipment and accessories schedules on the drawings for Basis of Design. Other acceptable manufacturers are listed herein, provided a model of equivalent design is available.

END OF SECTION

SECTION 22 1310 - DRAIN WASTE & VENT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary sewer piping and fittings.

B. Unions, flanges, and couplings.

C. Hangers and supports.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Include data on pipe and fittings, joining materials, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1. Piping must be clearly identified with intended service and range of sizes indicated.

2. Valves and other accessories shall be identified to correspond with the piping submittals.

1.5 INFORMATIONAL SUBMITTALS

A. Test Reports: Provide evidence of piping system pressure tests. Include date, section tested, test pressure, and results.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping and valves.

1.7 QUALITY ASSURANCE

A. Identify pipe with marking including size, material classification, potable water certification, and water pressure rating.

1.8 STORAGE AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings delivered to the jobsite. Maintain in place until installation.

C. 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

2.1 SANITARY SEWER PIPING, BELOW GRADE

A. Solid Wall PVC Pipe: ASTM D2665 or ASTM D3034, Schedule 40.

1. PVC Socket Fittings: ASTM D2665, to fit Sch 40 pipe.
2. Joints: Solvent welded, with ASTM F565 adhesive primer and ASTM D2564 solvent cement.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Hubless Cast Iron Pipe: ASTM A888 or CISPI 301, service weight.

1. Fittings: Cast iron ASTM A888 or CISPI 301.
2. Joints: ASTM C1277 or CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.3 STORM WATER PIPING, BELOW GRADE

A. Solid Wall PVC Pipe: ASTM D2665, Schedule 40.

1. PVC Socket Fittings: ASTM D2665, to fit Sch 40 pipe.
2. Joints: Solvent welded, with ASTM F565 adhesive primer and ASTM D2564 solvent cement.

2.4 STORM WATER PIPING, ABOVE GRADE

A. Hubless Cast Iron Pipe: ASTM A888 or CISPI 301, service weight.

1. Fittings: Cast iron ASTM A888 or CISPI 301.
2. Couplings: ASTM C1277 or CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

B. Hangers for Pipe Sizes 1/2 to 2-inch: Carbon steel, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2-1/2 to 6-inch: Carbon steel, adjustable, clevis.

D. Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Supports: Slotted channel framing with insulated strut clamps.

F. Vertical Supports: Steel riser clamps.

G. Hanger Rods: Mild steel continuous threaded.

PART 3 EXECUTION

3.1 PREPARATION

A. Examine piping interior for cleanliness, freedom from foreign matter, and corrosion.

B. Remove scale and dirt on inside and outside before assembly.

C. Protect open ends of pipe with temporary plugs or caps during construction.

D. Do not install below grade piping when bedding is wet or frozen.

3.2 GENERAL PIPING INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Drawing plans indicate general location and arrangement of piping systems. Install piping as closely as possible to that indicated unless deviations to layout are approved.

C. Route piping in an orderly manner, parallel and perpendicular to building structure.

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 firestopping to preserve fire resistance rating of partitions and other elements.

G. Install piping free of sags and bends. 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. Sleeve all piping passing through partitions, walls, and floors. Install escutcheons on exposed, finished side of penetrations.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

K. Provide galvanized hangers and supports and accessories in locations exterior to the building.

L. Provide access doors where valves and fittings are not exposed or otherwise inaccessible.

M. Install piping to permit valve servicing. Install valves with stems upright or horizontal, not inverted.

N. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

3.3 DWV PIPING INSTALLATION

A. Establish elevations of buried piping outside the building to ensure not less than the indicated depth of cover.

B. Install piping penetrating roofed areas to maintain integrity of roof assembly.

C. Install bell and spigot pipe with bell end upstream.

D. Install permanent labels designating "overflow" at all appropriate discharge spout locations.

E. Where modifications to layouts are proposed, include wall cleanouts after every 135-degrees of turn. Floor cleanouts will be considered as a last resort only.

F. Provide materials and installation in accordance with the local City or utility standard specifications for public works construction. Note specific requirements for underground nuts/bolts and restraining rods, epoxy coated fittings, etc.

3.4 CONNECTIONS

A. Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to ASTM D2855 and ASTM D2665 appendixes.

B. Hubless Joints: Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20. Apply appropriate tape or thread compound to external pipe threads.

D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 PIPE HANGERS AND SUPPORTS

A. Install pipe hangers and supports in accordance with ASME B31.9.

B. Install hangers to provide 1-inch space between finished covering and adjacent work.

C. Place hangers adjacent to fittings, within 12-inches of each horizontal elbow, and within 24-inches of connected equipment. Do not support piping from equipment.

D. Use hangers with 1-1/2-inch vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

E. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

F. Install hangers adjacent to motor driven equipment with vibration isolation.

G. Prime coat exposed steel hangers and supports.

3.6 APPLICATION

A. Provide brass or copper nipples at trap arms and dirty arms. Galvanized piping is not permitted.

B. Exposed accessories beneath sinks and lavatories shall include chrome plated brass p-traps and extensions, quarter-turn angle stops, and braided stainless steel flexible supplies.

3.7 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2-inch vertically of locations indicated. Unless noted otherwise, slope to drain as follows:

1. Pipe size 4-inch and smaller: Slope at a minimum of 1/4-inch per foot.
2. Pipe size 5-inch and larger: Slope at a minimum of 1/8-inch per foot.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspection:

1. General: All new, altered, extended, or replaced plumbing piping systems shall be tested and inspected in accordance with the the authority having jurisdiction.
2. Tests shall be applied to systems in their entirety or in completed sections. Repair any leaks that may occur and repeat the test procedure.
3. Record and submit test and inspection reports for each system, complete with diagram or description of section tested and any corrective action taken.
4. Sanitary and storm systems shall be filled with water and tested with no less than a 10 foot head of water. The pressure shall be held for not less than 15 minutes.

3.9 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:
    a. Pipe size: 1/2 inches to 1-1/4 inches:
        1) Maximum hanger spacing: 6 feet.
        2) Hanger rod diameter: 3/8 inches.
    b. Pipe size: 1-1/2 inches to 2 inches:
        1) Maximum hanger spacing: 10 feet.
        2) Hanger rod diameter: 3/8 inch.
    c. Pipe size: 2-1/2 inches to 3 inches:
        1) Maximum hanger spacing: 10 feet.
        2) Hanger rod diameter: 1/2 inch.
    d. Pipe size: 4 inches to 6 inches:
        1) Maximum hanger spacing: 10 feet.
        2) Hanger rod diameter: 5/8 inch.
2. Plastic Piping:

a. All Sizes:

1) Maximum hanger spacing: 6 feet.

2) Hanger rod diameter: 3/8 inch.

END OF SECTION

SECTION 22 1320 - DRAIN WASTE & VENT PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof and floor drains.

B. Wall and floor cleanouts.

C. Trap primers and seals.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Manufacturer's standard data sheets describing components including materials, dimensions, relationship to adjacent construction, and attachments. Provide component sizes, rough-in requirements, service sizes, and finishes.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of cleanouts, trap primers, and other equipment and accessories.

B. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.6 QUALITY ASSURANCE

1.7 STORAGE AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. See equipment and accessories schedules on the drawings for Basis of Design. Other acceptable manufacturers are listed herein, provided a model of equivalent design is available.

2.2 ROOF AND FLOOR DRAINS

A. Manufacturers:
   1. Jay R Smith Manufacturing Company.
   2. Josam Company.
   3. Zurn Industries.
   4. Substitutions: See Section 20 0500 for substitution procedures.

B. General:
   1. Precise locations of drains shall be detailed by the architectural drawings. Where drain locations conflict with structural elements, confirm locations with architect prior to rough-in.
   2. Furnish flashing flange for all structural type membrane floors.

C. Floor Drain:
   1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.3 WALL AND FLOOR CLEANOUTS

A. Manufacturers:
   1. Jay R Smith Manufacturing Company.
   2. Josam Company.
   3. Zurn Industries:.
   4. Substitutions: See Section 20 0500 for substitution procedures.

B. General:
   1. Furnish and install cleanouts where indicated on the drawings and at all bends, angles, upper terminals, and not over 50 feet apart.
   2. All cleanouts to have bronze countersunk rectangular slotted plugs lubricated with non-hardening thread lubricant.
   3. Flush-with-floor cleanout tops shall have non-skid covers.
   4. Furnish flashing flange for all structural type membrane floors.

C. Interior Finished Floors:
   1. Cast iron adjustable floor level cleanout assembly with round nickel bronze top.

D. Exterior Unfinished Floors:

1. Cast iron adjustable floor level cleanout assembly with round heavy duty cast iron top.

E. Interior Finished Walls:

1. Cast iron ferrule with lead seal plug, round stainless steel cover with center screw.

2.4 TRAP SEALS

A. Manufacturers:

1. ProVent Systems.
2. Jay R Smith Manufacturing Company.
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Trap Seals:

1. ASSE 1072; elastomeric, normally closed, floor drain evaporation resistant sealing system.
2. Trap seals may be installed in lieu of trap primers with approval of the authority having jurisdiction.
3. Trap seals may not be used in kitchens or other areas subject to wax or grease.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install all plumbing specialties in a readily accessible location. Install access doors where required.

C. Floor drains and floor sinks are shown approximate. Confirm all locations with furnishings of other trades prior to rough-in, and set final elevation to accommodate sloping floors.

D. Coordinate drain locations with areas and fixtures served. Do no locate under sink, table, or partition legs. Strainers shall be easily accessible for removal and cleaning.

E. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding of drainage system. Encase exterior cleanouts in concrete flush with grade. Size to be 24-in by 24-in by 6-in thick minimum.

F. Protect drains and other specialties during construction to avoid clogging with dirt or debris, and to prevent damage from traffic or other construction work. Plug all open ends of incomplete piping at the end of each day's work.

G. In lieu of trap primer valves and with permission of the authority having jurisdiction, install listed and approved trap primer seals at each floor drain and floor sink. Do not install in kitchens or where waxed floor surfaces will be installed.

H. Where not indicated by architectural drawings:

1. Set floor drains for individual restrooms, custodial closets, and other small areas depressed into slabs 1/4-inch.
2. Set floor drains for gang restrooms and other larger areas depressed into slabs 1/2-inch.
3. Set floor sinks such that the grate is flush with the floor level and accessible.
4. Install drains with the slab installation.

END OF SECTION

SECTION 22 4200 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Mop basins.

F. Drinking fountains.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: For each type of product:

1. Include selected fixture and trim, fittings, accessories, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

    a. Each fixture and all related accessory trim shall be submitted grouped together and clearly identified to correspond with the individually scheduled mark.

    b. Submittals with cut sheets referencing multiple fixtures and/or not grouped according to the scheduled mark will be returned without review.

    c. Color to be manufacturer's standard commercial bright white unless noted otherwise.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fixtures, faucets, flush valves, and electronic sensors to include in operation and maintenance manuals. Include fixture trim exploded view and replacement parts lists.

B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each source through one source from a single manufacturer, unless specifically indicated otherwise.

B. Products Requiring Electrical Connection: Listed and labeled as defined in NFPA 70, by Underwriters Laboratories, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ANSI A117 and Americans with Disabilities Act regarding plumbing fixture for people with disabilities.

D. NSF Standard: Comply with NSF 372 - Drinking Water System Components - Lead Content, for faucet materials that will be in contact with potable water.

1.7 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.

C. All fixtures shall be protected from damage to the date of final acceptance ot the project. Any fixture or component found defective or damaged shall be replaced, not repaired.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All plumbing fixtures and trim shall be of one make, except where noted otherwise. All trim shall consist of chrome-plated brass, including faucet spouts and handles unless otherwise specified.

B. All plumbing fixtures shall be set level and plumb, spaced in accordance with the architectural drawings, and securely installed so as to be absolutely rigid. Provide sealant at all mounting surfaces.

C. All hot and cold water connections shall be provided with chrome plated annealed supplies and angle stops. All wall penetrations shall be finished with chrome-plated escutcheons for complete coverage.

D. All wall mounted fixtures shall be installed with floor mounted, concealed arm type carrier supports, for the wall depths shown on the architectural drawings.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, provide basis of design products indicated on the drawings or comparable products by one of the following:

B. Vitreous China Fixtures:

1. American Standard.

2. Kohler Company.

C. Flush Valves:

1. Sloan Valve Company.

D. Stainless Steel Fixtures:

1. Elkay Manufacturing Company.

2. Just Manufacturing.

E. Lavatory and Sink Faucets:

1. Delta Faucet Company.

F. Water Coolers:

1. Elkay Manufacturing Company.

G. Mop Service Basins:

1. Fiat Products: www.fiatproducts.com.

H. Substitutions: See Section 20 0500 for substitution procedures.

2.3 WATER CLOSETS

A. Water Closets: ASME A112.19.2; vitreous china, floor-mounted or wall-hung with elongated rim.

1. Flush Volume: 1.6 gallon, maximum.

2. Flush Style: Siphon jet flush action.

3. Flush Valve: Exposed (top spud).

4. Flush Operation: Sensor operated.

5. Supply Size: 1-inch.

6. Outlet Size: 3-inch.

B. Flush Valves: ASSE 1037, diaphragm type, with integral check stops and backflow device.

1. Sensor Type: Solenoid operator, battery powered, infrared sensor and over-ride push button.

2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.

C. Seats: Solid plastic, elongated rim, open front, extended back, self-sustaining hinge, brass bolts, without cover, white in color.

D. Carriers: ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers. Do not use back-to-back carriers unless indicated otherwise.

2.4 URINALS

A. Urinals: ASME A112.19.2; vitreous china, wall hung with side shields and integral trap.
   1. Flush Volume: 1.0 gallon, maximum.
   2. Flush Style: Washout flush action.
   3. Flush Valve: Exposed (top spud).
   4. Flush Operation: Sensor operated.
   5. Supply Size: 3/4-inch.
   6. Outlet Size: 2-inch.

B. Flush Valves: ASSE 1037, diaphragm type, with integral check stops and backflow device.
   1. Sensor Type: Solenoid operator, battery powered, infrared sensor and over-ride push button.
   2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.

C. Carriers: ASME A112.6.1M; Type I urinal carrier, cast iron and steel frame, with fixture support plates and coupling with seal for wall-mounting urinal-type fixture. Include steel uprights with feet.

2.5 LAVATORIES

A. Wall-Mounted: ASME A112.19.2; vitreous china, rectangular basin with splash lip, ledge back, front overflow, and soap depression.

B. Counter-Mounted: ASME A112.19.2; vitreous china, self-rimming, oval or round basin with front overflow and soap depressions.

C. Supply Faucet: ASME A112.18.1; brass body, chrome plated supply fitting with indexed handles, open grid strainer, and water economy aerator with maximum flow of 2.2-gal per minute.

D. Accessories:
   1. Chrome-plated 17-gauge brass p-trap and arm with escutcheon.
   2. Offset waste with perforated open strainer.
   3. Screwdriver or loose-key quarter-turn stops.
   4. ASSE 1070 solid brass temperature limiting valves.
   5. Chrome-plated rigid or flexible supplies with escutcheons.
   6. ADA compliant protective pipe covers where indicated.

E. Carriers: ASME A112.6.1M; type II lavatory carrier, cast iron and steel frame, with concealed arms and tie rod for wall-mounting lavatory-type fixture. Include rectangular steel uprights for accessible fixtures.

2.6 SINKS

A. Counter-Mounted: ASME A112.19.3; 18-gauge, Type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.

B. Supply Faucet: ASME A112.18.1; brass body, chrome plated supply fitting with indexed handles, open grid strainer, and water economy aerator with maximum flow of 2.2-gal per minute.

C. Accessories:

1. Chrome plated 17-gauge brass p-trap and arm with escutcheon.
2. Basket strainer or offset waste with perforated open strainer.
3. Screwdriver or loose-key quarter-turn stops.
4. ASSE 1070 solid brass temperature limiting valves.
5. Chrome-plated rigid or flexible supplies with escutcheons.
6. ADA compliant protective pipe covers where indicated.

2.7 MOP SERVICE BASINS

A. Mop Basin: White molded stone, floor mounted, with one inch wide shoulders, stainless steel strainer.

B. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver check stops with covering caps and adjustable threaded wall flanges.

C. Accessories:

1. Plain end reinforced plastic hose, 1/2-inch diameter, 5-ft length.
2. Hose clamp hanger.
3. Mop hanger.

2.8 DRINKING FOUNTAINS

A. Water Cooler: Electric, mechanically refrigerated; surface handicapped mounted; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push bar controls, touchless bottle filling station, with integral air cooled condenser and stainless steel grille.

1. Capacity: 8-gal per minute of 50-deg F water with inlet at 80-deg F and room temperature of 90-deg F, when tested in accordance with ASHRAE Std 18.
2. Electrical: 115 V, 60 Hertz compressor, 6-foot cord and plug for connection to electric wiring system including grounding connector.
3. Bottle Filling Station: Sanitary, touchless activation with auto 20-sec shut-off timer, 1.1-gal per minute laminar flow, where indicated.

2.9 PROTECTIVE PIPE COVERS

A. Manufactured plastic wraps for covering plumbing fixture hot and cold water supplies and trap and drain piping. Comply with ADA requirements.

1. Single or multi-piece design, non-absorbent, uv-inhibited, anti-microbial surface with white finish and tamper-resistant fastening system.
2. Tested in compliance with ASTM E84, with a 25 flame spread index and 450 smoke developed index.

2.10 FITTINGS FOR PLUMBING FIXTURES

A. Refer to plumbing fixtures schedules on the drawings for specific accessories and fittings. Other miscellaneous fittings include:

1. Supply Stops: Chrome-plated brass, angle or straight, quarter-turn ball-type or compression valve, same size as indicated supply.
2. Supply Piping: Chrome-plated-brass pipe, or chrome-plated copper tube, or braided stainless steel flexible connectors matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
3. Traps: Tubular brass with 17-gauge wall thickness, slip-joint inlet, wall-flange, escutcheons, and size as indicated on the drawings. Use chrome-plated tube for exposed applications.
4. Continuous Waste: Tubular brass, minimum 17-gauge wall thickness, with slip joint inlet. Use chrome-plated tube for exposed applications. Size to match equipment.
5. Indirect Waste: PVC or copper, size to match fixture.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and casework for suitable conditions where fixtures are to be installed.

B. Examine rough-in for sanitary drainage and vent piping systems and supports to verify actual sizes and locations and types of supports, before fixture installation.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks before rough-in and installation.

D. Where applicable, verify that electric power is available and of the correct characteristics.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated on the drawings.

3.3 INSTALLATION

A. Install fixtures level and plumb. Assemble fixtures, trim, fittings, and other components according to manufacturer's written instructions and rough-in drawings.

B. Install accessible, wall-mounted fixtures at mounting height for handicapped/elderly in accordance with ANSI A117.1.

C. Install lever-operated water closets and flush valves for accessible water closets with handle mounted on open side of water closet.

D. Attach supply piping to supports or substrate within pipe spaces behind fixtures so as to be rigid and not subject to push or pull movement.

E. Install supports, affixed to building substrate, for wall-mounted fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

F. Install counter mounted fixtures in and attached to casework.

G. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.

H. Install trap and waste piping on drain outlet of fixtures that are indicated to be directly connected to drainage system.

I. Install indirect waste piping on drain outlet of fixtures that are indicated to be indirectly connected to drainage system.

J. Install escutcheons at piping penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern if required to conceal protruding fittings.

K. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

L. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks.

M. Install waste disposer in outlet of sinks indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

N. Double-nut fixture studs at the face plates on all wall-mounted water closet carrier supports.

3.4 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings and controls.

B. Adjust temperature limiting devices to the Owner’s preference. Adjust any rotational limit stops on shower valves to a safe temperature.

C. Operate and adjust disposers and controls. Replace damaged and malfunctioning units.

D. Adjust water pressure for intended water flow rate to fixtures without splashing, noise, or overflow.

E. Replace washers and seals of leaking and dripping faucets and stops.

F. Install new batteries in sensor-operated equipment at the time of close-out.

3.5 CLEANING

A. Clean fixtures, faucets, and fittings with manufacturer's recommended cleaning methods and materials.

B. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.

C. Remove sediment and debris from traps and drains.

3.6 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by the Owner.

C. Repair or replace damaged products prior to the date of substantial completion.

3.7 SCHEDULES

A. Fixtures and Faucets: See fixture schedules on the drawings for Basis of Design.

B. Fixture Heights: Install fixtures to heights above finished floor as indicated on the architectural drawings.

END OF SECTION

DIVISION

23

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 0710 - HVAC DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air duct insulation.

B. Duct liner.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Qualifications Statement: Submit name and qualifications of insulation applicator and name of supervisor for approval within 30-days after award of Contract.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified in this section, having a mnimum of 5-years experience and approval of the manufacturer.

B. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

C. Source Limitations: Obtain insulation of each type through one source from a single manufacturer.

1.6 STORAGE AND HANDLING

A. Accept materials on site in original factory packaging, labelled 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.

1.7 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.

PART 2 PRODUCTS

2.1 FLEXIBLE GLASS FIBER INSULATION

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. CertainTeed Corporation: certainteed.com.
2. Johns Manville Corporation: jm.com.
3. Knauf Insulation: knaufusa.com.
4. Owens Corning Corporation: ocbuildingspec.com.
5. Substitutions: See Section 20 0500 for substitution procedures.

B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 250 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96.
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.

2.2 RIGID GLASS FIBER DUCT LINER

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. CertainTeed Corporation: certainteed.com.
2. Johns Manville Corporation: jm.com.
3. Knauf Insulation: knaufusa.com.

4. Owens Corning Corporation: ocbuildingspec.com.
5. Substitutions: See Section 20 0500 for substitution procedures.

B. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; rigid board and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
1. Fungi Resistance: ASTM G21.
2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
3. Service Temperature: Up to 250 degrees F.
4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
5. Minimum Noise Reduction Coefficients:
a. 1 inch Thickness: 0.45.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, welded with integral head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulate all concealed supply air ducts where not lined. Liner will be installed within all ducts down stream of the fan coils and in the return air duct. Do not wrap exposed supply air ducts.

D. Insulated ducts conveying air above or 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, dampers, flexible connections, and expansion joints.

3.3 SCHEDULES

A. Outside Air Ducts:
1. Rigid Glass Fiber Duct Insulation: 2 inches thick.

B. Plenums:

1. Rigid Glass Fiber Duct Liner Insulation: 1 inches thick.

C. Supply Air Ducts:

1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

D. Supply Ducts After TFan Coils:

1. Flexible Glass Fiber Duct Insulation: 1 inches thick.

E. Return Air Ducts:

1. Flexible Glass Fiber Duct Insulation: 1 inches thick.

F. Exhaust Air Ducts:

1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

END OF SECTION

SECTION 23 0720 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Qualifications Statement: Submit name and qualifications of insulation applicator and name of supervisor for approval within 30-days after award of Contract.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified in this section, having a mnimum of 5-years experience and approval of the manufacturer.

B. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

C. Source Limitations: Obtain insulation of each type through one source from a single manufacturer.

1.6 STORAGE AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 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.

PART 2 PRODUCTS

2.1 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

1. Armacell: armacell.us.
2. Substitutions: See Section 20 0500 for substitution procedures.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 3; use molded tubular material wherever possible. AP Armaflex or approved equal.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

C. Adhesive: Manufacturer's recommended adhesive, compatible with insulation; AP Armaflex 520.

D. Finish: Manufacturer's recommended finish, compatible with insulation; AP Armaflex WB.

E. Fittings: Suppy mfgr's preformed flexible elastomeric fittings; no field fabricated fittings.

2.2 JACKETS

A. PVC or ABS Plastic.

1. 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 E96/E96M.
   d. Thickness: 10 mil.
   e. Connections: Pressure sensitive color matching vinyl tape.

B. Aluminum Jacket: ASTM B209 formed aluminum sheet.

1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with NAIMA National Insulation Standards and manufacturer's instructions.

B. 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.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with PVC fitting covers.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, etc.

D. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without 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.

E. Insulated pipes conveying fluids above ambient temperature and less than 140-deg F: Do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. Insulated pipes conveying fluids above ambient temperature and greater than 140-deg F: Insulate entire system including fittings, valves, unions, flanges, strainers, etc..

G. Inserts and Shields:

1. Shields: Piping 1/2-inch diameter or larger. Galvanized steel between pipe hangers and insulation. Tape all shields in place with pressure sensitive color matching vinyl tape.

2. Insert Application: Piping 2-inch diameter or larger when supported with hangers, 1/2-inch diameter or larger when strut mounted.

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 suitable for the planned temperature range.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at clamps, protrusions, and other interruptions. At fire separations, refer to Division 7.

I. Where piping is exposed, locate insulation and cover seams in the least visible locations. Cover all insulation with protective PVC or aluminum covers within 8-ft of the floor (or as noted).

J. On renovation projects, install all missing insulation or replace all damaged insulation in the area of the work, regardless of fault or pre-condition. Pre-bid inspection is the contractor's responsibility.

3.3 SCHEDULE

A. Refrigerant Suction and Liquid Piping:

1. Flexible Elastomeric Cellular Insulation:

a. All pipe sizes: 0.75-inch thick.

END OF SECTION

SECTION 23 2310 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Refrigerant piping and fittings.

B. Refrigerant piping specialties.

C. Refrigerant.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Include data on pipe and fittings, joining materials, assembly of specialties, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record exact locations of piping and refrigeration accessories on record drawings.

B. Field Quality Control Reports: Prepare testing and inspection reports documenting all testing procedures and outcomes.

C. Operation and Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.6 QUALITY ASSURANCE

A. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 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.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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.

2.2 REFRIGERANT PIPING

A. Copper Tube: ASTM B280, Type ACR or ASTM B88, Type K or L.

1. Fittings: Wrought copper, brazed joint: ASME B16.50.
2. Solder Filler: ASTM B32 95-5 tin-antimony or alloy HB solder.

B. Copper Tube: ASTM B88, ACR Type K, annealed 7/8-inch diameter and smaller.

C. Pressure-Seal-Joint Fittings:

1. UL 207 copper housing certified for field installation.
2. O-Rings: HNBR or compatible with specific refrigerant.
3. Tools: Manufacturer's approved special tools.
4. Minimum Rated Pressure: 700 psig.

D. Pipe Supports and Anchors:

1. Provide hangers and supports that comply with MSS SP-58. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
3. Trapeze Hangers: Steel channels with welded spacers and hanger rods.
4. Wall Supports: Slotted channel framing with insulated strut clamps.
5. Hanger Rods: Mild steel threaded both ends or continuous threaded.
6. Vertical Support: Steel riser clamp.

2.3 PIPING SPECIALTIES

A. Expansion Valves:

1. For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system. Size valves to provide full rated capacity of cooling coil served. Coordinate valve selection with evaporator and condenser units.

B. Filter/Dryer:

1. On liquid lines 3/4 inch and larger, filter/dryer shall be replaceable core type with non-ferrous casing and schrader type valve. On lines smaller than 3/4 inch, filter/dryer shall be a sealed type using sweat copper fittings. Size shall be full line size.

C. Sight Glass:

1. Combination moisture and liquid indicator with cap. Sight glass shall be line size, of solid copper or brass. Coated steel is not allowed.

D. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends.

E. Solenoid Valves

1. AHRI 760 plated steel body with stainless steel tube, plunger, closing spring, and seat orifice. Molded, water-tight electrical coil of apropriate voltage, in NEMA 250 enclosure.

F. Flexible Connections:

1. Connectors shall be for refrigerant service with bronze seamless corrugated hose and bronze braiding.

2.4 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

B. All refrigerant piping specialties shall be designed for use with and have materials compatible with R-410a refrigerant as required. Pressure rating for all accessories shall be 500 psi minimum.

2.5 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.6 VALVES

A. 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.

B. Ball Valves:

C. 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.

2.7 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.

B. Straight Line, Non-Cleanable Type:

2.8 CHECK VALVES

A. Manufacturers:

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 425 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 200 degrees F.

2.9 SOLENOID VALVES

A. Valve: AHRI 760, pilot operated, copper or brass 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.

B. Coil Assembly: UL 429, 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.

2.10 EXPANSION VALVES

A. 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 non-replaceable capillary tube and remote sensing bulb.

B. 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.

2.11 FLEXIBLE CONNECTORS

A. 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

3.1 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.

3.2 INSTALLATION

A. Conform to ASME B31.9 for installation of piping system.

B. Install refrigeration specialties in accordance with manufacturer's instructions.

C. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and avoid interference with use of space.

E. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. 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.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 3100.

J. Flood piping system with nitrogen when brazing.

K. Insulate piping and equipment; refer to Section and Section 23 0716.

L. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

M. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

N. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

O. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

P. Provide service valves on each liquid and suction line connection where valves are not supplied as integral to the equipment.

Q. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

R. Fully charge completed system with refrigerant after testing.

S. Where pipe run lengths exceed 50 feet or the evaporator is located more than 8 feet above the condenser, provide piping systems with liquid line solenoid valves, inverted traps at coil connections, and additional refrigerant oil in accordance with the manufacturer's instructions.

T. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

U. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

V. 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 and at equipment. Do not support piping from equipment.
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.

3.3 FIELD QUALITY CONTROL

A. Test refrigeration systems in accordance with ASME B31.5.

B. Test refrigerant piping, specialties, and receivers. Isolate components not suitable for the test pressures.

C. Test refrigerant piping using dry oil-free nitrogen and prove tight at the pressures listed below. Maintain test for 12-hours with no leakage or reduction in gauge pressure.

D. Line test pressure for refrigerant R-410-A:

1. Suction lines for air conditioning applications: 300 psig.
2. Suction lines for heat-pump applications: 535 psig.
3. Hot-gas and liquid lines: 535 psig.

E. Request witness by a member of the design team or the general contractor. Prepare testing and inspection reports and submit documentation of all testing procedures and outcomes.

F. Evacuation: Reduce absolute pressure on both sides of the system simultaneously to 300 microns; then charge the system with proper refrigerant until 0-psi is obtained. Repeat the evacuation-charging procedure two more cycles, then maintain 300 microns for 2-hours before final charging with refrigerant.

G. Request witness by a member of the design team and submit a report documenting all testing procedures and outcomes, inlduding dates and times.

3.4 SYSTEM CHARGING

A. Pull a system vacuum down to at least 1000 microns (+/- 50 microns) and close the vacuum header valves.

B. If the 1000 micron vacuum holds for 30-min, break the vacuum with dry nitrogen to a pressure of 2 psig. Install core in filter dryers after leak test but before evacuation.

C. Install system suction and liquid drier cores, and pull a second vacuum to a minimum of 500 microns and close the vacuum header valves.

D. If the 500 micron vacuum holds for 30-min, then break the vacuum with the refrigerant to be used in the system to a pressure of 2 psig.

E. Pull a third vacuum to a mnimum of 300 microns. Close the vacuum header valves and allow system to stand for a minimum of 24-hrs.

F. If the 300 micron vacuum holds for 24-hrs with a maximum drift of 100 microns over the 24-hr period, then the system is ready to be charged with refrigerant.

G. Break the vacuum with the refrigerant to be used in the system and charge the system with refrigerant. Add oil to the compressors, oil separator, and oil reservoirs, if equipped.

H. Request witness by a member of the design team and submit a report documenting all testing procedures and outcomes, including dates and times.

3.5 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high and low pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.
2. Open compressor suction and discharge valves.

3. Open refrigerant valves except bypass valves that are used for other purposes.
4. Check open compressor-motor alignment and verify lubrication for motors and bearings.

D. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

3.6 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.

END OF SECTION

SECTION 23 3110 - HVAC METAL DUCTWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rectangular ducts and fittings.

B. Round ducts and fittings.

C. Sheet metal materials.

D. Internal duct liner.

E. Sealants and gaskets.

F. Hangers and supports.

G. Duct leakage testing.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Flexible duct.

C. Delegated Design:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of ducts and duct fittings.

1.7 QUALITY ASSURANCE

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA (DCS) and performance and design criteria indicated in this section.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA (DCS) and ASCE/SEI 7.

C. Duct Leakage Tests: Comply with SMACNA HVAC Air Duct Leakage Test Manual. Test 100% of all ducts with a pressure class of greater than 3-inch water gauge.

1.8 STORAGE AND HANDLING

A. Inspect shipments to insure ductwork is undamaged and complies with the specification.

B. Protect from moisture, dirt, dust, construction debris, and foreign materials. Where end caps or packaging is provided, take precaution so protection remains in place and free from damage.

C. Ductwork shall be kept sealed and cleaned prior to and after installation. All ductwork not kept clean, in the opinion of the design team, will be replaced at no additional cost to the project.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All ductwork shall be constructed to be free from vibration, chatter, objectionable noise or pulsations, and leakage under specified operation conditions.

B. Use material, weight, thickness, construction, support, and installation methods as outlined in the above listed SMACNA publications.

C. Duct pressure classification and sealing requirements shall be as specified herein. Where not indicated, follow requirements in SMACNA publications.

D. Duct sizes indicated on the drawings are net inside dimensions. Where sizes are not indicated, the duct segment size shall be equal to the largest duct segment to which it is attached.

E. Pressure Class Requirements:

1. Variable Volume: Unless otherwise indicated, the pressure class for variable volume system ductwork upstream of the air terminal units shall be equal to the static pressure at the fan discharge, but not less than 4-inches water gauge.
2. Constant Volume: Unless otherwise indicated, the pressure class for constant volume system ductwork shall be equal to the static pressure at the fan discharge, but not less than 2-inches water gauge.
3. The minimum allowable pressure class for all other ductwork, positive or negative, is 2-inches water gauge.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA (DCS) for materials involved, duct-support intervals, and other provisions, based on indicated static-pressure class, and sealing requirements stated herein.

B. Longitudinal Seams: Select seam types and fabricate according to SMACNA (DCS), Figure 2-2, "Rectangular Duct/Longitudinal Seams."

1. Longitudinal seams shall be flat crimped Pittsburgh lock (SMACNA Type L1) with specified sealant applied over seams.

C. Transverse Joints: Select joint types and fabricate according to SMACNA (DCS), Figure 2-1, "Rectangular Duct/Transverse Joints."

1. Transverse joints in ducts 24-inches and under on the longest side may be slip and drive type or flanged.
2. Transverse joints in ducts exposed to view and concealed ducts larger than 24-inches shall be flanged.

D. Branch Connections: Comply with SMACNA (DCS), Figure 4-6, "Branch Connections."

1. Rectangular Main to Rectangular Branch: 45-degree entry.
2. Rectangular Main to Round Branch: Conical spin-in or high-performance type.

E. Elbows: Comply with SMACNA (DCS), Figure 4-2, "Rectangular Elbows."

1. Use radius throat, radius heel elbows (SMACNA Type RE 1) with a minimum centerline radius to width ratio of one and one half times.
2. Where 1.5 radius elbows will not fit, use short radius elbows (SMACNA Type RE 3) with a minimum centerline radius to width ratio of one times and two radius proportional splitter vanes installed within.
3. Where radius elbows will not fit or where shown on the drawings, use rectangular mitered elbows (SMACNA Type RE 2) with vanes complying with SMACNA (DCS), Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

F. Transitions, Offsets, and Other Duct Construction: Select types and fabricate according to SMACNA (DCS), Chapter 4, "Fittings and Other Construction."

2.3 SINGLE-WALL ROUND DUCT AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA (DCS), Chapter 3, "Round, Oval, and Flexible Duct," for materials involved, duct-support intervals, and other provisions, based on indicated static-pressure class, and sealing requirements stated herein.

B. Longitudinal Seams: Select seam types and fabricate according to SMACNA (DCS), Figure 3-2, "Round Duct Longitudinal Seams."

1. All exposed round duct shall be spiral lock-seam (SMACNA Type RL1) with gored elbows. No snap-lock or longitudinal seams are permitted.

C. Transverse Joints: Select joint types and fabricate according to SMACNA (DCS), Figure 3-1, "Round Duct Transverse Joints,"

1. Use beaded sleeve joints (SMACNA Type RT1) with minimum 2-inch insertion length, or flanged joints (SMACNA Type RT2 or RT2A).

2. Transverse joints in concealed ducts 24-inches and larger in diameter and exposed ducts 12-inches and larger in diameter shall be flanged.

D. Tees and Laterals: Select types and fabricate according to SMACNA (DCS), Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees."

1. Use 45-degree lateral or combination taps. Where velocities are less than 1000 feet per minute, conical tees may also be used.

2. Saddle taps are permitted in existing ducts only.

E. Elbows: Comply with SMACNA (DCS), Figure 3-4, "Round Duct Elbows."

1. Use radius elbows with a minimum centerline radius to diameter ratio of one and one half times. Where 1.5 radius elbows will not fit and velocity is 1200 feet per minute or lower, use 1.0 radius elbows.

2. Round elbows shall be welded, segmented type. Elbows 10-inches and smaller may be stamped. Adjustable elbows are not permitted, unless approved in writing by the engineer, and then only with the gores fixed and thoroughly sealed.

2.4 SHEET METAL MATERIALS

A. General Requirements: Comply with SMACNA (DCS) for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653.

1. Galvanized Coating Designation: G90.

2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A1008, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480, Type 304 or 316; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated.

E. Reinforcement Shapes and Plates: ASTM A36, steel plates, shapes, and bars; black and galvanized.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. CertainTeed Corporation: certainteed.com.
2. Johns Manville Corporation: jm.com.
3. Knauf Insulation: knaufusa.com.
4. Owens Corning Corporation: ocbuildingspec.com.
5. Substitutions: See Section 20 0050 for substitution procedures.

B. Fibrous-Glass Duct Liner: Comply with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

C. Maximum Thermal Conductivity:

1. Type I, Flexible: 0.27 at 75 deg F mean temperature.
2. Type II, Rigid: 0.23 at 75 deg F mean temperature.

D. Water Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.

E. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating.

F. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

G. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

2.6 SEALANT AND GASKETS

A. General Requirements: Surface-burning characteristics for sealants and gaskets shall have a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723.

B. Joint and Seam Sealant: Water-based, indoor or outdoor service, water resistant, mold and mildew resistant, maximum 75 g/L VOC content, compatible with galvanized sheet steel, stainless steel, or aluminum sheets.

C. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.7 HANGERS AND SUPPORTS

A. Strap and Rod Sizes: Comply with SMACNA (DCS), Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

B. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Galvanized-steel shapes and plates for galvanized steel ducts.

G. Channel Support System: Shop or field fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end.

H. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans indicate general location and arrangement of duct systems. Install duct systems as closely as possible to that indicated unless deviations to layout are approved in writing.

B. All air distribution ductwork shall be fabricated, erected, and supported, in accordance with applicable standards of SMACNA, where such standards do not conflict with NFPA 90A, and where class of construction equals or exceeds that noted herein.

C. Duct systems have been designed for metal ducts. Fibrous glass duct (duct board) may not be substituted for metal duct.

D. Install ducts with the fewest possible joints. Install round and flat-oval ducts in maximum practical lengths.

E. Limit transition angles to 15-degrees diverging and 30-degrees converging (each side).

F. Install ducts vertically and horizontally, parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1-inch, plus allowance for flanges and insulation thickness.

I. Route ducts to avoid passing through electrical equipment rooms and enclosures.

J. Install sheet metal flashing collars where ducts are exposed to view (including mechanical rooms) and where ducts pass thru walls, floors, or ceilings.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements for fire and smoke damper ratings.

L. All ductwork, including low pressure ductwork, shall be sealed to SMACNA Seal Class A with all joints, seams, and penetrations sealed, unless otherwise indicated.

M. Do not install duct sealants when temperatures are less than recommended by sealant manufacturers. Maintain temperatures during and after installation of duct sealant.

N. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

O. Install liner within ducts where indicated, noted, or detailed. Rectangular supply air ducts exposed above partial "cloud" ceilings shall be lined instead of insulated.

P. Provide an appropriately sized wood frame “window-buck” to the mason for each masonry penetration with location dimensions permanently indicated.

Q. Install all automatic control dampers and other devices furnished by the BAS contractor. See the BAS specifications for installation requirements.

3.2 FLEXIBLE CONNECTIONS

A. Connections to inlet and discharge openings of fans shall be made with a section of at least 1/16-inch thick neoprene coated fiberglass fabric. Flex connections shall not be less than 3-inches long and shall have at least 1-inch of slack.

B. Connections shall have angle frames at each end for rectangular ducts, and metal tension bands at each end for round ducts.

C. Connections shall be installed on straight duct sections, not transitional fittings, and allow for easy replacement.

D. Connections to units that have internally isolated fans within the unit housing will not require flex connections, unless otherwise indicated.

3.3 APPLICATION OF DUCT LINER

A. Comply with SMACNA (DCS), Chapter 7, "Flexible Duct Liner Installation."

B. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area.

C. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

D. Butt transverse joints without gaps, and coat joint with adhesive.

E. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

F. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.

G. Secure liner with mechanical fasteners 4-inches from corners and at intervals not exceeding 12-inches transversely; at 3-inches from transverse joints and at intervals not exceeding 18-inches longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "z-profiles" or are integrally formed from the duct wall. Fabricate edge facings at fan discharges, and intervals of lined duct preceding unlined duct.

I. Terminate inner ducts with build-outs attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated build-outs (metal hat sections) or other build-out means are optional; when used, secure build-outs to duct walls with bolts, screws, rivets, or welds.

3.4 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Utilize flange connection systems with corner clips or optional nuts and bolts. Install in strict accordance with manufacturer's instructions.

C. Trim duct gaskets and sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

D. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter.

E. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

F. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.5 WATER-TIGHT DUCTWORK

A. Where water or snow may accumulate in ductwork and plenums, ducts shall be made water-tight by soldering, brazing, or welding of joints and seams.

B. Install ductwork sloped down toward drain points at louvers. Work with the general contractor to install flashing for a permanent water-tight seal.

C. Install duct drains and piping where indicated. Route drain piping at right angles around the perimeter of the room to a floor drain. Do not run piping across walkways or access.

D. Applies to dishwasher hood exhaust ductwork and air intake plenums.

3.6 KITCHEN HOOD EXHAUST DUCT INSTALLATION

A. Install commercial kitchen hood exhaust duct and access doors in accordance with NFPA 96. Install ducts with rated insulation or within rated enclosures with minimum clearance to combustibles.

B. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and slope a minimum of 2-percent to drain grease back to the hood.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

D. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 10 feet in horizontal ducts, and at every floor level for vertical ducts, not less than 2-inches from bottom of duct.

E. Construct access doors of the same material and thickness as the duct and as large as possible. Locate for ease of inspection and cleaning not less than 2-inches from bottom of duct.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA (DCS), Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA (DCS), Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24-inches of each elbow and within 48-inches of each branch intersection.

D. All supports shall be from joists, beams, or other structural members. Do not support from roof decking. Install channel framing to span bar joists.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, screws, or blind rivets; support at each floor and at maximum intervals of 16 feet.

F. Install upper attachments to structure. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

G. Straps may be used to support rectangular ducts 60-inches wide or smaller. Use trapeze hangers with rods and angles or channel to support rectangular duct larger than 60-inches wide.

H. Where hangers are exposed to view, use angle or channel supports with threaded rod.

I. Use double nuts and lock washers on threaded rod supports.

3.8 DUCT LEAKAGE TESTING

A. Testing equipment, procedure and reports shall be in accordance with the latest edition of the SMACNA HVAC Air Duct Leakage Manual.

1. Equipment shall include, but not be limited to, a blower with volume control, manometer, and orifice meter with pressure differential manometer.
2. Ductwork shall be tested in partial segments as work progresses before concealment and application of external insulation.
3. Manometer readings shall be converted to cubic feet per minute from a calibrated test curve.

B. The following ducts shall be tested:

1. Supply air ducts with a pressure classification of greater than 3-inches water gauge shall be tested with a leakage classification as scheduled herein.
2. Test duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.

C. Design pressure for testing ductwork shall be determined from the maximum pressure generated at the fan discharge at the nominal motor horsepower installed or the stated pressure class, whichever is greater.

D. Leaks identified during inspection or testing shall be repaired.

1. All leaks shall be found audibly or visually with smoke.
2. All leaks shall be repaired or the joints remade, and testing repeated until acceptable results are achieved.
3. Leaks shall be repaired by complete removal of the sealant materials, thorough cleaning of the joint surfaces, and reinstallation of multiple layers of sealing materials.

E. All low pressure duct systems, positive or negative, shall be inspected for visual and audible signs of leakage.

F. Leaks that cause objectionable noise in the opinion of the Owner or engineer, must be repaired regardless of the amount of leakage.

G. The contractor shall notify the design team 7-days in advance of when duct pressure testing is planned so the Owner or engineer has the option to observe the tests.

3.9 DUCT CLEANING

A. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

B. Ductwork shall be kept sealed and cleaned prior to and after installation. All ductwork not kept clean, in the opinion of the architect, will be replaced at no additional cost to the project.

C. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums, scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, condensate drain pans, filters and filter sections, and drains.

3.10 SCHEDULE

A. Primary Supply Air Ducts (upstream of variable volume terminal units):

1. Material: Galvanized sheet steel.
2. Pressure Class: Positive 4-inches water gauge.
3. Seal Class: A, all joints, seams, and penetrations sealed.
4. Leakage Class: 4 rectangular, 2 round.

B. Secondary Supply Air Ducts (downstream of variable volume terminal units):

1. Pressure Class: Positive 2-inches water gauge.
2. Seal Class: A, all joints, seams, and penetrations sealed.

C. Low Pressure Supply Air Ducts (single zone constant and variable volume systems):

1. Pressure Class: Positive 2-inches water gauge.
2. Seal Class: A, all joints, seams, and penetrations sealed.

D. Return Air and Outdoor Air Ducts:

1. Pressure Class: Negative 2-inches water gauge.
2. Seal Class: A, all joints, seams, and penetrations sealed.

E. Exhaust Air and Relief Air Ducts:

1. Pressure Class: 2-inches water gauge, positive or negative.
2. Seal Class: A, all joints, seams, and penetrations sealed.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

G. Liner:

1. All Ducts: Fibrous glass, Type I, 1-inch thick, where indicated.

END OF SECTION

SECTION 23 3300 - HVAC DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire dampers.

B. Combination fire and smoke dampers.

C. Backdraft dampers.

D. Duct access doors.

E. Insulated flexible duct.

F. Flexible connections.

G. Branch connections.

H. Volume control dampers.

I. Turning vanes.

J. Equipment support rails.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Record actual locations of access doors and test holes.

B. Operation and Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views, etc.

1.6 QUALITY ASSURANCE

A. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 STORAGE AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

B. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 FIRE DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc: louvers-dampers.com.
2. Nailor Industries Inc: nailor.com.
3. Pottorff: www.pottorff.com
4. Ruskin Company: ruskin.com.
5. Substitutions: See Section 20 0500 for substitution procedures.

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated. Penetrations through barriers with fire resistance ratings of less than 3-hrs shall be protected by 1.5-hr rated dampers. Penetrations through barriers with resistance ratings of 3-hrs or more shall be 3-hr rated dampers.

C. Frame: Hat-shaped channel, rool formed galvanized steel with interlocking gusseted corners. Structurally equivalent to 13 gauge U-channel type frame. Low profile head and sill on sizes less than 13-inches high.

D. Blades: 6-inch maximum width, double skinned true air foil, roll formed galvanized steel. Structurally equivalent to 14 gauge.

E. Jamb Seals: Stainless steel, flexible metal compression type.

F. Axles: Minimum 1/2" diameter plated steel hex-shaped, mechanically attached to blade.

G. Bearings: Self-lubricating stainless steel, sleeve-type turning in extruded hole in frame.

H. Linkage: Concealed in frame.

I. Release Temperature: 165 ºF.

J. Mounting: Vertical and/or Horizontal (1½ hour rated only)

K. Sleeve: Minimum 16-inches long x 20-gauge, factory installed.

2.2 BACKDRAFT DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc: louvers-dampers.com.
2. Nailor Industries Inc: nailor.com.
3. Ruskin Company: ruskin.com.
4. Substitutions: See Section 20 0500 for substitution procedures.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc: louvers-dampers.com.
2. Ruskin Company: ruskin.com.
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

C. Provide factory sleeve and collar for each damper.

D. Multiple Blade Dampers: Fabricate with 16 gage, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

E. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.

F. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.

G. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

A. Manufacturers:
1. Elgen Manufacturing: elgenmfg.com.
2. Nailor Industries Inc: nailor.com.
3. Ruskin Company: ruskin.com.
4. Substitutions: See Section 20 0500 for substitution procedures.

B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.

1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
4. Larger Sizes: Provide an additional hinge.

C. Access doors with sheet metal screw fasteners are not acceptable.

2.5 INSULATED FLEXIBLE DUCT

A. Manufacturers:
1. Hart and Cooley: hartandcooley.com
2. Thermaflex: thermaflex.net
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Fabrication: UL 181, Class 1, two-ply vinyl or black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.

2.6 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:
1. Carlisle HVAC Products: carlislehvac.com.
2. Elgen Manufacturing: elgenmfg.com.
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Fabrication: In accordance with SMACNA (DCS) and as indicated.

C. 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, approximately 2 inches wide.
2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

2.7 BRANCH CONNECTIONS

A. Manufacturers:
1. Hercules Industries: herculesindustries.com.
2. Substitutions: See Section 20 0500 for substitution procedures.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Rectangular sheet metal branch duct take-offs shall be fabricated with 45 degree entry fittings in accordance with SMACNA standards. Branch ducts shall include opposed action type multi-blade dampers where indicated on the drawings.

D. Sheet metal take-offs between rectangular and round ductwork shall be with conical bell-mouth type spin-ins, where duct sizes permit. Each fitting shall have a single blade quadrant locking damper as an integral part of the fitting. Fittings shall be Hercules bell-mouth spin-in, Hercules high efficiency take-off, or equivalent.

2.8 VOLUME DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. Hercules Industries: herculesindustries.com.
2. Substitutions: See Section 20 0500 for substitution procedures.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. 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.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

F. Quadrants: Provide locking, indicating quadrant regulators on single and multi-blade dampers. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

G. Where volume dampers are inaccessbile due to hard ceilings or other reasons, provide cable operated dampers with ceiling brackets and cover plates.

2.9 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. Ductmate Industries: ductmate.com.
2. Durodyne: durodyne.com.
3. Substitutions: See Section 20 0500 for substitution procedures.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.10 EQUIPMENT SUPPORT RAILS

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the work include, but are not limited to the following:

1. Roof Products and Systems: commercialproductsgroup.com
2. Substitutions: See Section 20 0500 for substitution procedures.

B. Equipment rails shall be fabricated of 18 gauge galvanized steel with built-in cant, monolithic construction with integral base plate and continuous mitered and welded corner seams, with factory installed wood 2x4 nailer.

C. Each equipment rail shall include a matching 18 gauge galvanized steel counter-flashing cap with integral drip edge, all corners mitered and welded, with screws for attachment.

D. Equipment rails over 3 feet long shall incorporate 14 gauge internal gussett reinforcing. Rail height to provide 6" clearance above the final roof surface, with a vertical step at the bottom (contractor verified) for insulation thickness.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to the Ductwork section for duct construction and pressure class.

C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke 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.

E. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

H. Provide volume dampers to all ducted air devices, whether indicated or not. Mount at the branch take-off where noise will not be detectable at the device. Provide cable operated dampers where duct branches are inaccessible for adjustment.

I. Provide volume 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.

3.2 FLEX DUCT INSTALLATION

A. Install insulated flexible ducts in accordance with SMACNA (DCS).

B. Support with bands 1-1/2" wide and spaced a maximum of 48-inches apart. Maximum centerline sag between supports shall not exceed 1/2-inch per 12-inches.

C. Do not bend flexible ducts across sharp corners, and avoid contact with fixtures, water lines, and conduits.

D. Install fully extended, in a direct line, without sags, twists, or turns. Bends shall not be less than one duct diameter.

E. Connect to diffusers and metal ducts with maximum 60-inch lengths of flexible ducts clamped or strapped in place.

   1. Tape the inner liner to the hard duct or device collar.
   2. Attach two nylon straps; one on the inner liner and one for the outer shell.
   3. Fold the outer shell inside itself before wrapping the hard duct.
   4. Install hard duct elbows at diffusers or "flexflow" radius forming elbows.

END OF SECTION

SECTION 23 3710 - GRILLES REGISTERS AND DIFFUSERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grilles, registers, and diffusers.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.5 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide basis of design products indicated on the drawings or comparable products by one of the following:

1. Krueger: krueger-hvac.com.

2. Metal-Aire: metalindustries.com
3. Price: priceindustries.com.
4. Titus: titus-hvac.com.
5. Substitutions: See Section 20 0500 for substitution procedures.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square and rectangular, multi-louvered diffuser to discharge air in two way and four way pattern .

B. Connections: As scheduled on drawings.

C. Frame: Provide surface mount and inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame.

D. Fabrication: Aluminum with baked enamel finish.

E. Color: As shown on drawings.

2.3 LINEAR SLOT DIFFUSERS

A. Type: Continuous width slot with adjustable vanes for left, right, or vertical discharge. Number of slots and width scheduled on the drawings.

B. Fabrication: Aluminum extrusions with factory clear lacquer finish.

C. Color: As shown on the drawings.

D. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket, mitered end border.

E. Plenum: Integral, galvanized steel, insulated.

F. Damper: Where dampers are inaccessible, provide manufacturer's cable operated dampers with mounting brackets.

2.4 SURFACE SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades to discharge air along face of grille, two-way deflection.

B. Frame: 1 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory enamel finish.

D. Color: As shown on drawings.

E. Damper: Where scheduled, integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.5 EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.

B. Fabrication: Steel and aluminum with 20 gauge minimum frame, or aluminum extrusions, with factory enamel finish.

C. Frame: 1 inch margin with countersunk screw mounting.

D. Color: As shown on the drawings.

E. Damper: Where scheduled, integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.6 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 x 1/2 x 1/2-inch grid core.

B. Fabrication: Grid core consists of aluminum with baked enamel finish.

C. Color: As shown on the drawings

D. Frame: 1-1/4 inch margin with countersunk screw mounting.

E. Frame: Channel lay-in frame for suspended grid ceilings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Install in accordance with manufacturer's instructions. Install level and plumb.

C. Ceiling-Mounted Outlets and Inlets:

1. Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop.

2. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel.

3. Make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

D. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, extractors, and fire dampers.

E. After installation, adjust diffusers, grilles, and registers to air patterns indicated, or as directed, before starting air balancing.

F. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, where dampers are not specified as part of the air device assembly.

G. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 23 7223 - PACKAGED AIR-TO-AIR ENERGY RECOVERY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Energy recovery units.

B. Casing.

C. Fans.

D. Filters.

E. Dampers.

F. Vibration isolation.

G. Power and controls.

H. Accessories.

I. Service accessories.

1.2 SUBMITTALS

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

B. Product Data: Manufacturer's installation instruction, product data, and engineering calculations.

C. Shop Drawings: Show design and assembly of energy recovery unit and installation and connection details.

D. Manufacturer's Qualification Statement.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Firm regularly engaged in manufacturing energy recovery units.
2. Products in satisfactory use in similar service for not less than five years.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store in manufacturer's unopened packaging.

B. Store products to be installed indoors in dry, heated area.

1.5 WARRANTY

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

B. Warranty ventilator to be free from defects in material and workmanship and of all parts for period of 1-1/2 years from date of Substantial Completion.

C. Warranty energy recovery wheel to be free from defects in material and workmanship for 3 years under circumstances of normal use.

D. Warranty motor to be free from defects in material and workmanship for 7 years under circumstances of normal use.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Energy Recovery Ventilators:

B. Basis of Design: RenewAire: www.renewaire.com/#sle.

1. HE Series ERV: Static-plate, heat and humidity transfer energy recovery ventilator.

a. Indoor ERV to condition 1690 cfm of outside air.

2.2 ENERGY RECOVERY UNITS

A. Energy Recovery Units: Provide stationary core air-to-air exchanger; prefabricated packaged system designed by manufacturer.

1. Provide unit with a AHRI 1060 (I-P) compliant air-to-air exchanger.
2. Access: Hinged ccess panels on front.
3. Lifting holes at the unit base.
4. Framing: Welded extruded aluminum tubular frame capable of supporting components and casings.
5. Permanent name plate listing manufacturer mounted inside door near electrical panel.

2.3 CASING

A. Wall, Floor, and Roof Panels:

1. Construction: 1 inch thick, double wall box construction, with formed edges of exterior wall overlapping formed edges of interior wall.
2. Exterior Wall: Galvanized steel sheet.

a. 0.040 inches thick aluminum.

3. Interior Wall: Galvanized sheet metal.

a. 22 gauge, 0.0299 inch galvanized sheet metal.

4. Insulation:

a. 1/2 inch insulated fiberglass.

b. Panel Cores: Mineral wool board.

c. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.

d. Smoke Developed Index (SDI): 50, maximum, when tested in accordance with ASTM E84 or UL 723.

5. Roof Panel: Weatherproof.

6. Seams: Sealed, requiring no caulking at job site.

7. Coating: Polyurethane enamel.

B. Access Panels: Provide access to components through a large, tightly sealed and easily removable panel.

C. Doors:

1. Construct doors of same construction and thickness as wall panels.

2. Height: 80 inches.

3. Hardware:

a. Hinges: Aluminum.

b. Gasket: P-shaped extruded neoprene.

c. Label each door to identify equipment located within.

2.4 FANS

A. Provide separate fans for exhaust and supply blowers.

B. Fans:

C. Housings: 12 gauge, 0.1046 inch aluminized steel with plenums integral to general housing and constructed to Class 1 fan standards.

D. Motors:

1. Motors: Open drip proof.

2. Efficiency: High.

3. Speed: Single.

4. Control: Constant Speed.

5. Fan Motor: UL listed and labeled.

E. Drives:

1. Fans: Belt driven.

2. Horsepower: 7.5 hp.

3. Service Factor: 1.2.

2.5 DAMPERS

A. Exhaust Back-Draft Damper: Factory installed, galvanized steel.

1. High performance, backdraft dampers suitable for application in HVAC systems with velocities to 3000 fpm.
2. Louvers, Dampers, and Shutters: AMCA 500-D and AMCA 500-L.
3. Damper Capacity: Demonstrate damper capacity to withstand HVAC system operating conditions.
4. Fabrication:
    a. Frame: 20 gauge, 0.0359 inch, 3 inch roll formed galvanized steel channel with rear flange, prepunched mounting holes, and welded corner clips for maximum rigidity.
    b. Blades:
        1) Style: Single-piece, overlap frame.
        2) Material: Roll formed 28 gauge, 0.0149-inch galvanized steel.
        3) Width: Maximum 6 inches.

B. Return Air Damper:
1. Factory installed, adjustable volume control, opposed blade damper for regulating airflow, based on external static pressure.
2. Conceal linkage out of air stream, within damper frame to reduce pressure drop and noise and lessen need for maintenance.
3. Return Air Damper: Structural hat channels, reinforced at corners.
4. Roll-formed Frames: Structurally superior to 13 gauge, 0.0897 inch U-channel frames.
5. Blades: Single skin, 16 gauge, 0.0598 inch.

C. Motorized Dampers: Provide motorized dampers at outside air inlet, exhaust air outlet, and supply air outlet.
1. Type: Motorized two position parallel blade damper with blade seals.
2. Motorized Damper: Roll-formed structural hat channels, reinforced at the corners,
3. Blades: Single skin, 16 gauge, 0.0598 inch.

D. Motorized Louvers:
1. Type: Motorized two position parallel blade louver with drainable blades, blade seals, and jamb seals
2. Adjustable louver:
    a. Fabrication: Mullion style.
        1) Frame:
            (a) Material: Extruded aluminum, Alloy 6063-T5.
        2) Blades:
            (a) Style: Horizontal, adjustable, drainable.
            (b) Material: Formed aluminum, Alloy 6063-T5.

2.6 VIBRATION ISOLATION

A. Vibration Isolation: Provide whole unit vibration isolation with the energy recovery unit assembly.

B. Construct with appropriately-sized, seismic-rated, corrosion-resistant captive-spring isolators.

2.7 POWER AND CONTROLS

A. Motor Control Panels: UL listed.

B. Include necessary motor starters, fuses, transformers and overload protection according to NFPA 70.

C. Provide single-point field connection to power supply.

D. Install wiring in accordance with NFPA 70.

2.8 ACCESSORIES

A. Airflow Meter:

1. Include integral airflow meter station or probe for ventilation, supply, or exhaust airflow in cfm as indicated on drawings.
2. Mount monitor gauge parallel to airflow meter on unit exterior and make casing connection watertight.

B. Electric Preheat Coil:

1. Resistance coil type with elements enclosed in a steel sheath with fins and painted with a baked-on aluminum paint for long life in a 100 percent outdoor air stream.
2. Coil: UL listed and constructed in accordance with NFPA 70 requirements.

C. Freeze Protection Thermostat:

1. Equip unit with thermostat such that unit can be stopped when temperature drops to 23 degrees F.

2.9 SERVICE ACCESSORIES

A. Electrical Receptacle:

1. Provide duplex, ground fault interrupter type receptacle.

B. Electrical Components: Factory wired for single point power connection.

1. Isolate electrical box from the airflow.
2. Protect all integral wires and connections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that structure is ready for installation of unit, that openings in deck for ductwork, if required, are correctly sized and located, and that mechanical and electrical utilities supplying unit are of correct capacities and are accessible.

3.2 INSTALLATION

A. Provide openings for suitable ductwork connection.

3.3 SYSTEM STARTUP

A. Provide services of manufacturer's authorized representative to provide start up of unit.

3.4 CLEANING

A. Clean filters, air plenums, interior and exposed-to-view surfaces prior to Substantial Completion.

END OF SECTION

SECTION 23 8110 - TERMINAL HEATING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electric heaters.

1.2 RELATED REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this project, unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this project.

1.4 ACTION SUBMITTALS

A. See Section 20 0500 for submittal requirements. Unless otherwise indicated, submittals shall be arranged according to individual sections and submitted separately.

B. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories for each unit type and configuration.

C. Samples: Color samples for initial selection for equipment with factory applied color finishes.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.

B. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

C. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with the manufacturer.

1.6 QUALITY ASSURANCE

A. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 PRODUCTS

2.1 ELECTRIC RADIANT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide basis of design products indicated on the drawings or comparable products by one of the following:

1. Ouellet Canada: ouellet.com
2. Marley Engineered Products: marleymep.com.
3. TPI Corporation: tpicorp.com
4. Substitutions: See Section 20 0500 for substitution procedures.

B. Assembly: UL listed and labelled, with thermal box and cover, and built-in controls.

C. Heating Elements: Enclosed copper tube element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material, in metal reflective cabinet.

D. Heating Elements: Enclosed solid state element with uniform resistance, with 1 inch fiberglass insulation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Install in accordance with manufacturer's instructions.

C. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

D. Protect finished cabinet units with protective covers during the balance of construction.

E. Electric Unit Heaters: Hang from building structure with hangers anchored to building. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

F. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.

3.2 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

C. Install new filters in all fan-driven units with replaceable filter media.

3.3 SCHEDULES

A. See equipment schedules on the drawings for Basis of Design.

END OF SECTION

SECTION 23 8129 - VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Refrigerant piping.

B. Refrigerant branch units.

C. Indoor units.

1.2 SUBMITTALS

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

B. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:

1. Detailed piping diagrams, with branch balancing devices.
2. Condensate piping routing, size, and pump connections.
3. Detailed power wiring diagrams.
4. Detailed control wiring diagrams.
5. Locations of required access through fixed construction.
6. Drawings required by manufacturer.

C. Operating and Maintenance Data:

1. Manufacturer's complete standard instructions for each unit of equipment and control panel.
2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.
3. Identification of replaceable parts and local source of supply.

D. Warranty: Executed warranty, made out in Owner's name.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.
2. Company that provides system design software to installers.

B. Installer Qualifications: Trained and approved by manufacturer of equipment.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

1.5 WARRANTY

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

B. Compressors: Provide manufacturer's warranty for 6 years from date of installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Daikin: www.daikinac.com/#sle.

2.2 VARIABLE REFRIGERANT FLOW SYSTEM

A. Minimum System Requirements:

1. System Testing, Capacity Rating, and Performance:
    a. AHRI 1230 when cooling capacity is equal or greater than 65,000 Btu/h.
    b. AHRI 210/240 when cooling capacity is below 65,000 Btu/h.
2. Safety Certification: Bear UL 1995 tested and ITS (DIR) listed certification label.
3. Outdoor Units: Furnish installation and surface support hardware products in accordance with ASCE 7 for wind restraint.
4. Cooling Mode Interior Performance:
    a. Daytime Setpoint: 68 degrees F, plus or minus 2 degrees F.
    b. Setpoint Range: 57 degrees F to 77 degrees F.
    c. Night Setback: 78 degrees F.
    d. Interior Relative Humidity: 20 percent, maximum.
5. Heating Mode Interior Performance:
    a. Setpoint: 68 degrees F, plus or minus 2 degrees F.
    b. Setpoint Range: 59 to 80 degrees F.
    c. Night Setback: 60 degrees F.
    d. Minimum Interior Relative Humidity: 10 percent RH.

B. System Design and Installation Considerations:

1. Conditioned spaces and zones are indicated on drawings.
2. Indoor unit locations are indicated on drawings.

3. Branch refrigerant unit locations are indicated on drawings.
4. Required equipment unit capacities are indicated on drawings.
5. Refrigerant piping sizes are indicated on drawings.
6. Condensate piping to nearest drain is indicated on drawings.
7. Provide calculations showing ASHRAE Std 15 guideline compliance.

2.3 REFRIGERANT PIPING

A. Two-Pipe Run: Provide low-pressure vapor and high-pressure vapor gas pipes for each indoor unit selected for seasonal heating or cooling service.

B. Three-Pipe Run: Provide low-pressure vapor, high-pressure vapor gas, and liquid pipes for each indoor unit selected for off-season heating and cooling changeover service.

C. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.

2.4 REFRIGERANT BRANCH UNITS

A. Manufacturers:

1. Daikin: www.daikinac.com/#sle.

B. Outdoor unit interface to handle two or more indoor units required to do automatic off-season heating and cooling changeover.

C. Concealed box consisting internally-piped refrigeration loops, subcooling heat exchanger, and other devices coordinated by electronic valves to facilitate off-season load management between outdoor and indoor units.

D. Minimum Requirements:

1. Control direction of refrigerant flow using electronic expansion valves; use of solenoid valves for changeover and pressure equalization is not permitted due to refrigerant noise; use of multi-port branch selector boxes is not permitted unless spare ports are provided for redundancy.
2. Provide one electronic expansion valve for each downstream indoor unit served except when multiple indoor units are connected, provide balancing joints in downstream piping to keep total capacity within branch unit capacity.
3. Energize subcooling heat exchanger during simultaneous heating and cooling service.
4. Casing: Galvanized steel sheet with flame and heat resistant foamed polyethylene sound and thermal insulation.
5. Refrigerant Connections: Braze type.
6. Condensate Drainage: Provide unit that does not require condensate drainage.

2.5 INDOOR UNITS

A. Manufacturers:

B. Minimum Unit Requirements:

1. DX Evaporator Coil:

a. Copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.

b. 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch and flare end-connections.

c. Provide thermistor on liquid and gas lines wired into local controller.

d. Refrigerant circuits factory-charged with dehydrated air for field charging.

2. Fan Section:

a. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.

b. Thermally protected, direct-drive motor with statically and dynamically balanced fan blades.

c. Minimum-adjustable external static pressure 0.32 in-wc; provide for mounting of field-installed ducts.

3. Local Unit Controls:

a. Exposed Thermostat: Wall-mounted thermostat wired into controller.

b. Temperature Control: Return air control using thermistor tied to computerized Proportional-Integral-Derivative (PID) control of superheat.

c. Temperature Zones:

1) Single Indoor Unit: Set served space(s) as the local temperature zone.

2) Multiple Indoor Units: For large zones, group and coordinate related indoor units with served spaces as the local temperature zone with each indoor unit as sub-zone.

4. Return Air Filter:

5. Condensate:

a. Built-in condensate drain pan with PVC drain connection for drainage.

b. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.

c. Units Without Built-In Condensate Pump: Provide built-in condensate float switch and wiring connections.

6. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.

C. Ceiling-Concealed Ducted Indoor Units:

1. Manufacturers:

a. Low Static, Ceiling-Concealed Ducted Indoor Units:

1) Daikin: www.daikinac.com/#sle.

b. Mid Static, Ceiling-Concealed Ducted Indoor Units:

1) Daikin: www.daikinac.com/#sle.

c. High Static, Ceiling-Concealed Ducted Indoor Units:

1) Daikin: www.daikinac.com/#sle.

2. Type: Ducted unit with DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
3. Ducted horizontal discharge and side or back-end return; galvanized steel cabinet.
4. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
5. Return Air Filter: Manufacturer's standard.
6. Sound Pressure: Measured at low speed at 5 feet below unit.
7. Provide external static pressure switch adjustable for high efficiency filter operation
8. Condensate Pump: Built-in, with lift of 9 inches, minimum.
9. Switchbox accessible from side or bottom.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.

C. Notify Architect if conditions for installation are unsatisfactory.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

D. Coordinate with installers of systems and equipment connecting to this system.

E. Refrigerant Piping: See Section 23 2300 with Section 23 0719 for insulation, and Section 23 0529 for hangers and supports unless following specific manufacturer recommendations.

F. Connect indoor units to condensate piping.

G. Install refrigerant leak detection and alarm system in occupied spaces; see Section 28 4400.

H. Provide refrigerant detection systems for units and piping; see Section 28 4400.

3.3 FIELD QUALITY CONTROL

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

B. Provide manufacturer's field representative to inspect installation prior to startup.

3.4 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

3.5 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

3.6 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

B. Demonstration: Demonstrate operation of system to Owner's personnel.

1. Use operation and maintenance data as reference during demonstration.
2. Conduct walking tour of project.
3. Briefly describe function, operation, and maintenance of each component.

C. 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 of training.
3. Instructor: Manufacturer's training personnel.
4. Location: At project site.
5. Location: Owner's offsite classroom facilities may be used.

3.7 PROTECTION

A. Protect installed components from subsequent construction operations.

B. Replace exposed components broken or otherwise damaged beyond repair.

3.8 MAINTENANCE

A. Provide a separate maintenance contract for specified maintenance service.

END OF SECTION

DIVISION

26

ELECTRICAL

SECTION 26 0010 - GENERAL ELECTRICAL REQUIREMENTS

PART I - GENERAL

1.1 RELATED DOCUMENTS AND REQUIREMENTS

A. Specifications throughout all divisions of the project manual are directly applicable to this section, and this section is directly applicable to them.

B. Drawings, specification sections and other documents which form the basis for the Contract apply to all work of Division 26, Division 27, and Division 28.

1.2 SUMMARY

A. This section includes general requirements for electrical work and is supplemental and in addition to the requirements of Division 01. This section applies to work of all Division 26, Division 27, and Division 28 sections.

B. Provide all materials, appliances, apparatus, safety precautions, programs and methods, whether specifically mentioned or not, which are necessary for a complete electrical installation.

1.3 REGULATORY REQUIREMENTS

A. Errors and omissions in the Contract Documents do not relieve the contractor from providing the work in accordance with regulatory requirements.

B. As a minimum, execute, test and inspect work in accordance with Underwriters and State and Local codes, rules, and regulations applicable to the trade involved. If plans or specifications call for requirements in excess of these codes, rules and regulations, the greater requirement shall apply. Included are the requirements of IBC, NFPA, NEC, OSHA, NEMA, ICEA, ANSI, ASTM, UL, EIATIA, UBC, and Federal Specifications.

C. Obtain and pay for all permits, licenses, and inspections required by laws, ordinances and rules that govern the work of this project.

D. Where a conflict between Division 26, Division 27, and Division 28 drawings and specifications arise, The specifications shall take precedence.

E. All materials furnished and all work installed shall comply with locally adopted, international, or uniform building and fire protection codes, with the requirements of local utility companies, and with the requirements of all governmental authorities having jurisdiction.

1.4 DRAWINGS

A. The drawings are to scale as noted; however refer to the architectural plans for exact building dimensions and civil plans for exact site dimensions. Do not scale electrical drawings.

B. Drawings are diagrammatic. No attempt has been made to show every conduit, fitting, device, connection or detail of construction.

C. Consult other drawings of the project for correlating information. Pay particular attention to door swings, casework, fixed furniture, piping, radiation and structural steel. No additional compensation will be allowed for the moving of misplaced items.

D. Since drawings are at a small scale, outlets, devices, equipment, etc., are indicated only in their approximate locations. Verify final locations for rough-ins with field measurements and with the requirements of the equipment to be installed. In the event of conflicts with other systems or building components, notify the Architect whose decision will govern. Make changes required to correct conflicts at no change in contract cost to the Owner.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown 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.

1.5 PROJECT COORDINATION

A. Project Coordinator: General Contractor (GC)

B. Make the following types of submittals to Architect through the Project Coordinator:

1. Preconstruction Submittals
    a. Requests for Substitution.
    b. Proposed Product Lists.
    c. Shop drawings, product data, and samples.
    d. Coordination Drawings.
    e. Manufacturer's Instructions.
2. Construction Submittals
    a. Requests for Interpretation.
    b. Proposal Requests
    c. Credit/Deduct Change Orders
3. Substantial Completion Submittals
    a. Source Quality Control Test Reports
    b. Field Quality Control Test and Inspection Reports.
    c. Schedule of Owner Training.
4. Closeout Submittals
    a. Corrected Test and Inspection Reports.
    b. Certification of Owner Training.
    c. Maintenance Materials.
    d. Operation & Maintenance Manuals.

e. Inspector Certificates of Acceptance

f. Warranty Certificates

C. Coordinate work with other Contractors and trades doing work on the project. Examine drawings and specifications of other trades for construction details. Make every effort to prevent conflicts or interferences with other trades.

D. Before ordering equipment, determine that equipment will pass through building openings and passageways that provide unobstructed access to final equipment locations. Determine that equipment will properly fit in the designated space without conflict with other systems, and that Code required spaces and access can be maintained.

E. 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.

F. 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.

G. Comply with working clearances identified in Article 110-26 2020 NEC and coordinate with Division 22 and Division 23 subcontractor to insure that no piping, ductwork or equipment is installed in the exclusively dedicated space for switchboards or panelboards within the scope of the NEC.

H. 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.

1.6 JOB CONDITIONS

A. Examine the project site prior to bidding and become familiar with all existing conditions that may affect the bid, No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

B. Inspect materials upon arrival at the site and verify conformance with Contract Documents. Containers that are broken, opened, damaged or water marked are unacceptable. All material, except items specifically designed to be installed outdoors, shall be stored in an enclosed dry building or trailer.

C. Protect work, materials and equipment from theft and damage. Be responsible for any such theft or damage until project acceptance by the Owner.

PART 2 - PRODUCT REQUIREMENTS

2.1 STANDARDS

A. Unless otherwise indicated, provide only first-quality new materials and equipment, free from defects, in first class condition, suitable for the application and for installation in the space provided. Unless specifically required or permitted by the Contract Documents.

B. Unless otherwise indicated, material and equipment shall be the standard current products of manufacturers regularly engaged in the manufacture of such products.

C. Provide material and equipment listed by UL or other approved testing organization wherever standards have been established for that product unless otherwise permitted by the Authority Having Jurisdiction. Custom designed products shall be constructed from UL approved materials and approved by UL as a complete assembly.

D. Where two or more products of the same class are required, provide products of a single manufacturer.

2.2 SUBSTITUTIONS

A. Products are specified by naming one or more manufacturers with a provision for substitutions. Submit any requests for substitution of specified materials not named prior to bidding in accordance with the provisions of Division 01.

B. Provide sufficient material or data to allow evaluation of proposed alternatives and determination of compliance with the Contract Documents. Specifically List any deviations from the Contract Documents.

C. Where such alternatives alter the design or space requirements, include in the proposal, all items of cost for revised design and construction, including the cost of all allied trades involved.

D. Where specific products are mentioned by name or part number, the proposed substitute must meet all the standard services and functionality of the specified system weather explicitly mentioned or not.

E. Division 01 instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

F. All product substitutions shall be by addendum, or with written approval only.

G. Substitutions after the bid will be considered when a product becomes unavailable through no fault of the EC.

H. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

I. A request for substitution 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.
2. Will provide the same warranty for the substitution as for the specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.

J. Substitution Submittal Procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

2.3 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1. 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.

2. Shop Drawing Submittals: Prepared specifically for this Project.

3. Submit shop drawings and product data as required by various sections of Division 26, Division 27, and Division 28 in accordance with Division 01 . Make submittals to the Architect.

   a. Do not submit directly to the Engineer

4. Do not use materials and equipment removed from the existing premises, except as specifically permitted by the Contract Documents.

B. Provide submittals for equipment as described in the electrical drawings as well as each section of these electrical specifications, including, but not limited to all sections of Division 26, Division 27, and Division 28.

C. Submittals will be reviewed by the Engineer only for general compliance with the intent of the Contract Documents. Review does not extend to details of construction, dimensions or equipment quantities.

D. Review of submittals and action recommended as a result of review is a courtesy extended to the Contractor by the Engineer. Errors in submittals are the sole liability of the Contractor. Submission of material for review does not alter the Contractors responsibility to comply with the Contract Documents regardless of action noted in the Engineer's review.

E. Submittals shall include all information necessary to properly identify and evaluate all components of the equipment being submitted for review. Any proposed equipment variances from the Contract Documents must be clearly highlighted. If this is not done the Engineer reserves the right to reject such equipment at any time before or after installation.

F. Submittals shall be bound in folders with covers that indicate the project name and equipment included within the folder. The Contractor's review stamp, dated and initialed, shall be on the folder cover or cover page. Provide tab dividers, properly identified, to identify different categories of equipment. If more than one item of equipment is shown on the same catalog page, that equipment which is applicable to the project must be clearly identified.

1. Contractor's stamp implies that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

G. Incomplete or improperly formatted submittals will not be reviewed.

H. When revised for resubmission, identify all changes made since previous submittal.

PART 3 - ADMINISTRATIVE REQUIREMENTS

3.1 NOT USED - REFER TO 01 FOR REQUIREMENTS

PART 4 - EXECUTION REQUIREMENTS

4.1 GENERAL

A. Workmanship shall be first quality and none but competent electricians, licensed in the State of Wyoming, shall be employed. All work shall be performed under supervision of an experienced, and competent foreman, licensed in the State of Wyoming, and in complete compliance with all applicable codes.

B. The finished appearance of electrical work shall be first class. Install systems, materials and equipment level and plumb, and parallel and perpendicular to building components where installed exposed. Install electrical equipment to facilitate servicing, maintenance and repair or replacement of equipment components.

C. Follow manufacturer's installation instructions explicitly unless otherwise indicated. Whenever any conflict arises between the manufacturer's instructions and the Contract Documents notify the Architect and comply with Architect's decision. Keep copy of manufacturer's installation instructions on job site available for review at all times.

D. Do no work without proper documents or written instruction. Any work completed without proper authorization will not be considered for additional compensation.

E. Contractor shall replace any improperly executed work at his cost.

F. Install electrical equipment to facilitate servicing maintenance and repair of replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.

G. In finished areas ,except as otherwise indicated; conduit and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

H. No back to back electrical boxes inside walls, maintain a 6” inch minimum spacing between boxes and no more than 2 boxes in any joist space.

I. All ceiling mounted devices (i.e. smoke detectors, light fixtures, etc.) shall be installed centered in ceiling tiles. Coordinate with ceiling installer.

J. Electrical devices are shown on Drawings in approximate locations unless dimensioned. Adjust devices up to five feet if required to accommodate intended purpose.

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

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

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

4.2 TRANSPORTATION, STORAGE, AND PROTECTION

A. Transport and handle products in accordance with manufacturer's instruction. All transportation costs for Division 26, Division 27, and Division 28 equipment shall be by this contractor.

B. Store and protect products in accordance with manufacturer's instructions.

C. Store with seals and labels intact and legible.

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

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

F. Provide off-site storage and protection when site does not permit on-site storage or protection. Certificate of insurance is required for off-site storage.

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

H. Protect installed work and provide special protection where specified in individual specification sections.

4.3 TEMPORARY LIGHTING AND POWER

A. Temporary Power

1. Provide a minimum 240/120V, 200A, single phase, three wire, service with main disconnect, and over current protection at a convenient location.

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

    a. Provide 20A duplex receptacles for power tools every 2,500 square feet of active work area. All duplex receptacles used for construction purposes shall be provided with ground fault protection for personnel.

    b. Provide 20A single phase branch circuits for lighting.

B. Temporary Lighting

1. Provide and maintain lighting for construction operations per OSHA 1926.56.

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

3. Maintain lighting and provide routine repairs. Replace lamps as required during construction phase. Task lighting for painting and finishing shall be provide by the associated contractor.

4. Upon completion of the work, remove all temporary facilities from the project site.

C. Promptly notify the architect of any discrepancies discovered.

4.4 CUTTING AND PATCHING

A. Obtain permission from the Architect and coordinate with other trades prior to cutting. Conform to Architect's direction for location and method of cutting. Cut carefully, and only the minimum amount necessary.

B. Submit written request in advance of cutting or alteration which 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.
6. Include in request:
    a. Location and description of affected work.
    b. Necessity for cutting or alteration.
    c. Description of proposed work and products to be used.

C. Repair any damage equal to the original condition, at minimum. Use materials and methods acceptable to the Architect.

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

E. Fit work air tight to conduit and other penetrations through surfaces.

F. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with latest approved materials and methods, to full thickness of the penetrated element.

4.5 PAINTING AND CLEANING

A. Touch up panelboards and other items of electrical equipment not “finish painted” under other sections if finished surface is marred or damaged. Use paint furnished by the equipment manufacturer specifically for that purpose.

B. Leave all equipment, lighting fixtures, etc., in clean condition, with all unnecessary labels removed. Use cleaning materials appropriate to the surface and material being cleaned.

C. Clean up and remove all electrical construction debris from the site both prior to final project assessment and after completion of the work.

4.6 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems with Architect, Engineer, And Project Coordinator.

B. Notify General Contractor and Owner seven days prior to start-up of each item.

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

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

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

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

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

H. Adjust operating products and equipment to ensure smooth and unhindered operation. Refer to individual sections for additional adjustment requirements.

PART 5 - CLOSE OUT REQUIREMENTS

5.1 CLOSEOUT PROCEDURES

A. Notify General Contractor when work is considered ready for Substantial Completion.

B. Provide Substantial Completion Submittals as required by Division 01 and these specifications.

C. Provide close out submittals as required by Division 01 and these specifications.

D. Notify GC when work is considered finally complete.

E. Complete items of work determined by Engineer's final inspection.

F. Turn over complete, legible, set of “red-line” line documents accurately reflecting as-constructed changes to design layouts.

5.2 TESTING AND DEMONSTRATIONS

A. Test and demonstrate that all electrical equipment and systems operate in accordance with the requirements of the Contract Documents and manufacturer's instructions. Repair or replace any equipment or system that fails the tests and demonstrations.

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

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

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

E. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

F. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

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

5.3 OPERATING AND MAINTENANCE MANUALS

A. Submit Operating and Maintenance Manuals for the following equipment. Include, as a minimum, all information incorporated in the submittals.

1. Lighting Fixtures
2. Fire Alarm Panel, Devices, and Riser Diagram.
3. Fuses and Connector Kits
4. Wiring Devices
5. Safety Switches and Disconnects
6. Structured Data Cabling and Outlets

B. Make up required operating and maintenance manuals no later than two weeks prior to completion of the project.

C. Include warranties, description of required testing and testing methods and details of routine maintenance.

D. Include recommended replacement parts with names, addresses, and telephone numbers of service organizations that carry the parts in stock.

E. Manuals shall be 8.5x11, bound in hard back binder, suitably labeled for identification. Accordion fold larger sheets to this size. Provide index page and plastic tabs coordinated with the index.

F. Submit one copy of the manual to the Engineer for review, and after review make noted changes. Turn over 3 copies of the final manual to the Owner.

G. The Contract is not complete and final payment to the contractor will not be made until final operating and maintenance manuals are received and accepted.

5.4 SUBMITTALS FOR PROJECT CLOSEOUT

A. Project Record Documents: Submit the following items/documents to Architect for project closeout submittals.

1. Record Drawings and Specifications (One (1) clean set with Change Orders identified).
2. A one-year warranty statement on company stationary.
3. Submit material and labor warranty as specified.
4. Operating and maintenance manuals.

END OF SECTION

SECTION 26 0505 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 3 EXECUTION

1.1 EXAMINATION

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

B. Beginning of demolition means installer accepts existing conditions.

1.2 PREPARATION

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

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.

1.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

F. Repair adjacent construction and finishes damaged during demolition and extension work.

G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

H. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

1.4 CLEANING AND REPAIR

A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

B. Clean and repair existing materials and equipment that remain or that are to be reused.

C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace broken electrical parts.

END OF SECTION

SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Armored cable.

C. Metal-clad cable.

D. Wiring connectors.

E. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire.

F. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

G. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.

H. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation.

I. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers.

J. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation.

K. NECA 1 - Standard for Good Workmanship in Electrical Construction.

L. NECA 104 - Standard for Installing Aluminum Building Wire and Cable.

M. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable.

N. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

O. NFPA 70 - National Electrical Code.

P. UL 4 - Armored Cable.

Q. UL 44 - Thermoset-Insulated Wires and Cables.

R. UL 83 - Thermoplastic-Insulated Wires and Cables.

S. UL 486A-486B - Wire Connectors.

T. UL 486C - Splicing Wire Connectors.

U. UL 486D - Sealed Wire Connector Systems.

V. UL 1569 - Metal-Clad Cables.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.3 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is permitted only as follows:

1. Where not otherwise restricted, may be used:
    a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
        1) Maximum Length: 6 feet.
    b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.

G. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:
    a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

1) Maximum Length: 6 feet.

b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:

1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.

a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:

1) Services: Copper conductors size 1/0 AWG and larger.

2) Feeders: Copper conductors size 1/0 AWG and larger.

b. Where aluminum conductors are substituted for copper, comply with the following:

1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.

2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.

3) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

H. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

a. Exceptions:

1) Conductors must be sized appropriately for voltage drop per NFPA 70.

2. Control Circuits: 14 AWG.

I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

J. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

b. Equipment Ground, All Systems: Green.

c. Isolated Ground, All Systems: Green with yellow stripe.

d. Travelers for 3-Way and 4-Way Switching: Pink.

e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

f. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

2. Control Circuits: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.4 ARMORED CABLE

A. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN.

E. Grounding: Combination of interlocking armor and integral bare bonding wire.

F. Armor: Steel, interlocked tape.

2.5 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
3. Connectors for Aluminum Conductors: Use compression connectors.

C. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
4. Aluminum Conductors: Use compression connectors for all connections.
5. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
6. Conductors for Control Circuits: Use crimped terminals for all connections.

D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide bolted type or set-screw type.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install aluminum conductors in accordance with NECA 104.

E. Install armored cable (Type AC) in accordance with NECA 120.

F. Install metal-clad cable (Type MC) in accordance with NECA 120.

G. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

J. Terminate cables using suitable fittings.
1. Armored Cable (Type AC):
   a. Use listed fittings and anti-short, insulating bushings.
   b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
2. Metal-Clad Cable (Type MC):
   a. Use listed fittings.

b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

K. Install conductors with a minimum of 12 inches of slack at each outlet.

L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

N. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

P. Insulate ends of spare conductors using vinyl insulating electrical tape.

Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NFPA 70 - National Electrical Code.

C. UL 467 - Grounding and Bonding Equipment.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.
2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.4 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal air ducts.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

4. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

A. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Division 03.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
    a. NFPA 70.
    b. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
5. Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2-inch diameter.
    b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
    c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.

d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.

e. Outlet Boxes: 1/4-inch diameter.

f. Luminaires: 1/4-inch diameter.

F. Nonpenetrating Rooftop Supports for Low-Slope Roofs:

1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.

2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

G. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

2. Concrete: Use expansion anchors or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

4. Hollow Masonry: Use toggle bolts.

5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam clamps, machine bolts, or welded threaded studs.

7. Sheet Metal: Use sheet metal screws.

8. Wood: Use wood screws.

9. Plastic and lead anchors are not permitted.

10. Powder-actuated fasteners are not permitted.

11. Hammer-driven anchors and fasteners are not permitted.

12. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

a. Manufacturer: Same as manufacturer of metal channel/strut framing system.

b. Comply with MFMA-4.

c. Channel Material: Use galvanized steel.

13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.1 INSTALLATION

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

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:

   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

   4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 4 inches in height; see Division 03.

I. Conduit Support and Attachment: See Section 26 0533 for additional requirements.

J. Box Support and Attachment: See Section 26 0534 for additional requirements.

K. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.

L. Exterior Luminaire Support and Attachment: See Section 26 5600 for additional requirements.

M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N. Secure fasteners in accordance with manufacturer's recommended torque settings.

O. Remove temporary supports.

END OF SECTION

SECTION 26 0533 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Flexible metal conduit (FMC).

C. Liquidtight flexible metal conduit (LFMC).

D. Galvanized steel electrical metallic tubing (EMT).

E. Aluminum electrical metallic tubing (EMT).

1.2 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT).

E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

F. NFPA 70 - National Electrical Code.

G. UL 1 - Flexible Metal Conduit.

H. UL 6 - Electrical Rigid Metal Conduit-Steel.

I. UL 360 - Liquid-Tight Flexible Metal Conduit.

J. UL 514B - Conduit, Tubing, and Cable Fittings.

K. UL 797 - Electrical Metallic Tubing-Steel.

L. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel.

M. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

D. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

E. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

F. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.

G. Exposed, Exterior: Use galvanized steel rigid metal conduit.

H. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

I. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

1. Maximum Length: 6 feet.

J. Flexible Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit (FMC).
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
3. Maximum Length: 6 feet unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
   a. Transformers.
   b. Motors.

c. Air Handling Equipment.

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Electrical Service Conduits: See Section 26 2100 for additional requirements.

C. Fittings for Grounding and Bonding: See Section 26 0526 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4-inch trade size.
2. Branch Circuit Homeruns: 3/4-inch trade size.
3. Control Circuits: 1/2-inch trade size.
4. Flexible Connections to Luminaires: 3/8-inch trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
2. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

C. Description: Interlocked steel construction.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

C. Description: Interlocked steel construction with PVC jacket.

2.6 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel.

3. Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.

4. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

2.7 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.

2. Material: Use aluminum.

3. Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.

2.8 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

B. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

C. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

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

B. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Mechanical equipment rooms.
    c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.
    d. Across building exterior surfaces.
6. Conduits installed underground may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.

9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
14. Group parallel conduits in same area on common rack.

E. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 0529.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
9. Use of spring steel conduit clips for support of conduits is not permitted.
10. Use of wire for support of conduits is not permitted.

F. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

G. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Conceal bends for conduit risers emerging above ground.
4. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
5. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
6. Provide metal escutcheon plates for conduit penetrations exposed to public view.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where conduits are subject to earth movement by settlement or frost.

I. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
    a. Where conduits enter building from outside.
    b. Where service conduits enter building from underground distribution system.
    c. Where conduits enter building from underground.
    d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

a. Where conduits pass from outdoors into conditioned interior spaces.

b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

J. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

K. Provide grounding and bonding; see Section 26 0526.

L. Identify conduits; see Section 26 0553.

3.3 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

B. Install conduit to preserve fire resistance rating of partitions and other elements.

END OF SECTION

SECTION 26 0534 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Underground boxes/enclosures.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2726 - Wiring Devices:

1. Wall plates.

2. Additional requirements for locating boxes for wiring devices.

F. Section 27 1000 - Structured Cabling and Equipment for Voice and Data: Additional requirements for communications systems outlet boxes.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

E. NFPA 70 - National Electrical Code.

F. SCTE 77 - Specification for Underground Enclosure Integrity.

G. UL 514A - Metallic Outlet Boxes.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for floor boxes.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes where exposed galvanized steel rigid metal conduit is used.
4. Use suitable concrete type boxes where flush-mounted in concrete.
5. Use suitable masonry type boxes where flush-mounted in masonry walls.
6. Do not use "through-wall" boxes designed for access from both sides of wall.
7. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
8. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
9. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
10. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
11. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
12. Wall Plates: Comply with Section 26 2726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As Required..
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Provide logo on cover to indicate type of service.
5. Applications:
    a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
    b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.

c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
   a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

3.2 INSTALLATION

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

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Box Locations:
   1. Locate boxes to be accessible. Provide access panels as requiredwhere approved by the Architect..
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
      b. Communications Systems Outlets: Comply with Section 27 1000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.

9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

G. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
4. Use of wire for support of boxes is not permitted.
5. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

H. Install boxes plumb and level.

I. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

J. Install boxes as required to preserve insulation integrity.

K. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.

2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

N. Close unused box openings.

O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

P. Provide grounding and bonding in accordance with Section 26 0526.

Q. Identify boxes in accordance with Section 26 0553.

3.3 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

END OF SECTION

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

G. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

H. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

I. Section 27 1000 - Structured Cabling and Equipment for Voice and Data: Identification for communications cabling and devices.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code.

B. NFPA 70E - Standard for Electrical Safety in the Workplace.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Panelboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Transformers:

1) Identify kVA rating.

2) Identify voltage and phase for primary and secondary.

c. Enclosed switches, circuit breakers, and motor controllers:

1) Identify voltage and phase.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

d. Time Switches:

1) Identify load(s) served and associated circuits controlled. Include location.

e. Enclosed Contactors:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify load(s) and associated circuits controlled. Include location.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

3. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.

4. Use identification label on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.

5. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

a. Service equipment.

b. Panelboards and Switchboards.

7. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter

socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.

a. Minimum Size: 3.5 by 5 inches.

b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

c. Service Equipment: Include the following information in accordance with NFPA 70.

1) Nominal system voltage.

2) Available fault current.

3) Clearing time of service overcurrent protective device(s).

4) Date label applied.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.

2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

C. Identification for Raceways:

1. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.

2. Use underground warning tape to identify underground raceways.

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.

2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

a. For exposed boxes in public areas, provide identification on inside face of cover.

E. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 27 1000.

2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.

3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

a. For receptacles in public areas, provide identification on inside surface of wallplate.

4. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:

a. Indoor Clean, Dry Locations: Use plastic nameplates.

2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend:

a. Equipment designation or other approved description.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

a. Equipment Designation: 1/2 inch.

5. Color:

a. Normal Power System: White text on black background.

b. Emergency Power System: White text on red background.

D. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Power source and circuit number or other designation indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch.

5. Color: Black text on clear background.

2.3 VOLTAGE MARKERS

A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

B. Minimum Size:

1. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
2. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

C. Legend:

1. Markers for Voltage Identification: Highest voltage present.

D. Color: Black text on orange background unless otherwise indicated.

2.4 UNDERGROUND WARNING TAPE

A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

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

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Elevated Equipment: Legible from the floor or working platform.
4. Branch Devices: Adjacent to device.
5. Interior Components: Legible from the point of access.
6. Conduits: Legible from the floor.
7. Boxes: Outside face of cover.

8. Devices: Outside face of cover.

C. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

D. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

E. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

SECTION 26 0583 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 REFERENCE STANDARDS

A. NEMA WD 6 - Wiring Devices - Dimensional Specifications.

B. NFPA 70 - National Electrical Code.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
2. Determine connection locations and requirements.

B. Sequencing:

1. Install rough-in of electrical connections before installation of equipment is required.
2. Make electrical connections before required start-up of equipment.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.1 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.

C. Wiring Devices: As specified in Section 26 2726.

D. Flexible Conduit: As specified in Section 26 0533.

E. Wire and Cable: As specified in Section 26 0519.

F. Boxes: As specified in Section 26 0534.

G. Motor Controllers: As specified in Section 26 2913.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 EQUIPMENT CONNECTIONS

A. Furnish and install all wiring except temperature control wiring, equipment control wiring which does not conduct full load motor current, and interlock wiring, unless indicated otherwise. Furnish and install all power wiring complete from power source to motor or equipment junction box, including power wiring through starters.

B. Unless otherwise indicated, all hvac and plumbing equipment motors and controls shall be furnished, set in place, and wired in accordance with the following schedules:

	Furnished By	Installed By	Power Wired By	Control Wired By
Equipment motors	MC	MC	EC	-
Magnetic motor starters, manual or auto control w/ or w/o hand-off-auto	EC	EC	EC	MC
Magnetic motor starters supplied as part of factory wired equipment	MC	MC	EC	MC
Combination magnetic motor starter disconnects	EC	EC	EC	MC
Disconnect switches and thermal overload switches	EC	EC	EC	-
Pushbuttons and pilot lights:				
a. Full load motor amps	MC	EC	EC	EC
b. Non-full load motor amps	MC	MC	-	MC
Manual/multi-speed switches	MC	EC	EC	EC
Temperature control relays and transformers	MC	MC	EC	MC
Thermostats:				
a. Full load motor amps	MC	EC	EC	EC
b. Non-full load motor amps	MC	MC	-	MC
Temperature control panels and time clocks mounted within panels	MC	MC	EC	MC

Motorized valves, damper motors and remote bulb thermostats	MC	MC	EC	MC
Solenoid valves, PE switches, EP switches, etc.	MC	MC	EC	MC
Smoke detectors and relays for fan shutdown:				
a. Bldg w/ fire alarm system	EC	EC	EC	EC
b. Bldg w/o fire alarm system	MC	MC	MC	MC
Boiler and/or burner controls	MC	MC	EC	MC

C. EC to install all starters and disconnects not factory mounted on equipment. The Mechanical Contractor shall provide and be responsible for the overload "heaters" in all starters furnished under Divisions 22 and 23.

D. Control relay and control transformers shall be furnished under the mechanical contract except where furnishing such items is specifically required under the electrical specifications and/or drawings.

E. EC shall provide power to all temperature control panels. Location and quantity of control panels shall be determined by control contractor.

F. Provide field-installed disconnect switch when not in direct sight of Panelboard, Loadcenter, or Motor Controller.

3.3 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

J. Provide hardwired electrical connections using flexible conduit.

K. For Cord and Plug electrical connections, provide receptacle with proper configuration to match equipment plug.

END OF SECTION

SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices.

C. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.

D. NFPA 70 - National Electrical Code.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
2. Coordinate placement of wall switch occupancy sensors with installed door swings.
3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
4. Coordinate lighting control device product selections with luminaire characteristics; see Section 26 5100 and lighting fixture schedule.
5. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.4 SUBMITTALS

A. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

B. Operation and Maintenance Data: Include detailed information on device programming and setup.

C. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.6 WARRANTY

A. Provide five year manufacturer warranty for occupancy sensors.

B. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2 OCCUPANCY SENSORS

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Legrand North America, Inc: www.legrand.us/#sle.
3. Or Approved equal.

B. General Requirements:

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 combination of both passive infrared and ultrasonic 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 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, with time delay settings up to 30 minutes.
8. Sensitivity: Field adjustable.
9. Load Rating for Line Voltage Occupancy Sensors: As required to control load indicated on drawings.

C. Wall Switch Occupancy Sensors:
   1. General Requirements:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with 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 load indicated on drawings, provide line voltage units with self-contained relay.
      c. 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 delayed-off time interval.
      d. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.

D. Ceiling Mounted Occupancy Sensors:
   1. General Requirements:
      a. Description: Low profile occupancy sensors designed for ceiling installation.
      b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
      c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
      d. Finish: White unless otherwise indicated.
   2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
      a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 26 0534.

C. Maintain separation of remote-control, signaling, and power-limited circuits.

1. See manufacturer instructions and Section 26 0519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 26 2726.

H. Provide required supports; see Section 26 0529.

I. 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.

J. Occupancy Sensor Locations:

1. Location Adjustments: Within design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

3.3 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.

C. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.4 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

3.5 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. 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. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of installed lighting control devices.

3. Location: At project site.

END OF SECTION

SECTION 26 2726 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates and covers.

1.2 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices.

E. NEMA WD 1 - General Color Requirements for Wiring Devices.

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications.

G. NFPA 70 - National Electrical Code.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.4 SUBMITTALS

A. See Section 26 0010 - General Electrical Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Operation and Maintenance Data:

1. Wall Dimmers: Include information on operation and setting of presets.

2. GFCI Receptacles: Include information on status indicators.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

B. Except where explicitly permitted, substitution of combination switch-and-receptacle devices for separate switches and receptacles is not permitted.

C. Wiring Device Applications:

1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.

2. Provide GFCI protection for:

a. Receptacles installed within 6 feet of sinks.

b. Receptacles installed in kitchens.

c. Receptacles serving electric drinking fountains.

d. Receptacles serving vending machiines.

3. Single Receptacles Installed on Individual Branch Circuits: Provide receptacle ampere rating equal to branch circuit rating.

2.2 WIRING DEVICE FINISHES

A. Wiring Devices, Unless Otherwise Indicated: White with nylon wall plate.

B. Wiring Devices Installed in Finished Office Spaces: White with white nylon wall plate.

C. Wiring Devices Installed in Unfinished Spaces: White with galvanized steel wall plate.

D. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.

2.3 WALL SWITCHES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
4. Or Approved equal.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20and where applicable FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

1. Products:

2.4 WALL DIMMERS

A. Manufacturers:

1. Leviton Manufacturing Company, Inc: www.leviton.com.
2. Wattstopper, a brand of Legrand: www.legrand.us/wattstopper
3. Or Approved equal.

B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Control: Slide control type with separate on/off switch.

D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

E. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.5 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

4. Or Approved equal.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498and where applicable FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

3. Tamper Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

4. Tamper Resistant and Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. All GFI Receptacles: Provide with light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.

2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

4. Tamper Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

5. Tamper Resistant and Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

2.6 WALL PLATES AND COVERS

A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard.
3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.1 EXAMINATION

A. 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.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 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.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0534 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:
    a. Wall Switches: 48 inches above finished floor.
    b. Wall Dimmers: 48 inches above finished floor.
    c. Receptacles: 18 Inches above finished floor or 6 inches above counter, or 2" above backsplash.
    d. Install Individual Telephone or Data outlet 18 Inches above finished floor.
    e. Install Combo Tele/Data outlet 18 Inches above finished floor.
2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches 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. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on left.

N. 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.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

P. Connect wiring device grounding terminal to outlet box with bonding jumper.

Q. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

R. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

S. Install protective rings on active flush cover service fittings.

T. All non-locking type, 125V, 15A and 20A rated receptacles located in public access areas shall be listed as Tamper Resistant.

U. For all dedicated EWC receptacle, EC to rough-in behind water cooler shroud so no cords or plugs are visible when shroud is installed.

3.4 FIELD QUALITY CONTROL

A. Provide all test results to Engineer in Substantial Completion Submittals, via Architect, prior to scheduling Substantial Completion observations. Test results shall be tabulated to show name of tested device, measured value, expected values, acceptable standard deviation, and test conditions, as well as any miscellaneous variables that may be applicable to test being performed.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch with circuit energized to verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle to verify operation and proper polarity.

F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.6 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

1.1 SECTION INCLUDES

A. Fuses.

1.2 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses.

B. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements.

C. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses.

D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
    a. Fusible Switches for Switchboards: See Section 26 2413.
    b. Fusible Enclosed Switches: See Section 26 2816.
    c. Fusible Switches for Enclosed Motor Controllers: See Section 26 2913.
2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.

B. Littelfuse, Inc: www.littelfuse.com.

C. Or Approved equal.

2.2 APPLICATIONS

A. Service Entrance:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. Individual Motor Branch Circuits: Class RK1, time-delay.

2.3 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

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. Class R Fuses: Comply with UL 248-12.

H. Class L Fuses: Comply with UL 248-10.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 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 2816 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 2813 - Fuses.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

G. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).

H. NFPA 70 - National Electrical Code.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

K. UL 98 - Enclosed and Dead-Front Switches.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

C. Project Record Documents: Record actual locations of enclosed switches.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Approved equal.

F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Minimum Ratings:

a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

N. Heavy Duty Switches:

1. Comply with NEMA BS 31047.

2. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Lug Material: Copper, suitable for terminating copper conductors only.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

O. Provide the following features and accessories where indicated or where required to complete installation:

1. Hubs: As required for environment type; sized to accept conduits to be installed.

2. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

PART 3 EXECUTION

3.1 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. 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 above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Where a remote disconnect is on the load side of a variable speed/frequency motor drive, ec to provide auxilary contacts with break sensing to signal drive to switch to coast-to-stop mode. Control wiring and programming provided by supplier of drive.

3.2 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.3 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 2913 - ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
   1. Manual motor starters.

B. Overcurrent protective devices for motor controllers, including overload relays.

C. Control accessories:
   1. Auxiliary contacts.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

D. NFPA 70 - National Electrical Code.

E. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules.

F. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
   3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
   4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. See Section 26 0010 - General Electrical Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Project Record Documents: Record actual installed locations of controllers and final equipment settings.

1. Include nameplate data of actual installed motors and associated overload relay selections and settings.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Rockwell Automation, Inc.; Allen-Bradley Products: ab.rockwellautomation.com.

D. Siemens: www.sea.siemens.com.

E. Square D: www.schneider-electric.com.

F. Or Approved equal.

G. Source Limitations: Provide enclosed motor controllers and associated components produced by single manufacturer and obtained from single supplier.

1. Motor-starting switches without overload protection may be produced by same manufacturer as wiring devices used for project.

2.2 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D. Service Conditions:

1. Provide controllers and associated components suitable for operation under the following service conditions without derating:

a. Altitude:

1) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.

b. Ambient Temperature: Between 32 degrees F and 104 degrees F.

2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

E. Short Circuit Current Rating:

1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Enclosures:

1. Comply with NEMA ICS 6.

2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1 or Type 12.

b. Outdoor Locations: Type 3R or Type 4.

3. Finish: Manufacturer's standard unless otherwise indicated.

H. Manual Motor Starters:

1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).

2. Configuration: Non-reversing unless otherwise indicated.

3. Fractional-Horsepower Manual Motor Starters:

a. Furnish with toggle operator.

b. Overload Relays: Bimetallic or melting alloy thermal type.

c. Provide means for locking operator in the OFF position.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:

1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
3. Trip-free operation.
4. Visible trip indication.
5. Resettable.
    a. Employ manual reset unless otherwise indicated.
    b. Do not employ automatic reset with two-wire control.
6. Bimetallic Thermal Overload Relays:
    a. Interchangeable current elements/heaters.
    b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
    c. Trip test function.
7. Melting Alloy Thermal Overload Relays:
    a. Interchangeable current elements/heaters.

PART 3 EXECUTION

3.1 INSTALLATION

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

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed controllers plumb and level.

F. Provide grounding and bonding in accordance with Section 26 0526.

G. Install all field-installed devices, components, and accessories.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

J. Identify enclosed controllers in accordance with Section 26 0553.

K. Provide identification nameplate for each panelboard in accordance with Section 26 0553.

L. Provide neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder

M. Provide arc flash warning labels in accordance with NFPA 70.

N. Where a remote disconnect is on the load side of a variable speed/frequency motor drive, ec to provide auxilary contacts with break sensing to signal drive to switch to coast-to-stop mode. Control wiring and programming provided by supplier of drive.

3.2 FIELD QUALITY CONTROL

A. Provide all test results to Engineer in Substantial Completion Submittals, via Architect, prior to scheduling Substantial Completion observations. Test results shall be tabulated to show name of tested device, measured value, expected values, acceptable standard deviation, and test conditions, as well as any miscellaneous variables that may be applicable to test being performed.

B. Perform applicable inspections and tests listed in NETA STD ATS, except Section 4

C. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.

D. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

3.3 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 5100 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Drivers.

E. Lamps.

1.2 REFERENCE STANDARDS

A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information.

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources.

D. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems.

F. NFPA 70 - National Electrical Code.

G. NFPA 101 - Life Safety Code.

H. UL 924 - Emergency Lighting and Power Equipment.

I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.4 SUBMITTALS

A. See Section 26 00 10 - General Electrical Requirements for submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Drivers: Two percent of total quantity installed for each type, but not less than one of each type.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.7 WARRANTY

A. Provide five year manufacturer warranty for all LED luminaires, including drivers. Unless a different warranty is listed on the light fixture schedule.

B. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

C. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.1 MANUFACTURERS - LUMINAIRES

A. See Light Fixture Schedule on drawings.

B. Or Approved Equal.

2.2 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.3 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

H. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.4 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101; provide indicator light(s) to report test and diagnostic status.

G. Accessories:

1. Provide compatible accessory mounting brackets where indicated or required to complete installation.

2. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.5 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.

2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

1. Self-Powered Exit Signs:

a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

c. Provide low-voltage disconnect to prevent battery damage from deep discharge.

C. Accessories:

1. Provide compatible accessory wire guards where indicated.

2.6 DRIVERS

A. Drivers - General Requirements:

1. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to 10 percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.
    a. Wall Dimmers: See Section 26 2726.

2.7 LAMPS

A. Lamps - General Requirements:

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 Architect to be inconsistent in perceived color temperature.

B. LED:

1. Light Loss: L70 equal to or greater than 50,000 hrs.
2. Color temperature of 4,000k.
3. Color Shift within a 3-step MacAdams ellipse.
4. Luminaire performance based on 25 degree ambient temperature.
5. Power Factor greater .85 or better.

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0534 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship).

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.
2. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
3. Secure pendant-mounted luminaires to building structure.
4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
5. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:
1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
4. Install canopies tight to mounting surface.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

K. Surface Mounted Fixtures: Install plumb and square and aligned with building lines and with each other; secure to prevent movement.

L. Wall Mounted Fixtures: Install at height as indicated on the drawings.

M. Locate recessed ceiling luminaires as indicated on lighting plans.

N. Install accessories furnished with each luminaire.

O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture.

P. Bond products and metal accessories to branch circuit equipment grounding conductor.

Q. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched powerfrom existing emergency circuit. Bypass local switches, contactors, or other lighting controls.

R. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched powerfrom existing emergency circuit. Bypass local switches, contactors, or other lighting controls.

3.2 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.3 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Owner. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

D. Aim and adjust fixtures as indicated.

3.4 CLEANING

A. Clean surfaces according to NECA 500 (commercial 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 finishes and touch up damage.

3.5 CLOSEOUT ACTIVITIES

A. Just prior to Substantial Completion, replace all lamps that have failed.

END OF SECTION

DIVISION

27

COMMUNICATIONS

SECTION 27 1000 - STRUCTURED CABLING AND EQUIPMENT FOR VOICE AND DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Communications pathways.

B. Copper cable and terminations.

C. Communications equipment room fittings.

D. Communications outlets.

E. Communications grounding and bonding.

F. Communications identification.

G. Telecommunications service entrance to building(s).

1.2 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0536 - Cable Trays for Electrical Systems.

C. Section 26 0534 - Boxes for Electrical Systems.

D. Section 26 2726 - Wiring Devices.

1.3 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment.

C. EIA-310 - Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Association; Revision D, 1992.

D. NFPA 70 - National Electrical Code.

E. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set.

F. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards.

G. TIA-569 - Telecommunications Pathways and Spaces.

H. TIA-606 - Administration Standard for Telecommunications Infrastructure.

I. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

J. TIA/EIA-568-B.1 - Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements.

K. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards.

L. TIA-569-D - Telecommunications Pathways and Spaces.

M. TIA-606-B - Administration Standard for Telecommunications Infrastructure.

N. ANSI/J-STD-607 - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

O. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.

3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used (Cables, Racks, Switches, Outlets, etc.).

1. Storage and handling requirements and recommendations.

2. Installation methods.

B. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

C. Field Test Reports.

D. Project Record Documents:

1. Record actual locations of outlet boxes and distribution frames.

2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.

3. Identify distribution frames and equipment rooms by room number on drawings.

E. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:

1. Supervisors and installers factory certified by manufacturers of products to be installed.
2. Employing experienced technicians for all work; show at least 3 years experience in the installation of the type of system specified, with evidence from at least 2 projects that have been in use for at least 18 months; submit project name, address, and written certification by user.

1.7 DELIVERY, STORAGE, AND HANDLING

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

B. Keep stored products clean and dry.

1.8 WARRANTY

A. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cabling:
   1. Belden
   2. Westpenn. www.westpenn-wpw.com/
   3. Avaya. www.avaya.com/
   4. General Cable. www.generalcable.com/
   5. Systimax. www.commscope.com/
   6. Acceptable Equal

B. Equipment:
   1. Panduit. www.panduit.com/
   2. Systimax. www.commscope.com/
   3. Integrated Communications Cabling (ICC). www.icc.com/
   4. Acceptable Equal

2.2 SYSTEM DESIGN

A. Provide a complete, permanent system of cabling and pathways for voice and data communications, including conduits and wireways, pull wires, support structures, enclosures and cabinets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
   2. Provide fixed conduits and pathways that comply with NFPA 70 and ANSI/J-STD-607 and are UL listed or third party independent testing laboratory certified.

3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
5. Provide a separate cable for every jack indicted, both in single and multiple jack outlet combinations.

B. System Description:

1. Building Entrance Cable: Existing.
2. Horizontal Cabling: Copper.

C. Main Distribution Frame (MDF): Centrally located support structure for terminating backbone cables and horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.

D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.3 PATHWAYS

A. Conduit: As specified in Section 26 05 34.

1. Provide pull cords in all empty conduit

2.4 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - Voice and Data: TIA-568 Category 6 UTP (unshielded twisted pair); 23 AWG.
3. Cable Capacity: 4-pair.
4. Cable Applications:
    a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
    b. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.
5. Cable Jacket Color - Voice and Data Cable: Blue.

B. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
    a. Quantity: One for each pair of patch panel ports.
    b. Length: 50% 3 feet, 50% 5 feet.

2.5 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:

1. Connector Blocks for Category 6 Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
    a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
    b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
    c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    d. Provide incoming cable strain relief and routing guides on back of panel.

2.6 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 26 0534.

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
    a. Voice Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.
    b. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

B. Wall Plates:

1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 2726.

2.7 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

2.8 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.2 INSTALLATION OF PATHWAYS

A. Underground Service Entrance: Install conduit at least 24 inches below finish grade; encase in at least 3 inches thick concrete for at least 60 inches out from the building line. Provide foil backed warning tape in trench from building line to utility pedestal.

B. Install pathways with the following minimum clearances:

1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches from power conduits and cables and panelboards.
3. 5 inches from fluorescent and high frequency lighting fixtures.
4. 6 inches from flues, hot water pipes, and steam pipes.

C. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

D. Conduit:

1. Provide conduit in all inaccessible areas, crawlspaces, walls, and where exposed to view unless indicated below.
    a. Do not install more than 2 (two) 90 degree bends in a single horizontal cable run.
    b. Leave pull cords in place where cables are not initially installed.
    c. Conceal conduit under floor slabs and within finished walls, ceilings, and floors except where specifically indicated to be exposed.
        1) Conduit may remain exposed to view in mechanical rooms, electrical rooms, and telecommunications rooms.
        2) Treat conduit in crawl spaces and under floor slabs as if exposed to view.
        3) Where exposed to view, install parallel with or at right angles to ceilings, walls, and structural members.
        4) Under floor slabs, locate conduit at 12 inches, minimum, below vapor retarder; seal penetrations of vapor retarder around conduit.

E. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 26 0534 as required for installation of telecommunications outlets provided under this section.
    a. Mounting Heights: Unless otherwise indicated, as follows:

1) Telephone and Data Outlets: 18 inches above finished floor.

b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

c. Locate outlet boxes so that wall plate does not span different building finishes.

d. Grounding and Bonding: Perform in accordance with ANSI/J-STD-607 and NFPA 70.

2. Cable trays, D-rings, J-hooks, cable troughs:

a. Provide cable trays, D-rings, J-hooks, or cable troughs unless shown otherwise in plenums accessible ceilings, and areas not exposed to view.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.

2. Do not over-cinch or crush cables.

3. Do not exceed manufacturer's recommended cable pull tension.

4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames: 60 inches.

2. At Outlets - Copper: 12 inches.

C. Copper Cabling:

1. Category 5e/6/6A: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.

2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.

3. Use T568B wiring configuration.

4. Copper Cabling Not in Conduit: Use only type CMP plenum-rated cable as specified.

5. For all cable, provide NFPA 70 type CMP plenum-rated cable.

D. Field-Installed Labels: Comply with TIA/EIA-606 using encoded identifiers.

1. Cables: Install color coded labels on both ends.

2. Outlets: Label each jack on its face plate as to its type and function, with a unique numerical identifier.

3. Patch Panels: Label each jack as to its type and function, with a unique numerical identifier.

E. Install all equipment listed above in racks at locations coordinated by owner IT representative.

3.4 FIELD QUALITY CONTROL

A. EC to provide all testing. Comply with inspection and testing requirements of specified installation standards.

B. Visual Inspection:

   1. Inspect cable jackets for certification markings.

   2. Inspect cable terminations for color coded labels of proper type.

   3. Inspect outlet plates and patch panels for complete labels.

C. Testing - Copper Cabling and Associated Equipment:

   1. Test backbone cables after termination but before cross-connection.

   2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.

   3. Test operation of shorting bars in connection blocks.

   4. Category 6 Backbone: Perform near end cross talk (NEXT) and attenuation tests.

   5. Category 6 Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

D. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

   1. Provide a copy of the copper certification with the O&M manuals.

END OF SECTION

DIVISION

28

ELECTRONIC SAFETY AND SECURITY

SECTION 28 4600 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

D. NFPA 70 - National Electrical Code.

E. NFPA 72 - National Fire Alarm and Signaling Code.

F. NFPA 101 - Life Safety Code.

1.2 SUBMITTALS

A. See Section 260010 - General Electrical Requirements

B. Proposal Documents: Submit the following with cost/time proposal:

1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
3. Certification by Contractor that the system design will comply with Contract Documents.
4. Proposed maintenance contract.

C. Drawings must be prepared AutoCad.

D. Evidence of designer qualifications.

E. 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. Copy (if any) of list of data required by authority having jurisdiction.
2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
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. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
9. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
10. Certification by Contractor that the system design complies with Contract Documents.
11. Do not show existing components to be removed.

F. Evidence of installer qualifications.

G. Evidence of instructor qualifications; training lesson plan outline.

H. 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.

I. Operating and Maintenance Data: Revise and resubmit until acceptable; have one set available during closeout demonstration:

J. 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.

K. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's 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.

1.3 QUALITY ASSURANCE

A. 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.

B. Installer Qualifications: Firm with minimum 3 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 2 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 200 miles of project site.
5. Certified in the State in which the Project is located as fire alarm installer.

C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.4 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.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Alarm Control Units and Accessories - Basis of Design: Potter Electric Signal Company, as indicated under product descriptions below; www.pottersignal.com/#sle.

1. Existing fire alarm control unit is a Potter IP-60.

B. Initiating Devices and Notification Appliances:

1. Gentex Corporation.
2. System Sensor; a GE-Honeywell Company.
3. Or Approved Equal.
4. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

2.2 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:

1. Provide all components necessary, regardless of whether shown in Contract Documents or not.

2. Protected Premises: Entire building shown on drawings.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    a. ADA Standards.
    b. The requirements of the State Fire Marshal.
    c. The requirements of the local authority having jurisdiction.
    d. Applicable local codes.
    e. 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.
4. Evacuation Alarm: Single smoke zone; general evacuation of entire premises.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: Via existing system.

C. Circuits:
1. Initiating Device Circuits (IDC): Match existing.
2. Signaling Line Circuits (SLC) Within Single Building: Match existing.
3. Notification Appliance Circuits (NAC): Match existing.

2.3 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. Clearly label components that are "Not In Service."

C. Remove unused existing components and materials from site and dispose of properly.

2.4 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.

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. Refer to Section 08 7100.

2.5 COMPONENTS

A. General:

1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Conventional type; listed, classified, and labeled as suitable for the purpose intended.

C. Initiating Devices:

1. MANUAL FIRE ALARM BOXES
    a. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
        1) Single-action mechanism, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
2. SYSTEM SMOKE DETECTORS
    a. General Description:
        1) UL 268 listed, operating at 24-V dc, nominal.
        2) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
        3) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
    b. Photoelectric Smoke Detectors:
        1) Sensor: LED or infrared light source with matching silicon-cell receiver.
        2) Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.
    c. Duct Smoke Detectors:
        1) Photoelectric Smoke Detectors:
            (a) Sensor: LED or infrared light source with matching silicon-cell receiver.
            (b) Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

2) UL 268A listed, operating at 24-V dc, nominal.

3) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

4) Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.

5) Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status. Provide remote status and alarm indicator and test station where indicated.

6) Each sensor shall have multiple levels of detection sensitivity.

7) Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.

8) Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

D. Notification Appliances:

1. NOTIFICATION APPLIANCES

a. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn.

b. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1) Rated Light Output: Noted on drawings.

E. Circuit Conductors: Copper; provide 200 feet extra; color code and label.

F. 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

3.1 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and 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.

E. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

G. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.

I. WIRING INSTALLATION

1. Install wiring according to the following:

a. NECA 1.

b. TIA/EIA 568-A.

2. Wiring Method:

a. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.

b. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

3. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

4. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

5. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

6. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

J. IDENTIFICATION

1. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."

2. Install instructions frame in a location visible from the FACP.

3. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.2 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.

H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.

1. Record all system operations and malfunctions.

2. If a malfunction occurs, start diagnostic period over after correction of malfunction.

3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.

4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.3 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:

1. Hands-On Instruction: On-site, using operational system.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:

1. Initial Training: 1 session pre-closeout.

C. 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.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.4 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.

END OF SECTION