SPECIFICATION

FOR

FIRE STATION #7 APPARATUS STORAGE

885 SE 31ST ST, OCALA, FL 34471

FOR

City of Ocala

PROJECT #: 52-0001

DATE PREPARED: 10/10/2025

MONARCH
DESIGN GROUP

112 SW 6th St,
Gainesville, FL 32601
(352) 378-4400

SECTION 000101
PROJECT TITLE PAGE

PROJECT MANUAL

FOR

CITY OF OCALA FIRE STATION #7 APPARATUS STORAGE

ARCHITECT'S PROJECT NUMBER: 52-0001

PROJECT LOCATION ADDRESS: 885 SE 31ST ST, OCALA, FL 34471

DATE: 10/13/2025

PREPARED BY:

MONARCH DESIGN GROUP

END OF SECTION 000101

SECTION 000102
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: City of Ocala Fire Station #7 Apparatus Storage, located at: 885 SE 31st ST, Ocala, FL 34471.

B. Architect's Project Number: 52-0001

C. The Owner, hereinafter referred to as Owner: City of Ocala

D. Owner's Project Manager: Sean Lanier, PE.

1.02 NOTICE TO PROSPECTIVE BIDDERS

A. These documents constitute an Invitation to Bid to and request for qualifications from General Contractors for the construction of the project described below.

1.03 PROJECT DESCRIPTION

A. Summary Project Description: THE PROJECT CONSISTS OF THE INSTALLATION OF A NEW PRE-ENGINEERED METAL BUILDING (PEMB) TO SERVE AS AUXILIARY APPARATUS STORAGE FOR THE CITY OF OCALA FIRE STATION #7. THE NEW CONSTRUCTION WILL INCLUDE METAL PANEL SIDING COMBINED WITH PARTIAL MESH EXTERIOR SIDING, ADDITIONAL CANOPIES, EXTERIOR SIGNAGE, AND ONE ENCLOSED SHOP AREA WITHIN THE STRUCTURE EQUIPPED WITH A ROLLING DOOR AND DESIGNATED WORKBENCH SPACE. COORDINATION WILL BE REQUIRED WITH STRUCTURAL ENGINEERING FOR SLAB SLOPE REQUIREMENTS, WITH CIVIL ENGINEERING FOR OVERALL SITE CONFIGURATION AND RELOCATION OF PARKING AND THE DUMPSTER PAD, AND WITH MEP ENGINEERING FOR INTEGRATION OF THE AIR COMPRESSOR SYSTEM, EXTERIOR HOSE BIB HOOKUPS, AND EXTERIOR LIGHTING. AS AN ADD ALTERNATE, PRICING WILL BE PROVIDED FOR AN EXHAUST REMOVAL SYSTEM SERVING THE APPARATUS BAYS TO BE EVALUATED FOR INCLUSION IN THE FINAL SCOPE.

1.04 PROJECT CONSULTANTS

A. The Architect, hereinafter referred to as Architect: Monarch Design Group.

1.05 PROCUREMENT TIMETABLE

A. Last Request for Substitution Due: 7 days prior to due date of bids.

B. Last Request for Information Due: 7 days prior to due date of bids.

C. Bid Due Date: MM-dd-yyyy, before 4 PM local time.

D. Bid Opening: Same day, 5 PM local time.

E. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.06 PROCUREMENT DOCUMENTS

A. Availability of Documents: Complete sets of procurement documents may be obtained:
   1. From Owner at the Project Manager's address listed above.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 000102

SECTION 000103
PROJECT DIRECTORY

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 OWNER:

A. Name: City of Ocala
   1. Address Line 1: 1105 SW 7th Rd.
   2. City: Ocala.
   3. State: FL.
   4. Zip Code: 34471.
   5. Telephone: 352-671-6901.

B. Primary Contact: All correspondence from the Contractor to the Architect will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Title: City Engineer.
   2. Name: Sean Lanier.
   3. Email: slanier@ocalafl.gov.

1.03 CONSULTANTS:

A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Company Name: Monarch Design Group
      a. Address Line 1: 112 SW 6th St.
      b. City: Gainesville .
      c. State: FL.
      d. Zip Code: 32601.
      e. Telephone: 352-378-4400.
   2. Primary Contact:
      a. Title: Principal/Architect.
      b. Name: Barnett Chenault, III.
      c. Email: barnett@monarcharchitecture.com.
   3. Second Contact:
      a. Title: Director of Production
      b. Name: Claudia Casal
      c. Email: claudia@monarcharchitecture.com

B. Civil Engineering Consultant:
   1. Company Name: Kimley Horn.
      a. Address Line 1: 1700 SE 17th Street, Suite 200.
      b. City: Ocala.
      c. State: Florida.
      d. Zip Code: 34471.
      e. Telephone: 352-438-3000.
   2. Primary Contact:
      a. Title: Civil Engineer.
      b. Name: Jose A. Lopez Jr,, P.E..
      c. Email: Jose.Lopez@kimley-horn.com.

C. Structural Engineering Consultant:
   1. Company Name: Wayland Structural Engineering (WSE).
      a. Address Line 1: 546 Southeast 3rd Avenue.
      b. City: Gainesville.

c. State: FL.
d. Zip Code: 32608.
e. Telephone: (352) 331 - 0727.

2. Primary Contact:
a. Title: Sructural Engineer.
b. Name: Greg Wayland.
c. Email: waylandgs@aol.com.

D. Engineering Consultant - Mechanical, Electrical & Plumbing:
1. Company Name: Campbell Spellicy Engineering, Inc. (CSE).
a. Address Line 1: 3720 NW 43rd Street, Suite 106.
b. City: Gainesville.
c. State: FL.
d. Zip Code: 32606.
e. Telephone: 352.372.6967.

2. Primary Contact:
a. Title: Project Manager.
b. Name: Jose Alzate.
c. Email: spellicy@campbellspellicy.com.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 000103

SECTION 000110
TABLE OF CONTENTS

2.07 DIVISION 10 -- SPECIALTIES

A. 101419 - Dimensional Letter Signage
B. 104400 - Fire Protection Specialties
C. 108213 - Exterior Grilles and Screens

2.08 DIVISION 13 -- SPECIAL CONSTRUCTION

A. 133419 - Metal Building Systems

2.09 DIVISION 21 -- FIRE SUPPRESSION

2.10 DIVISION 22 -- PLUMBING

A. 220500 - COMMON WORK RESULTS FOR PLUMBING
B. 220517 - SLEEVE AND SLEEVE SEALS FOR PLUMBING PIPING
C. 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING
D. 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
E. 220553 - IDENTIFICATION FOR PLUMBING EQUIPMENT AND PIPING
F. 220700 - INSULATION FOR PLUMBING EQUIPMENT AND PIPING
G. 221113 - SITE WATER DISTRIBUTION PIPING
H. 221116 - DOMESTRIC WATER PIPING
I. 221500 - COMPRESSED AIR SYSTEMS

2.11 DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

A. 230500 - COMMON WORK RESULTS FOR HVAC
B. 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
C. 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC
D. 232300 - REFRIGERANT PIPING
E. 233400 - HVAC FANS
F. 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

2.12 DIVISION 26 -- ELECTRICAL

A. 260500 - COMMON WORK RESULTS FOR ELECTRICAL
B. 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
C. 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
D. 262416 - PANELBOARDS
E. 262726 - WIRING DEVICES
F. 262813 - FUSES
G. 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS
H. 265119 - LED INTERIOR LIGHTING

END OF SECTION 000110

SECTION 000115
LIST OF DRAWING SHEETS

GENERAL

G000 - COVER SHEET

G001 - PROJECT DATA

G002 - CODE SUMMARY & LIFE SAFETY PLAN

ARCHITECTURAL - PLANS

A100 - ARCHITECTURAL SITE PLAN

A101 - FLOOR PLAN AND RCP

A110 - ROOF PLAN

ARCHITECTURAL - ELEVATIONS

A201 - ELEVATIONS

ARCHITECTURAL - SECTIONS

A301 - BUILDING SECTIONS

ARCHITECTURAL - WALL SECTIONS

A401 - WALL SECTIONS

ARCHITECTURAL - H/J/S

A501 - H/J/S

ARCHITECTURAL - DETAILS

A701 - EXTERIOR PEMB DETAILS

A702 - DETAILS

SCHEDULES

A801 - SCHEDULES/LEGENDS

STRUCTURAL

S101 - STRUCTURAL NOTES

S201 - FOUNDATION PLAN & DETAILS`

MECHANICAL

M001 - MECHANICAL LEGEND, ABBREVIATIONS, NOTES, DETAILS, AND SCHEDULES

M201 - MECHANICAL FLOOR PLAN - NEW WORK

PLUMBING

P001 - PLUMBING LEGEND ABBREVIATIONS, NOTES, DETAILS AND SCHEDULES

P201 - PLUMBING FLOOR PLAN - DOMESTIC WATER

ELECTRICAL

E001 - ELECTRICAL LEGEND, ABBREVIATIONS, NOTES, AND DETAILS

E201 - ELECTRICAL CEILING PLAN - LIGHTING

E202 - ELECTRICAL FLOOR PLAN - POWER AND SYSTEMS

E301 - ELECTRICAL SCHEDULES

END OF SECTION 000115

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Fire Station 7 Apparatus Storage.

B. Owner's Name: City of Ocala.

C. Architect's Name: Monarch Design Group.

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

E. The Project consists of the THE INSTALLATION OF A NEW PRE-ENGINEERED METAL BUILDING (PEMB) TO SERVE AS AUXILIARY APPARATUS STORAGE FOR THE CITY OF OCALA FIRE STATION #7. THE NEW CONSTRUCTION WILL INCLUDE METAL PANEL SIDING COMBINED WITH PARTIAL MESH EXTERIOR SIDING, ADDITIONAL CANOPIES, EXTERIOR SIGNAGE, AND ONE ENCLOSED SHOP AREA WITHIN THE STRUCTURE EQUIPPED WITH A ROLLING DOOR AND DESIGNATED WORKBENCH SPACE. COORDINATION WILL BE REQUIRED WITH STRUCTURAL ENGINEERING FOR SLAB SLOPE REQUIREMENTS, WITH CIVIL ENGINEERING FOR OVERALL SITE CONFIGURATION AND RELOCATION OF PARKING AND THE DUMPSTER PAD, AND WITH MEP ENGINEERING FOR INTEGRATION OF THE AIR COMPRESSOR SYSTEM, EXTERIOR HOSE BIB HOOKUPS, AND EXTERIOR LIGHTING. AS AN ADD ALTERNATE, PRICING WILL BE PROVIDED FOR AN EXHAUST REMOVAL SYSTEM SERVING THE APPARATUS BAYS TO BE EVALUATED FOR INCLUSION IN THE FINAL SCOPE..

1.02 CONTRACT DESCRIPTION

A. General
   1. Work included: This Section applies to situations in which the Contractor or his representatives, including, but not necessarily limited to, suppliers, subcontractors, employees, and field engineers, enter upon the Owner's property.
   2. Contractor shall provide full-time, on-site supervision. Should the supervisor leave the project site, he/she must appoint someone to act as supervisor until he/she returns. The Supervisor shall be responsible for job-site safety conditions, knowledge of MSDS sheets, and emergency contact numbers as well as for the performance of the work.

B. Quality Assurance
   1. Promptly upon award of the Contract, notify all pertinent personnel regarding requirements of this Section.
   2. Require that all personnel who will enter upon the Owner's property certify their awareness of and familiarity with the requirements of this Section.
   3. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Notifications
   1. Secure Owner's approval prior to entering upon the Owner's property in connection with the work of the Contract.

D. Contractor's Vehicles
   1. Provide adequate protection for curbs and sidewalks over which trucks and equipment pass to reach the job site.
   2. Require Contractor's vehicles, vehicles belonging to employees of the Contractor, and all other vehicles entering upon the Owner's property in performance of the work of the Contract, to use only the direct access route and actual site of the work.
   3. Do not permit such vehicles to park on any street or other area of the Owner's property unless directed by the Owner.

E. Security

1. As needed, the Contractor shall coordinate with City/County Traffic & Engineering regarding the approval of, provision, and installation of traffic signs to warn motorists of the construction zone. As needed, signs, at minimum, shall be placed at each end of each street that crosses or fronts the project site.

F. Safety
   1. Contractor shall use every means to protect the safety of the occupants and staff and visitors. Contractor shall, at a minimum, provide the following safety standards:
      a. Keep vehicle and tools and materials locked at all times when unattended.
      b. Temporary toilets shall be locked and protected from overturning.
      c. Vehicles removing debris shall be properly covered.
      d. Exterior of building shall be barricaded (safety tape acceptable) during the course of the work.
      e. Site shall be picked-up at all times and at end of each work day. Do NOT leave tools, fasteners, unlocked vehicles, materials, trash or other items unattended.
      f. Maintain speed limits.
      g. No smoking on site.
      h. Submit Contractors Safety Plan/Policy and Sexual Harassment Policy
      i. Comply with other safety items as may be requested from time to time by the Owner or Architect
   2. The Owner reserves the right to VOID the Contractors contract if Safety measures are not kept

G. Sexual Harassment Policy Minimum Requirements:
   1. It is the policy of the Owner that it will not tolerate verbal or physical conduct by any employee which harasses, disrupts, or interferes with another's work performance or which creates an intimidating, offensive, or hostile environment on the Project Site or to those members of the Public in the immediate vicinity of the Project Site.
   2. While all forms of harassment are prohibited, it is the Owner's policy to emphasize that sexual harassment is specifically prohibited. The Contractor's designated Superintendent has a responsibility to maintain the work place free of any form of sexual harassment. No superintendent is to threaten or insinuate, either explicitly or implicitly, that an employee's or subcontractor's refusal to submit to sexual advances will adversely affect the employee's or subcontractor's employment, evaluation, wages, advancement, assigned duties, shifts, or any other condition of employment or career development. In addition, no superintendent is to favor in any way any applicant, subcontractor or employee because that person has performed or shown a willingness to perform sexual favors for the superintendent
   3. Other sexually harassing conduct in the workplace, whether committed by the Contractor's or any of the Subcontractor's personnel, and whether committed to another person on the Project Site or a person in the immediate vicinity of the Project Site is also prohibited. Such conduct includes but is not limited to:
      a. Sexual flirtations, touching, advances, or propositions
      b. Verbal abuse of a sexual nature.
      c. Graphic or suggestive comments about an individual's dress or body.
      d. Sexually degrading words to describe an individual.
      e. The display in the work place of sexually suggestive objects or pictures, including nude photographs.
   4. Any employee of the contractor, subcontractor, or member of the public who believes that the actions or words of the superintendent, subcontractors or employees thereof constitute unwelcome harassment has a responsibility to report or complain as soon as possible to the superintendent or to the Owner's representative, if the complaint involves the superintendent or other employees of the Contractor.
   5. All complaints of harassment must be investigated promptly and in an impartial and in as confidential a manner as possible by the superintendent or Owner's representative. If a person is not satisfied with the processing of a complaint or the action taken by the

supervisor, then that person should bring the complaint to the attention of the Owner's Representative. In all cases, the person is to be advised of the superintendent's or Owner's Representative's findings and conclusions.

6. Any employee of the Contractor, subcontractor, or superintendent who is found after appropriate investigation to have engaged in harassment of another employee or member of the public while on the Project Site will be subject to appropriate disciplinary action, depending on the circumstances, up to and including termination.

H. Dress Code

1. All workers on the job site shall wear OSHA approved work shoes and hardhats. Pants or shorts shall be no shorter than mid-thigh length, and shall not have any offensive holes, tears, or slits. Shirts shall have sleeves at least 3" in length. Clothing may not display any offensive language or images. Offensive language/images shall be as determined by the Owner or Architect. Workers found in violation will be instructed to leave the job site and not to return until compliant attire is worn.

1.03 OWNER OCCUPANCY

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

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

C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

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

B. Arrange use of site and premises to allow:

1. Owner occupancy.

C. Provide access to and from site as required by law and by Owner:

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

END OF SECTION 011000

SECTION 012300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

1.02 ACCEPTANCE OF ALTERNATES

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

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

1.03 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Exterior Exhaust Fans:

1. Base Bid Item: Exterior Exhaust Fans - Section 23 34 00 and Drawing number 1/A201, 2/A201, 4/A301

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012300

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

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

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

C. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of outdoor substitute products.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

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 coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

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

C. "Or Equivalent"
   1. Where the phrase "or equivalent" or "or equivalent as approved by the Architect/Engineer," occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equivalent unless the item has been specifically so approved for this Work by the Architect/Engineer.
   2. The decision of the Architect/Engineer shall be final.

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

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

1. No specific form is required. Contractor's Substitution Request documentation must include the following:
    a. Project Information:
        1) Official project name and number, and any additional required identifiers established in Contract Documents.
    b. Substitution Request Information:
        1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
        2) Indication of whether the substitution is for cause or convenience.
        3) Issue date.
        4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
        5) Description of Substitution.
        6) Reason why the specified item cannot be provided.
        7) Differences between proposed substitution and specified item.
    c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
        1) Physical characteristics.
        2) In-service performance.
        3) Expected durability.
        4) Visual effect.
        5) Warranties.
        6) Include, as appropriate or requested, the following types of documentation:
            (a) Product Data:
            (b) Samples.
            (c) Drawings, when required to show impact on adjacent construction elements.
    d. Impact of Substitution:
        1) Savings to Owner for accepting substitution.
        2) Change to Contract Time due to accepting substitution.

F. 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 CONSTRUCTION

A. Architect will consider requests for substitutions only within 45 days after date of Agreement.

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

C. Submit request for Substitution for Convenience immediately upon 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.

3.03 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.

3.04 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.

3.05 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 012500

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Web-based project software service.

C. Electronic document submittal service.

D. Preconstruction meeting.

E. Progress meetings.

F. Construction progress schedule.

G. Coordination drawings.

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

I. Number of copies of submittals.

J. Requests for Interpretation (RFI) procedures.

K. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 013329.02 - Sustainable Design Reporting - LEED v4: Reporting related to sustainability certification project procedures.

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

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

1.03 REFERENCE STANDARDS

A. AIA G716 - Request for Information; 2004.

B. AIA G810 - Transmittal Letter; 2001.

C. CSI/CSC Form 12.1A - Submittal Transmittal; Current Edition.

D. CSI/CSC Form 13.2A - Request for Information; Current Edition.

1.04 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 Information (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.

1.05 PROJECT COORDINATOR

A. Project Coordinator: Construction Manager.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 011000 - Summary.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for Information.
   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: Provide, administer, and use web-based project software to host and manage project communication and documentation.
   1. Include, at minimum, the following features:
      a. Project directory, including Owner, Contractor, subcontractors, Architect, Architect's consultants, and other entities involved in the project. Include names of contact persons and contact information for each entity.
      b. Access control for each entity and for each workflow process to determine each entity's digital rights to create, modify, view, and print documents.
      c. Workflow planning, allowing customization of workflow for each project entity.
      d. Creation, logging, tracking, and notification for project communications.
      e. Tracking of project communication statuses in real time, including timestamped response log.
      f. Procedures for viewing PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
      g. Processing and tracking of payment applications.
      h. Processing and tracking of contract modifications.
      i. Creation and distribution of meeting minutes.
      j. Document management for drawings, specifications, and coordination drawings, including revision control.
      k. Management of construction progress photographs.
      l. Mobile device compatibility.
      m. Creation of data analytics reports.
      n. Creation and export of editable logs for software functions. Provide Owner, Architect, and Architect's consultants with rights and ability to download logs when requested.
   2. Provide up to 20 user licenses for use by Owner, Architect, Architect's consultants, and other entities involved in the project.
   3. Comply with the software service's current published licensing agreements.

4. Training: Provide one-hour, web-based training session for users of software service. Further training is the responsibility of the user.
    a. Representatives of Owner are scheduled and included in this training.
5. Project Closeout: Architect determines when to terminate the software service for the project and is responsible for obtaining archive copies of files for Owner.
6. Web-Based Project Software Services: The selected service is:

3.02 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via 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 Information (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. Contractor and Architect are required to use this service.
    3. It is Contractor's responsibility to submit documents in allowable format.
    4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
    5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
    6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
    7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.03 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.

B. Attendance Required:
    1. Owner.
    2. Architect.
    3. Contractor.

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

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

3.04 PROGRESS MEETINGS

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

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

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

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

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

3.05 CONSTRUCTION PROGRESS SCHEDULE

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

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

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

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

E. Submit updated schedule with each Application for Payment.

3.06 COORDINATION DRAWINGS

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

B. Review drawings prior to submission to Architect.

3.07 REQUESTS FOR INFORMATION (RFI)

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

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

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
   2. Prepare using software provided by the Electronic Document Submittal Service.
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
   3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
      a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. 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).

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

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

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.

3.08 SUBMITTALS FOR REVIEW

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

4. Samples for verification.

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

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

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

3.09 SUBMITTALS FOR INFORMATION

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

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

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

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

3.11 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: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

A. General Requirements:
1. Consecutively number all submittals according to CSI Section number. (Number sequentially in order that electronic files will sort in order).

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. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

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

3.13 SUBMITTAL REVIEW

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

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

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

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "Approved", or language with same legal meaning.
b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
2. Not Authorizing fabrication, delivery, and installation:
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 013000

SECTION 013216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 011000 - Summary: Work sequence.

1.03 REFERENCE STANDARDS

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

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2016, with Addendum (2021).

1.04 SUBMITTALS

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

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

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

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

E. Submit updated schedule with each Application for Payment.

F. Submit in PDF format.

1.05 QUALITY ASSURANCE

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

B. Contractor's Administrative Personnel: 1 years minimum experience in using and monitoring CPM schedules on comparable projects.

1.06 SCHEDULE FORMAT

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

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

C. Sheet Size: Multiples of 8-1/2 x 11 inches (216 x 280 mm).

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

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

3.02 CONTENT

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

B. Identify each item by specification section number.

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

D. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

E. Indicate delivery dates for owner-furnished products.

F. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

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

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

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

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

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

3.05 UPDATING SCHEDULE

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

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

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

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

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

F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

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

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

END OF SECTION 013216

SECTION 013329.02
SUSTAINABLE DESIGN REPORTING - LEED V4

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General requirements for sustainable design reporting.
   1. This project intends to be constructed using procedures and documentation complying with the federally mandated "Guiding Principles" (GP), Third Party Certification (TPC) requirements (if applicable), UFC 1-200-02, High Performance and Sustainable Building Requirements, and other requirements identified in this specification.

1.02 REPORTING REQUIREMENTS

A. Free-standing furniture and furnishings are not included in the Contract.

B. Contractor must familiarize himself with the relevant reporting requirements and provide the necessary information and instruction to all subcontractors and installers.

1.03 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: General submittal requirements.

B. Section 013329.04 - Material Content Form: Form with checklist for documenting product content, emissions, health effects, sources, and costs.

C. Section 013566.12 - Sustainability Certification Project Procedures - LEED v4.

D. Section 016000 - Product Requirements.

E. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

F. Section 017419 - Construction Waste Management and Disposal.

1.04 PRODUCT REPORTING SCOPE

A. General: Product reporting scope for the purpose of achieving the selected sustainability certification level is limited to those items directly affecting ability to achieve targeted credits.
   1. Environmental Product Declarations (EPD): Documentation complying with definition and quality requirements in Section 016000 - Product Requirements.
   2. Multi-Attribute Product Certifications: Documentation complying with definition and quality requirements in Section 016000 - Product Requirements.

B. LEED Product Reporting Scope (for MR and EQ Credits): May include any of the products specified in Divisions 2 through 14, 31, and 32, and the following:
   1. All paints, coatings, adhesives, and sealants that are used but not specified.
   2. Composite wood that is permanently installed but not specified.
   3. Plumbing and HVAC piping and pipe insulation.
   4. Electrical conduit and lighting fixture housings.

1.05 REFERENCE STANDARDS

A. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute; Current Edition.

B. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; Current Edition.

C. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

D. USGBC LEED v4-BD+C - LEED v4 for Building Design and Construction; 2019.

E. USGBC LEED v4-ID+C - LEED v4 for Interior Design and Construction; 2019.

1.06 SUBMITTALS

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

B. Sustainable Design Documentation: The scope of required documentation is specified in this section and in applicable individual specification sections.

C. LEED v4 Prerequisites and Credits - Documentation is required for the following items:
   1. New Product Documentation:
      a. Materials and Resources: Use the Building Product Disclosure and Optimization (BPDO) Calculator spreadsheet software available from USGBC to track and document materials and products purchases and use. Use for documentation of USGBC LEED v4-BD+C and USGBC LEED v4-ID+C MR Credits.
      b. Building Product Disclosure and Optimization - Environmental Product Declarations.
         1) Submit information for the required number and sources of Environmental Product Declarations complying with LEED reporting requirements.
      c. Building Product Disclosure and Optimization - Sourcing of Raw Materials.
         1) Raw Materials' Suppliers self-declared reports on sourcing and extracting, or, preferably, third-party verified corporate sustainability reports (CSR).
      d. Building Product Disclosure and Optimization - Material Ingredients.
         1) Material Ingredient Reporting: Use, as is appropriate:
            (a) C2C (DIR) Cradle-to-Cradle certifications.
         2) Material Ingredient Optimization: Use, as is appropriate:
            (a) GreenScreen (METH) GreenScreen v1.2 Benchmark reports.
            (b) C2C (DIR)Cradle-to-Cradle certifications.
   2. Waste Disposal Management: Periodic reports quantifying diversion of construction waste away from landfills and incineration facilities.
      a. Include information on percentage of diverted material and number of material streams.
   3. Volume Calculations: When required to document EQ Credit Low-Emitting Materials, Option 1, submit volume calculations for the following items:
      a. Interior paints and coatings applied on site.
         1) General Emissions Evaluation for paints and coatings applied to walls, floors, and ceilings.
         2) VOC content requirements for wet applied products.
      b. Interior adhesives and sealants applied on site (including flooring adhesive).
         1) General Emissions Evaluation.
         2) VOC content requirements for wet applied products.
   4. Composite wood: Submit composite wood evaluation information for all materials not covered by another product category.
   5. Ceilings, walls, thermal, and acoustic insulation: Submit general emissions evaluation for all products.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROCEDURES

A. Submit sustainable design documentation required of Contractor, using procedures defined under Submittals for Information in Section 013000.

B. Submit sustainable design documentation to Architect, unless otherwise indicated.

C. Where an item of sustainable design documentation is specified, fill out and submit electronically the appropriate forms, using appropriate software.
   1. Fill out one line for each different brand name product and each different manufacturer of a lot of commodity products.
   2. Where required attachments are specified, attach the documentation.
   3. Mark each blank with the appropriate information; use "ATT" for items attached; if any item is not relevant use the code "NR"; if any item is not available use the code "NA".

D. Each form must be signed by the entity capable of certifying the information.

1. Certification signatures must be made by an officer of the company.
2. For products, certification must be made by the manufacturer not the supplier.
3. For custom fabricated products, certification by the fabricator is acceptable.

E. Submit the completed forms in accordance with the requirements of Section 013000, as information submittals.
   1. Give each form a unique submittal number.
   2. Do not combine sustainable design documentation with product data or shop drawing submittals.

END OF SECTION 013329.02

SECTION 013329.04
MATERIAL CONTENT FORM

PROJECT NAME: 52-0001 - COO - FIRE STATION 7 APPARATUS STORAGE; NO.: 45556.

1.01 APPLICABLE SPECIFICATION SECTION NUMBER(S) _____

1.02 PRODUCT NAME: _____ (BRAND NAME, MODEL NUMBER, ETC.)

1.03 MANUFACTURER NAME: _____ WWW._____

1.04 SOURCE LOCATION: _____ (IF PROCESSED AT MULTIPLE LOCATIONS, ATTACH A DESCRIPTION; SEE SECTION 016000)

PRODUCT CONTENT

2.01 TOTAL WEIGHT (MASS): _____ POUNDS (KG) PER _____ (UNIT).

2.02 ENVIRONMENTAL PRODUCT DECLARATION (EPD) _____ IS ATTACHED OR _____ IS NOT AVAILABLE.

2.03 _____ % SOLID WOOD, WOOD CHIP, AND WOOD FIBER CONTENT, BY WEIGHT (MASS).

A. ____ Product is FSC-trademarked.

B. ____ FSC Chain-of-Custody certificate number is _____

C. ____ SFI Certified ____ ATFS Certified ____ SFM Certified.

2.04 _____ % OTHER BIO-BASED CONTENT, BY WEIGHT (MASS); SOURCED FROM A SAN-CERTIFIED FARM.

2.05 _____ % STEEL CONTENT, BY WEIGHT (MASS).

A. ____ Steel Mill Source is: _____

B. ____ Mill letter describing mill process and typical re-used steel content is attached.

2.06 _____ % PRE-CONSUMER (POST-INDUSTRIAL) RECYCLED CONTENT, BY WEIGHT (MASS), OTHER THAN STEEL.

2.07 _____ % POST-CONSUMER RECYCLED CONTENT, BY WEIGHT (MASS), OTHER THAN STEEL.

2.08 _____ ZERO LEAD CONTENT.

2.09 _____ ZERO ASBESTOS CONTENT.

2.10 _____ ZERO INTENTIONALLY ADDED METHYLENE CHLORIDE OR PERCHLOROETHYLENE (PAINTS AND COATINGS).

2.11 _____ ZERO INTENTIONALLY ADDED CADMIUM (PAINTS AND COATINGS).

EMISSIONS AND HEALTH

3.01 HEALTH PRODUCT DECLARATION (HPD) _____ IS ATTACHED OR _____ IS NOT AVAILABLE.

3.02 _____ FORMALDEHYDE: COMPLYING WITH CARB COMPOSITE WOOD REGULATION FOR ULEF OR NO ADDED FORMALDEHYDE RESIN.

3.03 _____ LOW-EMITTING MATERIAL MEETING REQUIREMENTS OF CAL (CDPH SM), PRIVATE OFFICE SCENARIO.

3.04 WET-APPLIED PRODUCTS:

3.05 _____ VOC CONTENT MEETING SCAQMD RULE 1113.

3.06 _____ VOC CONTENT: MEETING CARB 2007, SCM FOR ARCHITECTURAL COATINGS.

3.07 _____ VOC CONTENT MEETS SCAQMD RULE 1168.

3.08 _____ OTHER VOC CONTENT TEST REPORTS; SEE SECTION 013329.02 - SUSTAINABLE DESIGN REPORTING - LEED V4.

CERTIFIED BY: (MANUFACTURER)

4.01 _____ DOCUMENTATION OF ALL CLAIMS MADE ABOVE IS ATTACHED.

4.02 PRINT NAME:_____

4.03 SIGNATURE:_____

4.04 TITLE: _____ (OFFICER OF COMPANY), DATE: _____

COST CERTIFICATION

5.01 TOTAL INSTALLED MATERIAL COST OF THIS PRODUCT: $ _____

5.02 NO. OF UNITS INSTALLED: _____ TOTAL VOLUME INSTALLED: _____(WET-APPLIED PRODUCTS)

5.03 CERTIFIED BY: (CONTRACTOR)

A. Print Name: _____

B. Signature: _____

C. Title: _____ (officer of company), Date: _____

END OF SECTION 013329.04

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. Contractor's design-related professional design services.

G. Control of installation.

H. Manufacturers' field services.

I. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 003100 - Available Project Information: Soil investigation data.

B. Section 013000 - Administrative Requirements: Submittal procedures.

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

1.03 REFERENCE STANDARDS

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

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

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

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

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025a.

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

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

H. 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.

1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

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

B. Base design on performance and/or design criteria indicated in individual specification sections.
   1. Submit a Request for Information to Architect if the criteria indicated are not sufficient to perform required design services.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Design of Structural Components: Include development of shop drawings, and performing shop and site work, as described in Section 133419 - Metal Building Systems.

1.07 SUBMITTALS

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

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

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

D. 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.

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.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.

1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.08 QUALITY ASSURANCE

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

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.

C. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.09 REFERENCES AND STANDARDS

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

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

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

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

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

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

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

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

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

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3740, and _____.
   2. Inspection agency: Comply with requirements of ASTM D3740, ASTM E329, and _____.
   3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
   4. Laboratory: Authorized to operate in the State in which the Project is located.
   5. Laboratory Staff: Maintain a full time specialist on staff to review services.
   6. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 3 EXECUTION

2.01 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.

2.02 TESTING AND INSPECTION

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

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

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

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

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

2.03 MANUFACTURERS' FIELD SERVICES

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

B. Submit qualifications of observer to Architect 30 days in advance of required observations.

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

2.04 DEFECT ASSESSMENT

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

END OF SECTION 014000

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dewatering

B. Temporary sanitary facilities.

C. Security requirements.

D. Vehicular access and parking.

E. Waste removal facilities and services.

F. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 013553 - Security Procedures

B. Section 015213 - Field Offices and Sheds.

C. Section 015500 - Vehicular Access and Parking.

1.03 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

1.04 TEMPORARY SANITARY FACILITIES

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

B. Maintain daily in clean and sanitary condition.

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

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

1.06 FENCING

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

1.07 SECURITY - SEE SECTION 013553

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

B. Coordinate with Owner's security program.

1.08 VEHICULAR ACCESS AND PARKING - SEE SECTION 015500

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

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

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

1.09 WASTE REMOVAL

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

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

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

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

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

1.10 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 6 persons.

C. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 015000

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Sustainable design-related product requirements.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

1.02 RELATED REQUIREMENTS

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

B. Section 013329.02 - Sustainable Design Reporting - LEED v4: Reporting requirements.

C. Section 013329.12 - Sustainable Design Reporting - LEED v4.1: Reporting requirements.

D. Section 013566.12 - Sustainability Certification Project Procedures - LEED v4: Requirements for LEED v4 procedures.

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

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

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

B. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute; Current Edition.

C. EN 15804 - Sustainability of Construction Works - Environmental Product Declarations - Core Rules for the Product Category of Construction Products; 2022 (Corrigendum 2021).

D. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; Current Edition.

E. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures; 2006.

F. ISO 14040 - Environmental Management - Life Cycle Assessment - Principles and Framework; 2006, with Amendment (2020).

G. ISO 14044 - Environmental Management - Life Cycle Assessment - Requirements and Guidelines; 2006, with Amendment (2020).

H. ISO 21930 - Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services; 2017.

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

1.04 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. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. 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.

C. 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.

D. 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.

E. Sustainable Design Submittals: Items necessary to document use of sustainable construction materials, products, and practices.
   1. See Section 013566.12 for Contractor's procedures necessary for achievement of targeted LEED v4 sustainability certification level.

1.05 QUALITY ASSURANCE

A. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.

B. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
   1. Good: Product-specific; compliant with ISO 14044.
   2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
   3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
   4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.

C. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
   1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
   2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
   3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
   4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
   5. Acceptable Evidence:
      a. For percentage of recycled content, information from manufacturer.
      b. For cost, Contractor's cost data.

PART 2 PRODUCTS

2.01 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. Made using or containing CFC's or HCFC's.
   2. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 016116.

2. If wet-applied, have lower VOC content, as defined in Section 016116.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 012500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

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

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

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

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

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

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

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

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

3.03 STORAGE AND PROTECTION

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

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

C. Store with seals and labels intact and legible.

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

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

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

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

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

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

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

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

END OF SECTION 016000

SECTION 016116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.

B. Section 013329.02 - Sustainable Design Reporting - LEED v4: Procedures for reporting emissions and VOC content data.

C. Section 014000 - Quality Requirements: Procedures for testing and certifications.

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

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Composite wood.
   4. Products making up wall and ceiling assemblies.
   5. Thermal and acoustical insulation.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).

C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.

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

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

1.05 SUBMITTALS

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

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 016116

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. Demonstration and instruction of Owner personnel.

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

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

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

B. Section 013000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

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

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

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

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.04 QUALIFICATIONS

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

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical

control points necessary for laying out construction work on project of similar size, scope and/or complexity.

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.

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

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

D. Perform dewatering activities, as required, for the duration of the project.

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

F. 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.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1.06 COORDINATION

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

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

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

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

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

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

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

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

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

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

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

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

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

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

3.02 PREPARATION

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

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

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

3.03 PREINSTALLATION MEETINGS

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

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

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

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

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

3.04 LAYING OUT THE WORK

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

B. Promptly notify Architect of any discrepancies discovered.

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

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

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

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

G. Utilize recognized engineering survey practices.

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

I. Periodically verify layouts by same means.

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

3.05 GENERAL INSTALLATION REQUIREMENTS

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

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

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

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

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

3.06 ALTERATIONS

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

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

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

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

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

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

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

H. Clean existing systems and equipment.

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

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

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

3.07 CUTTING AND PATCHING

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

B. See Alterations article above for additional requirements.

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

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

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

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

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

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

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

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

3.08 PROGRESS CLEANING

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

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

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

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

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

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

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

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

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

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

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

3.10 DEMONSTRATION AND INSTRUCTION

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

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

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

3.11 ADJUSTING

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

3.12 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

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

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

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

E. Clean filters of operating equipment.

F. Clean debris from .

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

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

3.13 CLOSEOUT PROCEDURES

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

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

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

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

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

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

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

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

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

3.14 MAINTENANCE

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

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

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

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

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

END OF SECTION 017000

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

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

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

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

D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

E. Develop and follow a Waste Management Plan designed to implement these requirements.

F. The following sources may be useful in developing the Waste Management Plan:

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

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

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 013566.12 - Sustainability Certification Project Procedures - LEED v4: Procedures for sustainable design documentation.

C. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

D. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

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

1.03 DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1.04 SUBMITTALS

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

B. Sustainable Design Submittals: Submit Waste Management Plan and Waste Disposal Reports in accordance with procedures specified in Section 013566.12 - Sustainability Certification Project Procedures - LEED v4.

C. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

4. Incinerator Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
   c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards (cubic meters).
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

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

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

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

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

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

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

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

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

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

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

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

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

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

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

END OF SECTION 017419

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Materials transparency manual.

D. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 007200 - General Conditions and 007300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

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

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

1.03 SUBMITTALS

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

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

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

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.

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

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

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

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

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

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

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

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

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

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

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. 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.

E. 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.
   2. Include Carbon Dioxide Monitoring Protocol.
   3. Include Carbon Monoxide Monitoring Protocol.

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

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

J. Include test and balancing reports.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

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

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

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

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION 017800

SECTION 030516
UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2024.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms (0.6 ng/(s m2 Pa)), maximum.
   2. Thickness: 15 mils (0.4 mm).
   3. Product:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches (150 mm).

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION 030516

SECTION 057700
WIRE MESH & EXPANDED AND PERFORATED METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabrications made of formed metal sheet, secondary supports, and anchors to structure, including:
   1. Wire mesh fabricated panels.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

E. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

F. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2023.

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

H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

I. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2022.

J. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

K. ASTM F594 - Standard Specification for Stainless Steel Nuts; 2022.

L. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric; 2016.

1.04 SUBMITTALS

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

B. Product Data - Sheet Metal Material: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.

C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Differentiate between shop and field fabrication.
   2. Indicate substrates and adjacent work with which the fabrications must be coordinated.
   3. Include large-scale details of anchorages and connecting elements.
   4. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than _____ inches per _____ inches (___ : ___).

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 12 inches (305 mm) square, representing actual product in color and texture.

F. Installer's Qualification Statement.

G. Maintenance Data: Care of finishes and warranty requirements.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating products specified in this section.
   1. With not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. With minimum 3 years of documented experience.
   2. Approved by fabricator.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well-ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of accumulated water.
   4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F (49 degrees C).
   5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Woven Wire Mesh:
   1. McNichols - BOD as noted on drawings.

2.02 FORMED METAL FABRICATIONS - GENERAL

A. Shop Assembly: Preassemble items to greatest extent possible. Minimize field splices and field assembly. Disassemble only as necessary for transportation and handling. Mark items clearly for assembly and installation.

B. Coordination: Match dimensions and attachment of formed metal items to adjacent construction. Produce integrated assemblies. Closely fit joints; align edges and flat surfaces unless indicated otherwise.

C. Forming: Profiles indicated. Maximize lengths. Fold exposed edges to form hem indicated or ease edges to radius indicated with concealed stiffener. Provide flat, flush surfaces without cracking or grain separation at bends.

D. Reinforcement: Increase metal thickness; use concealed stiffeners, backing materials or both. Provide stretcher leveled standard of flatness and stiffness required to maintain flatness and hold adjacent items in flush alignment.

E. Anchors: Straps, plates and anchors as required to support and anchor items to adjacent construction.

F. Supports: Miscellaneous framing, mounting, clips, sleeves, fasteners and accessories required for installation.

G. Welding and Brazing: Weld or braze joints continuously. Grind, fill or dress to produce smooth, flush, exposed surfaces. Do not discolor metal. Grind smooth, polish, and restore damaged finishes to required condition.

2.03 MATERIALS

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.

B. Anchors, Clips and Accessories: Use one of the following:
   1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
   2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
   3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 35.
   4. Interior Locations: Carbon steel; zinc coated in accordance with ASTM B633 or ASTM F1941/F1941M Class Fe/Zn 5.
   5. Exterior Locations or in Contact with Stainless Steel:
      a. Bolts: Stainless steel; ASTM F593, Group 1 (A1).
      b. Nuts: Stainless steel; ASTM F594.
   6. Structural Anchors: Provide anchors where work is indicated to comply with design loads.
      a. Type: Provide chemical or torque-controlled expansion anchors.
      b. Capacity: When tested according to ASTM E488/E488M; four times the load imposed when installed in concrete.
   7. Nonstructural Anchors: Provide powder-actuated fasteners where work is not indicated to comply with design loads. Provide size and number required for load, installation, and as recommended by manufacturer, unless indicated otherwise.

C. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 15 mil (0.4 mm) dry film thickness per coat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.

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

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

B. Deliver anchorage items to be cast into concrete or built into masonry to appropriate installer(s) together with setting templates.

C. Coat concrete and masonry surfaces that will be in contact with metal surfaces with bituminous coating.

3.03 INSTALLATION - SHEET METAL AND PLATE FABRICATIONS

A. Locate and place decorative formed sheet metal items level and plumb; align with adjacent construction. Cut, drill and fit as required to install.

B. Do not cut or abrade sheet metal finishes that cannot be completely restored in the field. Return such items to manufacturer or fabricator for required alterations and refinishing or provide new items.

C. Use concealed anchorages where possible. Provide washers where needed on bolts or screws to protect metal surfaces and make weathertight connection.

D. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers indicated.

3.04 PROTECTION

A. Protect installed products from damage during construction.

END OF SECTION 057700

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation _____ in exterior wall and roof construction where noted on drawings.

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

1.02 RELATED REQUIREMENTS

A. Section 075400 - Thermoplastic Membrane Roofing: Installation requirements for board insulation over low slope roof deck.

1.03 DEFINITIONS

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

1.04 REFERENCE STANDARDS

A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2022.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

E. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2017.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

G. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

1.05 SUBMITTALS

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

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

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

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

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

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.06 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation to fill wall girt cavity: PEMB Panel Liner system

2.02 FOAM BOARD INSULATION MATERIALS

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
   2. Formaldehyde Content: Zero.
   3. Thermal Resistance: R-value (RSI-value) of R13 walls & R30 roof (____).
   4. Facing: White vinyl sheet where indicated on drawings.
   5. Products:
      a. CertainTeed Corporation; _____: www.certainteed.com/#sle.
      b. Johns Manville; _____: www.jm.com/#sle.
      c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
   1. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   2. Thermal Resistance: R-value (RSI-value) of R25 walls & R30 roof (4.4025 walls & 5.2830 roof).
   3. Products:
      a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
      b. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
      c. ROCKWOOL; AFB: www.rockwool.com/#sle.
      d. ROCKWOOL; AFB evo™: www.rockwool.com/#sle.
      e. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
      f. Thermafiber, Inc; SAFB FF: www.thermafiber.com/#sle.
      g. Or equivalent.
      h. Substitutions: See Section 016000 - Product Requirements.

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. Adhere 6 inches (152 mm) wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

B. Install boards horizontally on walls.

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

3.03 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

A. Installation of board insulation over low slope roof deck, see Section 075400.

B. Board Installation Over Roof Deck, General:
   1. See applicable roofing specification section for specific board installation requirements.
   2. Ensure vapor retarder is clean and dry, continuous, and ready for application of roofing system.
   3. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
   4. Do not apply more insulation than can be covered with roofing on the same day.

3.04 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

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

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

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

3.05 FIELD QUALITY CONTROL

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

B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
   1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

3.06 PROTECTION

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

END OF SECTION 072100

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

C. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

A. Section 077123 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

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

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

E. CDA A4050 - Copper in Architecture - Handbook; current edition.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 3 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim:
   1. ALUCOBOND by 3A Composites USA; ALUCOBOND AXCENT: www.alucobondusa.com/#sle.
   2. Fairview Architectural LLC; VitraEdge _____: www.fairview-na.com/#sle.
   3. Hickman Edge Systems; _____: www.hickmanedgesystems.com/#sle.
   4. Petersen Aluminum Corporation; _____: www.pac-clad.com/#sle.
   5. Or equivalent.

6. Substitutions: See Section 016000 - Product Requirements.

2.02 SHEET MATERIALS

A. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 18 gauge, 0.040 inch (1.02 mm) thick; plain finish shop pre-coated with silicone modified polyester coating.
   1. Silicone Modified Polyester Coating: Pigmented organic powder coating, AAMA 2603; baked enamel finish system.
   2. Color: As selected by Architect from manufacturer's standard colors.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch (450 mm) long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.04 GUTTERS AND DOWNSPOUTS

A. See Section 077123 for manufactured gutters and downspouts.

B. Downspouts: Rectangular profile.

C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).

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

E. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3,000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.

F. Seal metal joints.

2.05 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.06 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.38 mm).

3.03 INSTALLATION

A. Comply with drawing details.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

F. Secure gutters and downspouts in place with concealed fasteners.

G. Slope gutters 1/4 inch per 10 feet (2.1 mm per m), minimum.

H. Set splash pads under downspouts.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION 076200

SECTION 077123
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum gutters and downspouts.

B. Precast concrete splash pads.

1.02 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.

B. Comply with applicable code for size and method of rain water discharge.

1.04 SUBMITTALS

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

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

C. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. Alside, Inc; _____: www.alside.com/#sle.
   2. ATAS International, Inc; ____: www.atas.com/#sle.
   3. Cheney Flashing Company; ____: www.cheneyflashing.com/#sle.
   4. OR EQUIVALENT.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209/B209M, ___ alloy, ___ temper; 0.032 inch (0.8 mm) thick.
   1. Finish: Plain, shop pre-coated with polyvinylidene fluoride (PVDF) coating.
   2. Color:
      a. Gutter: to match Kynar 500 Series Regal Red as selected by Architect.
      b. Downspout: to match Kynar 500 Series Midnight Bronze as selected by Architect

2.03 COMPONENTS

A. Gutters: SMACNA rectangular style profile.

B. Downspouts: SMACNA rectangular profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: Type recommended by fabricator.

2. Gutter Supports: Brackets.
3. Downspout Supports: Brackets.

D. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers.

2.04 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.05 ACCESSORIES

A. Splash Pads: Precast concrete type, rectangular profile 11"x36"; minimum 3,000 psi (21 MPa) compressive strength at 28 days, with minimum 5 percent air entrainment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.381 mm).

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters 1/8 inch per foot (min.) .

D. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

E. Set splash pads under downspouts.

END OF SECTION 077123

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable provisions of general conditions and special conditions govern work in this Section. The Contractor shall provide all items, articles, materials, operations, or methods listed, mentioned, or scheduled on the drawings or herein, including all labor, materials, equipment, and incidentals necessary and required for their completion. Caulking and sealants shall not be applied when the temperature is below 40 degrees F. Caulking and sealing work shall only be done by an applicator who is normally engaged in work of this nature.

1.02 WORK INCLUDED

A. Furnish all labor and materials to complete all work shown, mentioned or noted on the drawings, specified herein, or both to include, but not necessarily limited to the following:
   1. Caulking of all joints exposed on the exterior of the building in the area of the work shown on these documents.
   2. Caulking all flashing joints indicated in the area of the work on these documents.

1.03 RELATED REQUIREMENTS

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

1.04 REFERENCE STANDARDS

A. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

1.05 SUBMITTALS

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

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

1.06 QUALITY ASSURANCE

A. Applicator
   1. Qualifications: Shall have a minimum of two (2) years of experience installing sealants.
   2. Identification: Shall be listed on bid form with major subcontractors.
   3. Compatibility with Substrate: Applicator shall be responsible for verifying that sealants used are compatible with joint substrates.

B. Joint Tolerance:
   1. All joints varying over 1/8" from design dimension shall be called to the attention of the Architect/Engineer prior to sealant installation. Joint width/depth ratios are critical to sealant performance and compliance with those limitations is required.

1.07 GUARANTEES

A. Sealed joints shall be guaranteed against adhesive or cohesive failure of sealant and watertightness of sealed joint for five (5) years.

PART 2 PRODUCTS

2.01

A. Sealants

REFERENCE #		DESCRIPTION & REQUIRED PRODUCT CHARACTERISTICS
1.	TT-S-227(e) Class A (Type I or II as required)	Two component polyurethane or polysulfide, with Shore A hardness of 30-40. Acceptable: Vulkem 245, Vulkem 227 and Vulkem 922 by Mameco International; Dynatrol II and NR-200 by Pecora; Dualthane and Pourthane by W.R. Meadows.
2.	TT-S-230(c) Class A (Type I or II as required)	One component polyurethane or polysulfide with Shore A hardness of 25-45. Acceptable: Vulkem 45, Vulkem 116 and Vulkem 921 by Mameco International; Dynatrol I and NR-201 by Pecora; Sikaflex 1A by Sika.
3.	TT-S-1543 Class A (Amide cure only)	One component silicone, non-acid cure construction sealant, minimum 1500% elongation, shore A hardness of 15-25. Acceptable: Dow Corning 790.
4.	TT-S-1543 Class A (Acetoxy cure or Amide cure)	One component silicone (primer or primerless) for structural glazing; Shore A hardness of 25-30. Acceptable: Dow Corning 999, Dow Corning 795, GE 1200 by General Electric, 863 by Pecora
5.	SSS-S-200(d) Class H	Two component, coal tar extended, fuel resistant, polyurethane sealant, Shore A hardness of 10-35. Acceptable: Vulkem 202 by Mameco; NR-300 by Pecora; Gardox by W.R. Meadows.
6.	TT-S-1543 Class A (Midlew Resistant)	One component silicone, mildew resistant, Shore A hardness of 20-30. Acceptable: Dow Corning 786

B. Caulking

REFERENCE #		DESCRIPTION & REQUIRED PRODUCT CHARACTERISTICS
1.	ASTM C834-76	One component Acrylic Latex caulking with a minimum of 75% recovery when tested in accordance with ASTM C-736-72. Acceptable: AC-20 by Pecora; Easaply by W.R. Meadows.
2.	(N/A)	One component acoustical caulking, non-drying, non-hardening, synthetic rubber. Acceptable: BA-98 by Pecora; Acoustical Sealant by Temco.

C. Primers
1. Shall be in accordance with Manufacturer's instructions. Manufacturer shall be consulted for all surfaces not specifically covered in submitted application instructions

D. Backer Rod
1. Shall be open or closed cell polyethelene or polyurethane as recommended by the sealant manufacturer. Bond breaker tape shall be used to prevent three-sided adhesion in locations where backer rod cannot be used.

E. Solvents, cleaning agents, and other accessories shall be as recommended by the Manufacturer.

2.02 JOINT SEALANTS - GENERAL

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. Substrate surface shall be inspected to ensure that no bond-breaker materials contaminate the surface to which the sealant is to adhere and to ensure that unsound substrates are repaired.

D. Joint dimensions shall be verified to ensure that all dimensions are within tolerances established in this Section.

3.02 PREPARATION

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

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

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

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

E. Porous material shall be cleaned where necessary to provide a base for sealant adhesion by grinding, blast-cleaning, acid washing, or a combination of these methods.

F. Laitance shall be removed by acid cleaning

G. Non-porous surfaces shall be cleaned either mechanically or chemically. Protective coatings on metal surfaces shall be removed by a solvent that leaves no residue. Do not allow solvent to dry before wiping all solvent off the surface

3.03 INSTALLATION

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

B. Provide joint sealant installations complying with ASTM C1193.

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

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

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

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

G. Sealant shall be mixed (if multi-component) and installed in accordance with Manufacturers' recommendations and instructions to ensure complete mixing and an installed proper width/depth ratio with maximum adhesion contact. Three-sided adhesion must be prevented

H. Backer rod shall be installed using only blunt or rounded tools which will ensure a uniform (" 1/8") depth without puncturing the material. Backer rod shall be a minimum of 33% oversized for closed cell and a minimum of 50% oversized for open-cell backer rod, unless otherwise required by the Manufacturer.

I. Surrounding surfaces shall be protected as required to ensure no sealant contaminates these surfaces.

J. Joints to receive caulking and sealants shall be a minimum of ¼" deep unless indicated or specified otherwise.

K. Joints in Masonry and Concrete: Depth of the caulking may be equal to the width in joints up to ½" wide. For joints ½" to 1" wide, depth shall be ½". For expansion and other joints 2" to 2½" wide, depth shall not be greater than ½ the applied sealant width.

L. Joints in Metal: Caulking shall be a minimum of ½ the applied sealant width, and in no case exceed the applied sealant width.

M. Primer shall be applied to all surfaces as recommended by the Manufacturer.

N. Caulking and sealant shall be applied with guns in accordance with the Manufacturers' printed recommendations. Materials shall completely fill joints.

O. Cleaning of Surfaces
   1. Adjacent surfaces shall be cleaned of soiling and materials resulting form this work with solvent or cleaning agent recommended by the Manufacturer.

P. Concrete slabs shall receive two coats of sealant according to Manufacturer's instructions and in recommended quantities per unit of area. Concrete walls shall be sealed by applying one coat of sealer according to Manufacturer's instructions and recommended quantity per unit of area. Sealer shall be Thompson's Water Seal or Crystal Clear by Lambert or Enviroseal by Clariant Life Science Molecules.

Q. Both temperature and dampness conditions may restrict applications of these sealants. Comply with Manufacturer's instructions.

3.04 SCHEDULE

A. Unless shown otherwise on the Drawings, use table below

JOINT TYPE	SEALANT REFERENCE NUMBER							
	1	2	3	4	5	6	7	8
A. Exterior and Interior Sealants								
1.Significant movement (panel, coping, control and expansion joints)	X		X					
1.Significant movement (panel, coping, control and expansion joints)	X	X	X					
3. Paving (requiring fuel resistant sealants)					X			
B. Glazing Sealants								
1. Structural				X				
2. Non-structural		X	X	X				
C. Interior								
1. General							X	
2. Special								
a. Bathrooms						X		
b. Exposed Acoustical							X	
c.Non-exposed Accoustical								X

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 079200

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 099113 - Exterior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. ASCE: American Society of Civil Engineers.

C. HMMA: Hollow Metal Manufacturers Association.

D. NAAMM: National Association of Architectural Metal Manufacturers.

E. NFPA: National Fire Protection Association.

F. SCIF: Sensitive Compartmented Information Facility.

G. SDI: Steel Door Institute.

H. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

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

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

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

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

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

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

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

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

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

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

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

1.05 SUBMITTALS

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

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.

E. Design Submittals: Manufacturer to submit anchor design analysis calculations for blast-resistant doors signed and sealed by specialty design engineer experienced in this type of work and licensed in the State in which the Project is located.

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

G. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

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

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

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Trudoor company; https://www.trudoor.com/
   2. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   3. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   4. Deansteel Manufacturing Company, Inc; Hollow Metal Doors - SP Series: www.deansteel.com/#sle.
   5. OR EQUIVALENT.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

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

2.03 HOLLOW METAL DOORS

A. Type A , Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8(SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
   4. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   5. Door Face Sheets: Flush.
   6. Weatherstripping: Refer to Section 087100.
   7. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

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

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
   3. Weatherstripping: Separate, see Section 087100.

2.05 FINISHES

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

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
   1. Color: As indicated on drawings.

2.06 ACCESSORIES

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

B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

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

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

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

D. Coordinate frame anchor placement with wall construction.

E. Install door hardware as specified in Section 087100.

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

G. Touch up damaged factory finishes.

3.04 TOLERANCES

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

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

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

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

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

3.06 SCHEDULE

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

END OF SECTION 081113

SECTION 083323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior coiling doors.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Cylinder cores and keys.

B. Section 099113 - Exterior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

1.04 SUBMITTALS

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

B. Product Data: Provide general construction, electrical equipment, component connections and details, and Florida Product Approval Number.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Maintenance Data: Indicate lubrication requirements and frequency, periodic adjustments required, and _____.

E. Specimen warranty.

1.05 QUALITY ASSURANCE

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

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

1.06 WARRANTY

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

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Metal Doors:
   1. Overhead Door Company: Model 600 https://overheaddoorgnv.com/rolling-service-commercial-doors/
   2. COOKSON DOORS
   3. CLOPAY BUILDING PRODUCTS
   4. or equivalent

2.02 COILING DOORS

A. Exterior Coiling Doorsr: Steel slat curtain with polyurethane foam insulation.
   1. Capable of withstanding positive and negative wind loads of 20 psf (940 Pa) without undue deflection or damage to components or as required by code. All products shall have a Florida Product Approval Number.

2. Capable of withstanding an overall maximum of 50,000 operating cycles for the life of the door.
3. Single Thickness Slats: 7/8" THICK FOAMED IN PLACES CLOSED CELL URETHANE. Total slat thickness: 15/16"
4. R-value: 8.0 min
5. Flame spread: 0
6. Nominal Slat Size: 3 inches (75 mm) wide by required length.
7. Finish: Galvanized.
8. Endlocks: fabricate interlocking sections with high strench endlocks on alternate slats secured with two rivets. provide windlocks as req.
9. Guide, Angles: Galvanized steel. Minimum 3/16".
10. Hood Enclosure: Manufacturer's standard; galvanized steel.
11. Manual hand chain lift operation. ControlGard Chain Hoist.
12. Mounting: As indicated on drawings.Coordinate with PEMB. PEMB to provide structure and support as required.
13. Locking Devices: Masterkeyable cylinder operable from both sides of bottom bar. (Best 7 pin).
14. Bottom bar: Heavy duty bottom bar.
15. Weatherstripping:
    a. Bottom bar - replaceable bulb style compressible EDPM gasket extending into guides.
    b. Guides - Replaceable vinyl strip on guides sealing against both sides of curtain
    c. Hood - Neoprene/ Rayon baffle to impede air flow from above
    d. Lintel seal: Nylon brush seal fitted at door header to impede air flow.

2.03 MATERIALS

A. Metal Curtain Construction: Interlocking slats.
   1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
   2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
   3. Steel Slats: Minimum thickness, 22 gauge; ASTM A653/A653M galvanized steel sheet.

B. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal. Coordinate for removable section of guide with manufactuif necessary to facilitate instalation or as needed for future curtain service.

C. Guides - Angle: ASTM A36/A36M metal angles, size 3/16" minimum.
   1. Hot-dip galvanized in compliance with ASTM A123/A123M.

D. Brackets:
   1. 3/16" minimum steel plate with permanently lubricated ball or roller bearing at rotating support points to support counterbalance shaft assembly and dorm end closures. Hot dip galvanized.

E. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
   1. Minimum 24 gauge steel with reinforced top and bottom edge. Provide minimum 1/4" steel intermediate support bracket as required to prevent excessive sag.

F. Lock Hardware:
   1. Latch Handle: Manufacturer's standard.
   2. Manual Chain Lift

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

PART 3 EXECUTION

3.01 EXAMINATION

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

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

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

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

3.02 INSTALLATION

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

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

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

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

E. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.6 mm).

C. Maximum Variation From Level: 1/16 inch (1.6 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet (3.2 mm per 3 m) straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation. Lubricate, test, and adjust as needed, and ensure operation is free from warp, twist, or distortion.

3.05 CLEANING

A. Clean installed components as recommended by manufacturer.

B. Remove surplus materials and depris from the site.

C. Remove labels and visible markings

END OF SECTION 083323

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for hollow metal doors.

B. Thresholds.

C. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 081433 - Stile and Rail Wood Doors.

1.03 REFERENCE STANDARDS

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

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

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

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

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

F. BHMA A156.21 - Thresholds; 2019.

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

H. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2023.

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

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

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

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

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

1.04 SUBMITTALS

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

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

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Provide complete description for each door listed.

1.05 DELIVERY, STORAGE, AND HANDLING

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

1.06 WARRANTY

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

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Locksets and Cylinders: Three years, minimum.
   2. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

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

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

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

2.02 HINGES

A. Manufacturers:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Provide hinges on every swinging door.
   2. Provide following quantity of butt hinges for each door:

2.03 LOCK CYLINDERS

A. Manufacturers:
   1. Refer to the hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
   1. Provide cylinders from same manufacturer as locking device.
   2. Provide cams and/or tailpieces as required for locking devices.

2.04 DOOR PULLS AND PUSH BARS

A. Manufacturers:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Door Pulls and Push Bars: Comply with BHMA A156.6.
   1. Bar Type: Bar set, unless otherwise indicated.
   2. Material: Aluminum, unless otherwise indicated.

2.05 CLOSERS

A. Manufacturers; Surface Mounted:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.
   2. Provide door closer on each exterior door.

2.06 KICK PLATES

A. Manufacturers:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 8 inch (203 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.07 WALL STOPS

A. Manufacturers:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Type: Bumper, concave, wall stop.
   2. Material: Aluminum housing with rubber insert.

2.08 THRESHOLDS

A. Manufacturers:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at each exterior door, unless otherwise indicated.
   2. Type: Flat surface.
   3. Material: Aluminum.
   4. Threshold Surface: Fluted horizontal grooves across full width.
   5. Field cut threshold to profile of frame and width of door sill for tight fit.
   6. Provide non-corroding fasteners at exterior locations.

2.09 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Adjustable.
   2. Door Sweep Type: Encased in retainer.
   3. Material: Aluminum, with brush weatherstripping.

2.10 SILENCERS

A. Manufacturers:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   1. Single Door: Provide three on strike jamb of frame.
   2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   3. Material: Rubber, gray color.

2.11 KEY CONTROL SYSTEMS

A. Manufacturers:
   1. Refer to the Hardware Schedule indicated in the drawings or in the SCHEDULE section below. Coordinate with Architect/Owner for final selection and location.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Key Control Systems: Comply with guidelines of BHMA A156.28.
   1. Provide keying information in compliance with DHI (KSN) standards.
   2. Keying: Grand master keyed.
   3. Supply keys in following quantities:
      a. 1 each Grand Master keys.

2.12 FINISHES

A. Finishes: Identified in Door Hardware Schedule. Refer to drawings.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

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

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Do not install surface mounted items until application of finishes to substrate are fully completed.

E. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch (1024 mm).
      b. Push Plates/Pull Bars: 42 inch (1067 mm).
      c. Deadlocks (Deadbolts): 48 inch (1219 mm).
      d. Exit Devices: 40-5/16 inch (1024 mm).
      e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).

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

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

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

3.05 CLEANING

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

B. Clean adjacent surfaces soiled by hardware installation.

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

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

3.06 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

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

3.07 SCHEDULE

A. The following hardware sets are intended to establish type and standard of quality when used together with this section's requirements. Examine Drawings and Specifications and furnish proper hardware for door openings.

BUILDING HARDWARE TABLES

HARDWARE SET 1	
HINGES - 3EA	SCHLAGE SQUARE CORNER MORTISE HINGE 4" X 4"
THRESHOLD - 1EA	170A 36". PEMKO
LOCKSET - 1EA	
DEADBOLT - 1EA	
WEATHERSTRIPPING - 1EA	
KICK PLATE - 1EA	#8400 16" X 34" 32D. IVES

END OF SECTION 087100

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.

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. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

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.
   4. Manufacturer's installation instructions.

C. Samples: Submit two paper chip samples, 6 inch (152 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

1.05 QUALITY ASSURANCE

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

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.

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. PPG Paints: www.ppgpaints.com/#sle.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

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. Volatile Organic Compound (VOC) Content: Comply with Section 016116.

C. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - EXTERIOR

A. Exposed PEMB framing to be painted, refer to drawings.

2.04 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 INSTALLERS

A. Acceptable Applicators by manufacturer.

3.02 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. Test shop-applied primer for compatibility with subsequent cover materials.

3.03 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 for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.04 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.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

B. Owner will provide field inspection.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.07 PROTECTION

A. Touch-up damaged finishes after Substantial Completion.

3.08 COLOR SCHEDULE

A. Refer to the Selections & Finishes Schedule on the drawings for paint colors and paint tag numbers.

B. Refer to Exterior Elevations on the drawings for paint locations.

END OF SECTION 099113

SECTION 101419
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dimensional letter signage.

1.02 SUBMITTALS

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

B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

C. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dimensional Letter Signs:
   1. Firebird Sign Company; _____: www.firebirdsign.com/#sle.
   2. Inpro Corporation; _____: www.inprocorp.com/#sle.
   3. Takeform; ____: www.takeform.net/#sle.
   4. Or equivalent.

2.02 DIMENSIONAL LETTERS

A. Applications: Building identification.
   1. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters:
   1. Material: Aluminum.
   2. Thickness: Manufacturer's standard for letter size.
   3. Letter Height: 15' - 0" tall
   4. Text and Typeface:
      a. Character Font: Helvetica, Arial, or other sans serif font.
   5. Finish: Powder coated.
   6. Color: White.
   7. Mounting: As indicated on drawings.

2.03 ACCESSORIES

A. Concealed Screws: Noncorroding metal; _____.

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. Protect from damage until date of substantial completion.

END OF SECTION 101419

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCE STANDARDS

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

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.03 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, locations of individual fire extinquishers, mounting measurements for wall bracket, installation procedures, and accessories required for complete installation.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Amera Products; https://www.ameraproducts.com/
   2. Ansul, a Tyco Business; ____: www.ansul.com/#sle.
   3. Kidde, a unit of United Technologies Corp; _____: www.kidde.com/#sle.
   4. Or equivalent..
   5. Substitutions: See Section 016000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Amera Products;[____]: https://www.ameraproducts.com/
   2. Kidde, a unit of United Technologies Corp; _____: www.kidde.com/#sle.
   3. Larsen's Manufacturing Co; _____: www.larsensmfg.com/#sle.
   4. 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. Size: 5 pound (2.27 kg).
   3. Size and classification as scheduled.
   4. Finish: Baked polyester powder coat, color as selected.
   5. Temperature range: Minus 65 degrees F (Minus 54 degrees C) to 120 degrees F (49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.

C. Fire Rated Cabinet Construction: One-hour fire rated.

D. Cabinet Configuration: Surface mounted type.
   1. Exterior nominal dimensions of 12-3/16" (309.6 mm) wide by 21-3/16" (533.4 mm) high by 6 inch (152.4 mm) deep.
   2. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

E. Door Glazing: Float glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

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

H. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

I. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Lettering: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).

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, accomodating for ADA regulatory height from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

3.03 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

3.04 MAINTENANCE - SELF-SERVICE FIRE EXTINGUISHERS

A. Monthly Inspections: Inspect self-service fire extinguishers on monthly basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

B. Annual Inspections: Inspect self-service fire extinguishers on annual basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

C. Inspection Certification Tag: Provide new tag indicating acceptable condition of fire extinguisher, date of inspection, and name of self-service inspector for each inspection.

END OF SECTION 104400

SECTION 108213
EXTERIOR GRILLES AND SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior steel screens attached to structure.

1.02 REFERENCE STANDARDS

A. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

B. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

1.03 SUBMITTALS

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

B. Shop Drawings: Submit detailed shop drawings, indicating component profiles, sections, finishes, fastening details, special details, and manufacturer's technical and descriptive data.
   1. Include field dimensions of openings and elevations on shop drawings.
   2. Indicate distinction between factory-assembled and field-assembled work on shop drawings.

C. Samples: Submit samples for color verification, 10 inches (254 mm) by 10 inches (254 mm) minimum.

D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

E. Designer's Qualification Statement.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Perform structural design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

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

C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original, unopened packaging, with labels clearly identifying manufacturer and material.

B. Store materials indoors, protected from moisture, humidity, and extreme temperature fluctuations.

1.06 WARRANTY

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

B. Correct defective work within a one year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exterior Metal Grilles and Screens:
   1. McNICHOLS; Basis of Design: www.mcnichols.com/
   2. Or equivalent.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 SCREENS

A. Aluminum Screens: Provide shop fabricated, shop finished screens assembled into panels.
   1. Screen Type: Wire Mesh Sheet.
   2. Panel Size and Configuration: As indicated on drawings. Side by side, Parallel Pattern
   3. Frame/Support: Flat aluminum bar, miter corner, MIG welded

B. Substitutions: See Section 016000 - Product Requirements.

2.03 MATERIALS

A. Designer Woven - Twin Wire Flat Top Weave Mesh Sheet

B. Concealed Structural Supports: Steel coated for corrosion resistance and dissimilar metal isolation. Tabs welded to frame for mounting.

C. Substitutions: See Section 016000-Product Requirements.

2.04 FABRICATION

A. Shop fabricate grilles and screens to the greatest extent possible.

B. Disassemble as necessary for shipping and handling, clearly mark units for proper reassembly.

C. Provide supports, anchorages, and accessories as required for complete assembled system.

D. Provide inserts as required for installation into concrete or masonry based support materials.

E. Fabricate grilles to ensure proper fit into openings of sizes indicated, with tolerances for installation.

F. Attach grille panels to each other by welding, unless otherwise indicated.

2.05 FINISHES

A. Finish Color: As selected by Architect from manufacturer's standard color range. All accessories to match final selected finish color.

2.06 ACCESSORIES

A. Fasteners: ASTM F593 stainless steel or ASTM A307 carbon steel, sizes to suit installation conditions. Finish to match selected color by architect

B. Anchors and Inserts: Corrosion resistant; type, size, and material required for loading and installation as indicated. Finish to match selected color by architect

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that painting, roofing, masonry work, and other adjacent work that might damage grille finish have been completed prior to start of installation.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

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

B. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint, and allow paint to dry prior to installation of aluminum components.

C. Set grilles level, plumb, with uniform joints, and in alignment with adjacent work as indicated.

D. Mechanically secure grilles to supporting structure.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

3.03 CLEANING

A. Remove temporary protective covering as grilles are installed.

B. Clean finished surfaces as recommended by manufacturer and maintain clean condition until Date of Substantial Completion.

C. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

D. Replace grilles that have been damaged beyond touch-up repair.

3.04 PROTECTION

A. Protect installed grilles to ensure grilles are without damage until Date of Substantial Completion.

END OF SECTION 108213

SECTION 133419
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 GENERAL

A. The intent of these specifications and drawings is to establish a quality and performance level for structural design, material, durability and workmanship for:
   1. Structural steel main building frames and secondary framing including purlins and girts, engineered and fabricated by the building systems supplier.
      a. Wall and Roof panels including soffits, fascia, gutters and downspouts

B. General Contractor shall include in his bid submittal a complete list of the following:
   1. Building Manufacturer and specific building proposed.
   2. Statement that building proposed meets or exceeds all specification requirements.

1.02 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Insulated Metal wall and roof panels including soffits, gutters and downspouts, and roof mounted equipment curbs.

1.03 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between accessory components and wall system.

B. Section 081113 - Hollow Metal Doors and Frames.

1.04 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC):
   1. AISC 360 - Specification for Structural Steel Buildings, June 22, 2010.
   2. AISC 341 - AISC Seismic Provisions for Structural Steel Buildings, June 22nd, 2010.
   3. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges, April 14th, 2010.

B. American Iron and Steel Institute (AISI) :
   1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members, 2012 Edition.

C. American Welding Society (AWS)
   1. AWS D1.1/D1.1M - Structural Welding Code - Steel.
   2. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel

D. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
   1. ASHRAE 90.1-2010 - Energy Standard for Buildings Except Low-Rise Residential Buildings (I-P Edition).

E. ASTM International (ASTM): Latest versions of:
   1. ASTM A 6/A 6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
   2. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
   3. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
   4. ASTM A 475 - Standard Specification for Zinc-Coated Steel Wire Strand.
   5. ASTM A 490 Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
   6. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   7. ASTM A 529/A 529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
   8. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.

9. ASTM A 572/A 572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
10. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
11. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 Percent Aluminum- Zinc Alloy-Coated by Hot-Dip Process.
12. ASTM A 992/A 992M - Standard Specification for Structural Steel Shapes.
13. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot- Rolled, Carbon, Structural, High-Strength, Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
14. ASTM A 1018/A 1018A - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
15. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
16. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
17. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
18. ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
19. ASTM D 1494 - Standard Test Method for Diffuse Light Transmission Factor of Reinforced Plastics Panels.
20. ASTM D 1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
21. ASTM D 2240 - Standard Test Method for Rubber Property—Durometer Hardness.
22. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
23. ASTM D 4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
24. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
25. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
26. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across Specimen.
27. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
28. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
29. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
30. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
31. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
32. ASTM F 436 - Standard Specification for Hardened Steel Washers
33. ASTM F 1941 - Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))

F. International Accreditation Service (IAS):
1. Accreditation Criteria 472 (AC472) - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, latest edition.

G. Metal Building Manufacturers Association (MBMA):

1. Metal Building Systems Manual, 2012 Edition.

H. National Fenestration Rating Council (NFRC):
   1. NFRC 100 - Procedure for Determining Fenestration Product U-factors, 2014
   2. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence, 2010.

I. National Fire Protection Association (NFPA):
   1. 1. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, 2012 Edition

J. Research Council on Structural Connections (RCSC):
   1. RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts, December 31, 2009.

K. Underwriters Laboratories (UL):
   1. UL-580 - Tests for Uplift Resistance of Roof Assemblies.
   2. UL-790 - Standard Test Methods for Fire Tests of Roof Coverings.
   3. UL-2218 - Impact Resistance of Prepared Roof Covering Materials.

L. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

O. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

Q. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2018.

R. MBMA (MBSM) - Metal Building Systems Manual; 2024.

S. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Pre installation meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, and manufacturer's technical representative, inspection agency and related trade contractors.

B. Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.

1.06 DEFINITIONS

A. Traditional Metal Building System: Building system using either continuous or simple span "Z" purlins for support of roof covering material.

B. Gable Symmetrical: Continuous frame building with ridge in center of building, consisting of tapered or straight columns and tapered or straight rafters. Sidewall girts may be continuous (by-passing columns) or simple span (flush in column line). Rafters may or may not have interior columns.

C. Gable Unsymmetrical: Continuous frame building with an off-center ridge, consisting of tapered or straight columns and tapered or straight rafters. Eave height and roof slope may differ on each side of ridge. Sidewall girts may be continuous (by-passing columns) or simple span (flush in column line). Rafters may or may not have interior columns.

D. Single Slope: Continuous frame building which does not contain ridge, but consists of one continuous slope from side to side. Building consists of straight or tapered columns and tapered

or straight rafters. Sidewall girts may be continuous (by-passing columns) or simple span (flush in column line). Rafters may or may not have interior columns.

E. Lean-to (LT): Building extension, which does not contain ridge, but consists of one continuous slope from side to side, usually with same roof slope and girt design as building to which attached.

F. Roof Slope: Pitch expressed as inches of rise for each 12 inches (305 mm) of horizontal run.

G. Acrylic-Coated Galvalume: Aluminum-Zinc coated steel with a thin clear acrylic finish coating eliminating the need for roll-forming oil and reducing incidence of field marking by handling or foot traffic.

H. Building Eave Height: Nominal dimension measured from finished floor to top flange of eave strut.

I. Building Width: Measured from outside to outside of side wall secondary structural member.

J. Building Length: Measured from outside to outside of end wall secondary structural member.

K. Auxiliary Loads: Dynamic loads induced by cranes, conveyors, or material handling systems.

L. Collateral Loads: Weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.

M. Dead Load: Actual weight of building system as supplied by manufacturer supported by given member.

N. Floor Live Loads: Loads induced on floor system by building occupants and possessions including but not limited to furniture and equipment.

O. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and or movable or moving loads but not including wind, snow, seismic, crane, or dead loads.

P. Roof Snow Loads: Gravity load induced by weight of snow or ice on roof, assumed to act on horizontal projection of roof.

Q. Seismic Loads: Loads acting in any direction on structural system due to action of an earthquake.

R. Wind Loads: Loads on structure induced by forces of wind blowing from any horizontal direction.

1.07 DESIGN REQUIREMENTS

A. Governing Design Code: Structural design for the metal building system shall be performed by the manufacturer of the metal building system in accordance with the building code provided in the contract documents.
   1. Use standards, specifications, recommendations, findings, and interpretations of professionally recognized groups as basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances, including the AISC Code of Standard Practice for Steel Buildings and Bridges.
   2. Design structures in accordance with MBMA Practices and Manual including fabrication and erection tolerances.
   3. Design structural mill sections and welded plate sections in accordance with AISC 360, ASD Method.
   4. Design the lateral force resisting systems and related components for seismic loads in accordance with AISC 341.
   5. Design cold-formed steel structural members and panels in accordance with AISI S- 100.
   6. Design all bolted joints in accordance with RCSC Specification.

B. Design Loads:
   1. In accordance with Contract Documents and manufacturer's standard design practices.
   2. Design loads include dead loads, roof live loads, wind loads, seismic loads, collateral loads, auxiliary loads, floor live loads and applied or specified loads.

1.08 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings:
      a. Complete erection drawings with identification and assembly of building components.
      b. Show anchor bolt settings, transverse cross-sections, sidewall, endwall, and roof framing, flashing and sheeting, and accessory installation details.
      c. Bear seal and signature of Registered Professional Engineer responsible for metal building system design in accordance with state law.
   2. Manufacturer installation manual showing:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.
      c. Installation methods.

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

C. Product Data: Provide data on profiles, component dimensions, fasteners.

D. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature. No fabrication will begin until approval has been received by Architect/Engineer.

E. Samples: Submit two samples of precoated metal panels for each color selected, 4 by 4 inch (101.6 by 101.6 mm) in size illustrating color and texture of finish.

F. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement, and column reactions.

G. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

H. Designer's Qualification Statement.

I. Manufacturer's Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472.
   1. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.

J. Erector's Qualification Statement.

K. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

L. Project Record Documents: Record actual locations of concealed components and utilities.

1.09 QUALITY ASSURANCE

A. Manufacturer and Fabrication Qualifications: Primary products furnished by single IAS AC472 accredited manufacturer/fabricator with minimum 5 years of experience.

B. Erector Qualifications:
   1. Single installer with minimum 5 years of experience in installing products of same or similar type and score.
   2. Installer must be certified by metal building manufacturer

1.10 DELIVER, STORAGE AND HANDLING

A. Store packaged products in original, unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials and materials used with solvent-based materials in accordance with requirements of the authority having jurisdiction.

C. Protect steel products from weather as specified by manufacturer instructions.

1.11 PROJECT CONDITIONS

A. Do not install systems when temperature, humidity, or ventilation is outside of limits recommended by manufacturer.

B. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.
   1. Design Engineer Qualifications: Licensed in the State in which the Project is located.
   2. Comply with applicable code for submission of design calculations as required for acquiring permits.
   3. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

C. Perform work in accordance with AISC 360, MBMA (MBSM), and _____.
   1. Maintain one copy on site.

D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than 5 years of documented experience.
   2. Accredited by IAS in accordance with IAS AC472.

E. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

F. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.12 WARRANTY

A. Manufacturer’s Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace metal building system components that fail in materials and workmanship within one year from date of Substantial Completion.

B. Special Weathertightness Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace metal building system components that fail to remain weathertight, including leaks, [without monetary limitation] [up to cost limitation of seven dollars ($7.00) per square foot of covered area] [up to cost limitation of fourteen dollars ($14.00) per square foot of covered area] within [20] years from date of Substantial Completion.

C. Special Panel Finish Warranty: On Manufacturer’s standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within the specified number years from date of Substantial Completion, including:
   1.
   2. Fluoropolymer Two-Coat System (PVDF):

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

E. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Buildings Systems:
   1. Basis of Design Manufacturer : Hornet Steel Buildings, Inc.
   2. Or equivalent.

2.02 PERFORMANCE REQUIREMENTS

A. Installed Thermal Resistance of Wall System: R-value of R-13 (RSI-value of ____).

B. Installed Thermal Resistance of Roof System: R-value of R-30 (RSI-value of ____).

C. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

D. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 120 degrees F (48.8889 degrees C).

E. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

2.03 MATERIALS - PRIMARY FRAMING

A. Hot Rolled Shapes: ASTM A 36 or ASTM A 992, minimum yield of 36 ksi (248 MPa) or 50 ksi (345 MPa)

B. Built up sections:
   1. Webs:
      a. ASTM A 1011 or ASTM A1018, SS or HSLAS, Grade 55 (380) for webs 3/16 inch (4.76 mm) thick and thinner.
      b. ASTM A 572 Grade 50 (340) or 55 (380) for webs thicker than 3/16 inch (4.76 mm).
   2. Flanges: ASTM A 529 Grade 55 (380) or ASTM A 572 Grade 50 (340) or 55 (380).

C. Round tube: ASTM A 500, Grade B or C with minimum yield strength of 42 ksi (290 MPa).

D. Square and rectangular tube: ASTM A 500, Grade B or C with minimum yield strenght of 42 ksi (290 MPa)

E. Cold formed C sections: ASTM A 1011, Grade 55 (380), or ASTM A 653, Grade 55 (380).

F. X-bracing: ASTM A 529 or A 572 for rod bracing 36 ksi (248 MPa) or 50 ksi (345 MPa), ASTM A 36 for angle bracing or ASTM A 475 for cable bracing.

2.04 MATERIALS - SECONDARY FRAMING

A. Purlins, girts, and eave struts: ASTM A 1011 Grade 55(380), or ASTM A 653, Grade 55 (380).

B. Thickness:
   1. 16 gauge: 0.056 inch (1.421 mm) minimum uncoated thickness

C. Panels:
   1. Materials: ASTM A 792.
   2. Thickness and yield strength:
      a. WALLS 26 gauge: 0.0172 inch (0.437 mm) minimum uncoated thickness, 80 ksi (550MPa) yield strength.
      b. ROOF 24 gauge: 0.0212 inch (0.538 mm) minimum uncoated thickness, 50 ksi (340 MPa) yield strength.
   3. Finishes
      a. Galvalume: Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A 792 AZ55
      b. Galvalume Plus: Acrylic-Coated Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A 792 AZ55 with acrylic finish with no added lubricant.
      c. Exterior Paint:
         1) Fluoropolymer Two-Coat System (PVDF): 0.2 - 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat. Basis of Design: Signature 300.
      d. Interior Paint: 0.5 mil total dry film thickeness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish
   4. Fasteners:
      a. WALLS Through-fastened panels: Self-Drilling with sealing washer.
      b. Standing seam panels: Long life self-drilling with sealing washer.
      c. Ridge: Long-life self-drilling with hex washer head and washer.
   5. Clips:
      a. Low or high sliding clips: Provide 2 to 4 inches of travel for panel thermal expansion and contraction.

6. Sealant and closures:
    a. Side-laps: Factory applied, hot melt, foamable mastic.
    b. End-laps, eave, ridge assembly, gable flashings: Field-applied non-skinning sealant as specified in Section 07 92 00.
    c. Standing Seam Roof Closures:
        1) Outside closures: 24 gauge steel sheet.
        2) Inside closures: 18 gauge Galvalume or G-40 galvanized coated steel complying with ASTM A 653/ A 653M

2.05 PRIMARY FRAMING

A. Frame Design: [As Indicated on Drawings] [Gable Symmetrical] [Single Slope] [Lean-to

B. Sidewall Column Profile: [Tapered or Prismatic] [Prismatic] [As indicated on Drawings]

C. Frame Span: [Modular or Clear Span as indicated on Drawings] [Modular Span as Indicated on Drawings] [Clear Span]

D. Modular Frame Interior Column Profile: [H Shape, Round Pipe or Tube] [H Shape] [Round Pipe] [Tube Sections] [As indicated on Drawings]

E. Bracing: [Standard X-Bracing or Portal Frames as allowed by accessories] [X-Bracing] [Portal Frames] [Shear Walls by others]

2.06 SECONDARY FRAMING

A. Roof Zee Purlins:
    1. Horizontal structural members which supports roof coverings.
    2. Depth: As required by design, [8] [10] [12] inches ([203] [216] [254] [305] mm) minimum.
    3. Thickness: As required by design, 16 gauge minimum.
    4. Finish: [Red Oxide] [Gray] primed.

B. Wall Zee Girts:
    1. Horizontal structural members that support vertical panels.
    2. Depth: As required by design, [8] [10] [12] inches ([203] [216] [254] [305] mm) minimum.
    3. Thickness: As required by design, 16 gauge (0.056 inch (1.424mm) minimum uncoated thickness).
    4. Finish: [Red Oxide] [Gray] primed.

2.07 BOLTS

A. Rigid Frame Connections: Provide High Strength Bolts, Nuts and Washers:
    1. Bolts: ASTM A 325 or ASTM A 490 Heavy Hex Structural Type I as required by manufacturer's design.
    2. Washers: [ASTM F 436 Type 1 Hardned Steel]
    3. Nuts: ASTM A 563 Grade C Heavy Hex.
    4. Coating: [ASTM F 1941 Electrodeposited Yellow Zinc] [Hot-Dipped Galvanized]

B. Other Connections: Provide High Strenght or Machine Bolts as required by manufacturer design:
    1. High Strength Bolts and Nuts:
        a. Bolts: ASTM A 325 Heavy Hex Structural Type I.
        b. Nuts: ASTM A 563 Grade C Heavy Hex.
        c. Coating: ASTM F 1941 Eletrodeposited Yellow Zinc.
    2. Machine Bolts:
        a. Bolts: ASTM A 307 Grade Carbon Steel.
        b. Nuts: ASTM A 562 Hex Nut Grade A.
        c. Coating: ASTM F 1941 Eletrodeposited Clear Zinc.

2.08 ROOF SYSTEMS

A. Assembly Performance REquirements: Provide roof products and assemblies meeting following requirements:

1. UL 580, Class 90 assemblies approved and listed under manufacturer.

B. Standing Seam Panels:
   1. Type: Single skin panels with concealed clips.
   2. Panel Strength: Determine and certify panel strength as follows:
      a. Positive Loading (Toward Panel Supports): Determine in accordance with AISI S100.
      b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E 1592.
   3. Panel Profile: VS-216; vertical leg architectural SSR machine seamed, 1/2:12 minimum roof slope.
      a. Panel width: [16 inches wide x 2 inches high (406mm wide x 51 mm high)]
      b. Seaming Type: Machine seamed.
      c. Thickness: 24 gauge
      d. Finish: PVDF
      e. Color: [Selected from manufacturer standard colors] [As shown on drawings].
      f. Air Infiltration: MAximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/-1.57 psf (75 Pa).
      g. Water Infiltration: No unctrollable water leakage when tested to ASTM E 1646 at a 12psf (573 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area

C. Accessories
   1. Eave trim condition: [Standard gutters and downspouts] [Sculptured eave].

2.09 WALL, LINER, SOFFIT, AND FASCIA PANEL SYSTEMS

A. Assembly Performance Requirements: Provide assemblues that function as exterior walls that meet the following requirements:
   1. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 283 at a pressure differential of +/- 1.57 psf (75Pa).
   2. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 331 at a 6.24 psf pressure differential when sprayed with 5 gallons of water per hour per square foot of specimen area.

B. Through-Fastened Panels:
   1. Panel Type: Single skin ribbed panels with exposed fasteners.
   2. Panel Strength: Determine in accordance with AISI S100
   3. Panel Profiles:
      a. PBR 12 inch x 1 inch (305 mm x 25 mm) Rib. 1-1/4 inch (32 mm) ribs x 12 inch (305 mm) centers.
   4. Thickness: [26 gauge]
   5. Finish: [PVDF]
   6. Color: [Selected from manufacturer standard colors] [As shown on drawings].

C. Accessories:
   1. Base condition:
      a. Base member: [Angle]
      b. Base member flashing: [Drip]
   2. Framed openings:
      a. Finish: [Pre-Galvanized]
      b. Framed opening trim: [Standard jamb, head, sill trim package] [Standard trim plus full cover trim on exposed jambs and headers].
   3. Trim profiles: [Manufacturer's standard profiles] [As indicated on Drawings].

D. Walk Doors:
   1. Source: [By metal building system manufacturer]

2. Size: [3 x7 feet]
3. Elevation: [Solid]
4. Type: [Insulated] [Non-insulated].
5. Hardware:
    a. [Mortise lockset.
    b. Exit Device.
    c. Weather stripping and threshold.
    d. Closers.
    e. Kick plate.
    f. Latch guard.
    g. Chain stops.
6. Frame type: Framed openings.

2.10 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.

B. Insulation: Batt glass fiber type, faced with reinforced white vinyl, ASTM E84 Class A, flame spread index of 25 or less where exposed, friction fit, ____ inches (____ mm) thick.

C. Joint Seal Gaskets: Manufacturer's standard type.

D. Fasteners: Manufacturer's standard type, primed and painted, finish to match adjacent surfaces when exterior exposed.

E. Sealant: Manufacturer's standard type.

F. Metal Mesh: Galvanized steel wire, woven.

2.11 FABRICATION

A. General:
1. Shop-fabricate framing members for field bolted assembly.
2. Surfaces of bolted connections: Smooth and free from burrs and distortions.
3. Shop connections to conform to manufacturer's standard design practices.
4. Mark framing members with identifying mark,
5. Welding to conform to AWS D1.1 and AWS D1.3 as applicable.

B. Primary Framing:
1. Plates, stiffeners, and related members: Factory welded base plates, splice plates, cap plates, and stiffeners into place on structural members.
2. Bolt holes and related machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop-fabricate webs to include bracing holes.
3. Secondary structural connections (purlins and girts): Ordinary (not prentensioned) bolted connections with welded clips.
4. Welding inspection: Per IAS AC472 Part A.
5. Non-destructive testing: Not required.

C. Zee Purlins:
1. Fabricate girts from cold-formed Z-shaped sections with stiffened flanges.
2. Size flange stiffeners to comply with requirements of AISI S100.
3. Purlin flanges unequal in width for easier nesting during erection.
4. Purlins pre-punched at factory to provide for field bolting to rigid frames.

D. Girts: Simple or continous span as required by design. Connection bolts will install through webs not flanges.

E. Bracing
1. Diagonal Bracing:
    a. Diagonal bracing in roof and sidewalls may be used to resist longitudinal loads in structure when panel diaphragm cannot be used.

b. Furnish to length and equipped with hillside washers and nuts at each end.
c. Bracing may consist of rods threaded at each end or galvanized cable with suitable threaded end anchors.

2. Special Bracing:
   a. When diagonal bracing is not permitted in sidewall use rigid frame type portal
3. Flange Braces: Brace compression flange of primary framing laterally with angles connection to purlin or girt webs so that flange compressive stress is within allowable limits for any combination of loading

F. Standing Seam Panels:
1. Provide factory fabricated and finished metal panels and accessories meeting the performance requirements, indicated profiles and structural requirements.
2. Fabricate metal joints configured to accept applied sealant providing weathertight seal and preventing metal to metal contat and minimizing noise resulting from thermal movement.
3. Fabricate panels in continuous lengths for full length of detailed runs, except where otherwise indicated on drawings.
4. Sheet Metal Flashing and Trim: Fabricate or install flashing and trim to comply with manufacturer's written instructions and construction drawings.
5. Maximum panel length: 45 feet (13 716 mm) unless otherwise indicated.

G. End Laps:
1. Fabricate with 16 gauge backup plates and eight end lap joint fasteners installed in six pre-punched holes in flat and in dimples in trapezoidal legs.
2. Apply mastic between panels and secure with self-drilling fasteners through panels and backup plate.
3. Through roof fasteners may be used only at end laps and eaves.

2.12 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as roofing metal.

B. Form gutters and downspouts of PEMB manufacturer standard profile and size to collect and remove water. Fabricate with connection pieces.

C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

D. Fabricate support straps of same material and finish as roofing metal, color as selected.

2.13 FINISHES

A. Framing Members: Clean, prepare, and prime to SSPC Manual requirements. Do not prime surfaces to be field welded.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces

B. Prepare surfaces using methods recommended by manufacturer for best result of substrate.

3.02 INSTALLATION

A. Install system in accordance with manufacturer's instructions and approved Shop Drawings.

B. Fit members of square against abutting components.

C. Position members plumb, square and level.

D. Temporarily brace members until permanently fastened.

E. Do not splice load bearing members.

F. Aligh and adjust various members forming parts of a complete frame or structure after assembly but before fastening.

G. Welding to conform to AWS D1.1

H. Fasten panels to supports.

I. Install trim to maintain visual continuity of system.

J. Install joint sealant and gasket to prevent water penetration.

K. Flash penetrations through roof with metal trim to match panels.

3.03 PROTECTION

A. Protect installed products until completion of project.

3.04 ADJUSTMENT

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

B. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.05 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.06 ERECTION - ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches (50 mm). Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.07 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

3.08 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.

END OF SECTION 133419

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Manual gates with related hardware.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Gate locking device.

1.03 REFERENCE STANDARDS

A. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.

B. BHMA A156.3 - Exit Devices; 2020.

C. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.

D. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing; 2023.

E. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.

1.04 SUBMITTALS

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

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

D. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt templates, and _____.

E. Manufacturer's Qualification Statement.

F. Fence Installer Qualification Statement.

G. Field Inspection Records: Provide installation inspection records that include post settings, framework, fabric, barbed wire, fittings and accessories, gates, and workmanship.

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.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.06 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. Provide five year manufacturer warranty for _____.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Chain Link Fences and Gates:
   1. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

A. Line Posts: 1.9 inch (48 mm) diameter.

B. Corner and Terminal Posts: 2.38 inch (60 mm) diameter.

C. Gate Posts: 3-1/2 inch (89 mm) diameter.

D. Top and Brace Rail: 1.66 inch (42 mm) diameter, plain end, sleeve coupled.

E. Bottom Rail: 1.66 inch (42 mm) diameter, plain end, sleeve coupled.

F. Gate Frame: 1.66 inch (42 mm) diameter for welded fabrication.

G. Fabric: 2 inch (51 mm) diamond mesh interwoven wire, 6 gauge, 0.1920 inch (4.9 mm) thick, top selvage knuckle end closed, bottom selvage twisted tight.

H. Fabric with Pre-Inserted Slats: 2 inch (51 mm) diamond mesh interwoven wire, 6 gauge, 0.1920 inch (4.9 mm) thick, top selvage knuckle end closed, bottom selvage twisted tight.
   1. Privacy Slats: High-density polyethylene (HDPE), woven into fabric.
      a. Visual Barrier: 95 percent.

I. Tension Wire: 6 gauge, 0.1920 inch (4.9 mm) thick steel, single strand.

J. Tie Wire: Aluminum alloy steel wire.

2.03 MATERIALS

A. Posts, Rails, and Frames: _____:
   1. Line Posts: Type I round in accordance with FS RR-F-191/1D.
   2. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

B. Wire Fabric: Black Spectra Chain Link:

2.04 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches (1,525 mm) high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

B. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches (1,525 mm) high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.

C. Hinges: Finished to match fence components.
   1. Brackets: Round.
   2. Mounting: Center.
   3. Closing: Manual.

2.05 LIGHT-DUTY ARCHITECTURAL HARDWARE

A. Hinge Set: Self-closing, for top and bottom support of swinging gate.
   1. Swing Direction: As indicated on drawings.
   2. Mounting to Round Fence Post and Gate Frame: Integral clamp.
   3. Finish: Black Powder Coat.

2.06 ACCESSORIES

A. Caps: Molded rigid vinyl; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Privacy Slats: High-density polyethylene (HDPE) strips, sized to fit fabric weave.

2.07 FINISHES

A. Components and Fabric: Vinyl coated over coating of 1.8 ounces per square foot galvanizing (over coating of 550 g/sq m galvanizing).

B. Accessories: Same finish as framing.

C. Color(s): Black.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris and _____.

B. Preinstallation Testing: Test areas for ledge and _____.

3.02 PREPARATION

A. Removal: Obstructions or debris.

B. Ground Preparation:

3.03 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Line Post Footing Depth Below Finish Grade: ASTM F567.

D. Brace each gate and corner post to adjacent line post with horizontal center brace rail _____. Install brace rail one bay from end and gate posts.

E. Install center brace rail on corner gate leaves.

F. Install gate locking device specified in Section 087100.

G. Peen all bolts upon installation.

H. Perform three random field inspections confirming proper installation.

3.04 FIELD QUALITY CONTROL

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

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

3.05 CLEANING

A. Leave immediate work area neat at end of each work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

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

3.06 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. Briefly describe function, operation, and maintenance of each component.

END OF SECTION 323113

TABLE OF CONTENTS

CAMPBELL
SPELLICY
ENGINEERING

Kevin Spellicy
FL PE 76968
Divisions 22, 23, 26, & 28

SECTION 323300
SITE FURNISHINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bollards.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Bollard infill and underground encasement.

B. Section 055000 - Metal Fabrications: Anchors to attach site furnishings to mounting surfaces.

C. Section 055000 - Metal Fabrications: Utilitarian concrete filled steel pipe bollards.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

1.04 SUBMITTALS

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

B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.

C. Shop Drawings: Indicate plans for each unit or group of units, elevations with model number, overall dimensions, construction, and anchorage details.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Pipe Bollards:
   1. Seton; _____: www.seton.com/

2.02 BOLLARDS

A. Steel Pipe Bollards: Concrete filled steel pipe with plain shaft.
   1. Shape: Round.
   2. Diameter: 5.5 inches (____ mm).
   3. Height Above Grade: 42 inches (____ mm).
   4. Materials:
      a. Steel Pipe: ASTM A53/A53M, standard weight.
      b. Factory Finish: Powder coated.
      c. Color: As selected by Architect from manufacturer's standard range.
   5. Mounting: In-ground.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify proper installation of mounting surfaces, preinstalled anchor bolts, and other mounting devices; and ready to receive site furnishing items.

B. See Section 055000 for anchors to attach site furnishings to mounting surfaces.

C. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

A. Install site furnishings in accordance with approved shop drawings, and manufacturer's installation instructions.

B. See Section 033000 for bollard infill and underground encasement.

C. Provide level mounting surfaces for site furnishing items.

END OF SECTION 323300

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

1. GENERAL

1.1. The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the plumbing work as herein called for and shown on the drawings.

1.2. Related Documents:

1.2.1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2.2. This is a Basic Plumbing Requirements Section. Provisions of this section apply to work of all Division 22 sections.

1.2.3. Review all other contract documents to be aware of conditions affecting work herein.

1.2.4. Definitions:

1.2.4.1. Provide: Furnish and install, complete and ready for intended use.

1.2.4.2. Furnish: Supply and deliver to project site, ready for subsequent requirements.

1.2.4.3. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.3. Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.4. Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data.

1.5. Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

1.6. Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be constructed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

1.7. Field Measurements and Coordination:

1.7.1. The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

1.7.2. Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.

1.7.3. Coordinate work in this division with all other trades in proper sequence to ensure that the total work is completed within contract time schedule and with a minimum cutting and patching.

1.7.4. Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on plumbing drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.

1.7.5. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval. Provide sleeves at all concrete penetrations.

1.7.6. Carefully examine any existing conditions, piping, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instructions will be issued to resolve discrepancies.

1.7.7. Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, ductwork, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or piping cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

1.8. Guarantee:

1.8.1. The Contractor shall guarantee labor, materials and equipment for a period of one (1) year from Substantial Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.

1.8.2. Owner reserves right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.9. Approval Submittals:

1.9.1. When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

1.9.1.1. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following.

1.9.1.1.1. Submittals shall be properly organized in accordance with the approved submittal control log.

1.9.1.1.2. Submittals shall not include items from more than one specification section in the same submittal package.

1.9.1.1.3. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.

1.9.1.1.4. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date.

1.9.1.1.5. Submittals that include a series of fixtures or devices (such as plumbing fixtures or valves) shall be organized by the fixture number or valve type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.

1.9.1.1.6. The electrical design shown on the drawings supports the plumbing equipment basis of design specifications at the time of design. If plumbing equipment is submitted with different electrical requirements, it is the responsibility of the plumbing contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the plumbing submittal with a written statement that this change will be provided at no additional cost. Plumbing submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

1.9.2. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.

1.9.3. Review of submittals, product literature, catalog data, or schedules by the Engineer shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

1.9.4. Submit shop drawings and any other drawings specifically called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than ¼" per foot), with dimensions clearly showing the installation. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment

furnished under other sections and shall show space allotted for it. Include construction details and materials.

1.9.5. Access Panels: When required by other Division-22 sections, submit product data for access doors. Submit with Division-22 section using access doors, not as a separate submittal. Include rating data.

1.10. Test Reports and Verification Submittals: Submit test reports, certifications and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports and take corrective action within the scheduled contract time.

1.11. O&M Data Submittals: Submit Operation and Maintenance (O&M) data as called for in other sections. Submit a draft of the O&M manuals at the 50% construction requisition. When a copy of approval submittals is included in the O&M Manual, only the final “Approved” or “Approved as Noted” copy shall be used. Contractor shall organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein. Submit manuals at the Substantial Completion inspection. Submit O&M manuals in electronic format on a disk separate from the "As-Built" drawings.

2. PRODUCTS

2.1. All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

2.2. Equipment and Materials:

2.2.1. Shall be new and the most suitable grade for the purpose intended. Products installed shall be approved by Engineer and Owner’s representative. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.

2.2.2. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.

2.2.3. The label of the approving agency, such as UL, IBR, ASME, ARI, AMCA, by which a standard has been established for the particular item shall be in full view.

2.2.4. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.

2.2.5. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

2.2.6. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

2.2.7. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.

2.3. Access Doors: Where floors, walls and ceilings must be penetrated for access to Plumbing work, provide types of access doors indicated. Furnish sizes indicated or, where not otherwise indicated, furnish adequate size for intended and necessary access. Minimum size allowed shall be 12"x12". Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.

2.3.1. Access Door Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth; 16-gauge frames and 14-gauge flush panel doors; 175° swing with concealed spring hinges; flush screw-driver-operated cam locks; factory-applied rust-inhibitive prime-coat paint finish.

2.3.2. Locks: Where indicated, provide flat pass key type 5-pin or 5-disc type cylinder locks, individually keyed unless otherwise indicated, 2 keys.

2.3.3. Locks: Provide Folger Adams or approved equal Model 415-6 high security deadlock six lever Number 12. All access doors shall be keyed the same throughout. Coordinate with the General Contractor.

2.3.4. Fire Rated Access Doors: Where required furnish with 20-gauge insulated sandwich panel, automatic closing mechanism, cylinder type lock (self-latching with inside release mechanism), and continuous concealed steel hinge pin. Access doors shall carry the UL 1-½ hour "B" label.

2.3.5. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.4. Requests for Substitution:

2.4.1. Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified.

2.4.2. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

2.4.2.1. Required product cannot be supplied in time for compliance with Contract time requirements.

2.4.2.2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.

2.4.2.3. Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

2.4.3. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

Principal of operation.
Materials of construction or finishes.
Thickness of gauge of materials.
Weight of item.
Deleted features or items.
Added features or items.
Changes in other work caused by the substitution.
Performance curves.

If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

3. EXECUTION

3.1. Workmanship: All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

3.2. Coordination:

3.2.1. The Contractor shall be responsible for full coordination of the plumbing systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping, ductwork, or other equipment passing through slabs or walls. Contractor shall be responsible for coordination with the Commissioning Agent for submittal review, plumbing installation verification, and functional performance testing.

3.2.2. Any additional steel supports required for the installation of any plumbing equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.

3.2.3. It shall be the Contractor's responsibility to see that all equipment such as valves, water hammer arresters, trap primer valves, and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.

3.2.4. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

3.2.5. The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

3.2.6. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

3.2.7. Start of work will be construed as acceptance of suitability of work of others.

3.3. Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

3.4. Phasing: Provide all required temporary valves, piping, ductwork, equipment and devices as required. Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

3.5. Cutting and Patching: Notify General Contractor to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.

3.6. Equipment Setting: Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.

3.7. Access doors shall be installed to operate and service all Plumbing equipment including valves, dampers, duct access panels, and other items requiring maintenance that are concealed above or behind finished construction. Access doors shall be installed in walls, chase and floors as necessary, but are not required in accessible suspended ceiling systems. Access doors shall have factory applied protective phosphate coating and baked enamel primer suitable for field painting.

3.8. Access doors shall be installed by the Division installing the substrate construction. However, responsibility for furnishing and determining location of access doors is part of this Division's work. The style of access door shall be suitable for construction into which installed.

3.9. Access doors shall be sized and located as required to provide proper maintenance and service access in accordance with the manufacturer's recommendations and code authority requirements for all devices and equipment.

3.10. Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 22. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.11. Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

3.12. Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.13. Record Drawings:

3.13.1. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, ductwork, equipment, and other systems which are not installed exactly as shown on the contract drawings.

3.13.2. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.

3.14. Acceptance:

3.14.1. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

3.14.2. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.

3.14.3. Operation and Maintenance Manuals: Furnish four complete manuals bound in ring binders with Table of Contents, organized, and tabbed by specification section. Manuals shall contain:

Detailed operating instructions and instructions for making minor adjustments.
Complete wiring and control diagrams.
Routine maintenance operations.
Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
Copies of approved submittals.
Copies of all manufacturer's warranties.
Copies of test reports and verification submittals.

3.14.4. Record Drawings: Submit record drawings.

3.14.5. Acceptance will be made on the basis of tests and inspections of job. A representative of firm that performed test and balance work shall be in attendance to assist. Contractor shall furnish necessary mechanics to operate system, make any necessary adjustments and assist with final inspection.

SECTION 22 05 17
SLEEVE AND SLEEVE SEALS FOR PLUMBING PIPING

1. GENERAL

1.1. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. This section is a Division-22 Basic Plumbing Materials and Methods section, and is part of each Division-22 section making reference to or requiring piping specialties specified herein.

1.3. Approval Submittals:

1.3.1. Product Data: Submit product data with installation instructions and UL listing for:

1.3.1.1. Fire barrier sealants.

1.3.1.2. Mechanical sleeve seals.

2. PRODUCTS

2.1. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2. Escutcheons:

2.2.1. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.

2.2.2. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

2.2.3. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

2.3. Fire Barrier Penetration Seals:

2.3.1. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for plumbing components such as piping or ductwork in accordance with the requirements of Division 7.

2.3.2. Cracks, Voids, or Holes Up to 4" Diameter: Use putty or calking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL-listed.

2.3.3. Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350°F, UL-listed.

2.4. Mechanical Sleeve Seals:

2.4.1. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4.2. Acceptable Manufacturers: Subject to compliance with requirements, provide products by Thunderline "Link Seal", Metraflex "MetraSeal" or approved equal.

3. EXECUTION

3.1. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.

3.2. Fire Barrier Penetration Seals: Provide pipe sleeve as required. Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions. Refer to Division 7.

3.3. Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves ¼" above level floor finish, and ¾" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.

3.3.1. Install sleeves in fire-rated assemblies in accordance with the listing of the assembly and the fire barrier sealant.

3.3.2. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings. Fill annular space with caulking or fire barrier sealant as required.

3.3.3. Install steel-pipe sleeves at floor penetrations. Fill annular space with caulking or fire barrier sealant as required.

3.3.4. Install iron-pipe sleeves at all foundation wall penetrations and at exterior penetrations; both above and below grade. Fill annular space with caulking or mechanical sleeve seals

3.4. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

END OF SECTION

SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

1.2. This section is a Division-22 Basic Materials and Methods section, and is part of each Division-22 section making reference to or requiring valves specified herein.

1.3. Extent of valves required by this section is indicated on drawings and/or specified in other Division-22 sections.

1.4. Quality Assurance:

1.4.1. Valve Dimensions: For face-to-face and end-to-end dimensions of flanged or welding-end valve bodies, comply with ANSI B16.10.

1.4.2. Valve Types: Provide valves of same type by same manufacturer.

1.4.3. Valve Listing: For valves on fire protection piping, provide UL listing.

1.5. Approval Submittals: When required by other Division-22 sections, submit product data, catalog cuts, specifications, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valves with Division-22 section using the valves, not as a separate submittal. Submit valve comparison chart with applicable valves clearly marked if valves other than basis-of-design are to be used. For each valve, identify systems where the valve is intended for use.

1.5.1. Check Valves

1.5.2. Ball Valves

1.5.3. Butterfly Valves

1.6. O&M Data Submittals: Submit a copy of approval submittals. Submit installation instructions, maintenance data and spare parts lists for each type of valve. Include this data in the O&M Manual.

2. PRODUCTS

2.1. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with specifications and installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections.

2.2. Acceptable Manufacturers: Subject to compliance with requirements, provide valves of one of the producers listed for each valve type. Other valve manufacturers list names are also acceptable. The model numbers are listed for contractor's convenience only. In the case of a model number discrepancy, the written description shall govern.

2.3. Check Valves:

2.3.1. Construction: Construct valves of castings free of any impregnating materials. Construct valves with a bronze regrinding disc with a seating angle of 40º to 45º, unless a composition disc is specified. Provide stop plug as renewable stop for disc hanger, unless otherwise specified. Disc and hanger shall be separate parts with disc free to rotate. Support hanger pins on both ends by removable side plugs.

2.3.2. Comply with the following standards:

Cast Iron Valves: MSS SP-71. Cast Iron Swing Check Valves, Flanged and Threaded Ends.

Bronze Valves: MSS SP-80. Bronze Gate, Globe, Angle and Check Valves.

Steel Valves: ANSI B16.34. Steel Standard Class Valve Ratings.

PVC Valves: 2” and Smaller: Non-Union PVC check valve. 4” and Smaller: Union PVC check valve.

2.3.3. Types of check (CK) valves:

2.3.3.1. Threaded Ends 2" and Smaller (CK1): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-319. Nibco T-413-BY. Crane 1707. Milwaukee 509.

2.3.3.2. Soldered Ends 2" and Smaller (CK2): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-309. Nibco S-413-B. Crane 1707S. Milwaukee 1509.

2.3.3.3. Flanged Ends 2½" and Larger (CK3): Class 125, iron body, bronze-mounted, bolted cap, horizontal swing, cast-iron or composition disc. Stockham G-931 or G-932 as applicable. Nibco F918-B. Crane 373. Milwaukee F2974 as applicable.

2.3.3.4. Flanged Ends 2½" and Larger (CK10): Class 125, cast-iron body, ASTM A126, stainless trim, globe style, compact silent check. Mueller Steam 105M-AP or 101M-AP.

2.4. Ball Valves:

2.4.1. General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

2.4.2. Construction: Ball valves shall be rated for 150 psi saturated steam and 600 psi non-shock cold water. Pressure containing parts shall be constructed of ASTM B-584 alloy 844, or ASTM B-124 alloy 377. Valves shall be furnished with blow-out proof bottom loaded stem constructed of ASTM B-371 alloy 694 or other approved low zinc material. Provide TFE packing, TFE thrust washer, chrome-plated ball and reinforced Teflon seats. Valves 1" and smaller shall be full port design. Valves 1¼" and larger shall be conventional port design. Stem extensions shall be furnished for use in insulated piping where insulation exceeds ½” thickness.

2.4.3. Comply with the following standards:

MSS SP-72. Ball Valves with Flanged or Butt-Welding Ends for General Service.

MSS SP-110. Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

2.4.4. Types of Ball (BA) valves:

2.4.4.1. Threaded Ends 2" and Smaller (BA1): Bronze two-piece full port body with adjustable stem packing and stainless-steel ball and trim. Nibco T-585-70. Stockham S216-BR-R-T. Milwaukee BA125. Apollo 77-100.

2.4.4.2. Soldered Ends 2" and Smaller (BA2): Bronze two-piece full port body with adjustable stem packing and stainless-steel ball and trim. Nibco S-585-70.

2.4.4.3. Threaded Ends 1" and Smaller (BA3): Bronze two-piece full port body, UL listed (UL 842) for use with flammable liquids and LP gas with lockout rings. Nibco T-585-70-UL. Milwaukee BA400NSF, Apollo 70LF-200, Jomar 175-LWN.

2.4.4.4. Flanged Ends 2½" and Larger (BA7): Class 150, carbon steel full bore two-piece body with adjustable stem packing. Nibco F515-CS series. Apollo 88-240.

3. PVC Valves: 2" and Smaller: Non-Union PVC ball valve. 4" and Smaller: Union PVC ball valve.

3.1. Butterfly Valves:

3.1.1. General: Comply with MSS SP-67, Butterfly Valves. Provide butterfly valves designed for tight shut-off. Where used for terminal or equipment removal or repair, select lug type valves. Select wafer type valves for other applications. Provide gear operators on all butterfly valves 6" and larger.

3.1.2. Types of butterfly (BF) valves:

3.1.2.1. Wafer Type 3" and Larger (BF1): 200 CWP, cast-iron body, lever-operated, cadmium-plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-512. Nibco WD 2011-5. Crane 42-FXZ-TL. Milwaukee MW222E-8416.

3.1.2.2. Lug Type 3" and Larger (BF2): 200 CWP, cast-iron body, lever-operated, cadmium-plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-712. Nibco LD 2110-3. Crane 44-FXB-TL. Milwaukee ML132B-8416.

3.2. Valve Features:

3.2.1. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1

3.2.2. Valve features specified or required shall comply with the following:

3.2.2.1. Drain: Comply with MSS SP-45, and provide threaded pipe plugs complying with applicable Division-22 pipe or tube section. Provide for gate valves 8" and larger.

3.2.2.2. Flanged: Provide valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).

3.2.2.3. Threaded: Provide valve ends complying with ANSI B2.1.

3.2.2.4. Solder-Joint: Provide valve ends complying with ANSI B16.18.

3.2.2.5. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry unless otherwise specified.

3.2.2.6. Non-Metallic Disc: Provide non-metallic material selected for service indicated in accordance with manufacturer's published literature.

3.2.2.7. Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.

3.2.2.8. Extended Stem: Increase stem length by 2" minimum, to accommodate insulation applied over valve.

3.2.2.9. Mechanical Actuator: Provide factory-fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve for all valves 4" and larger that are mounted more than 7'-0" above the floor, or are otherwise difficult to operate regardless of height.

3. EXECUTION

3.1. Installation:

3.1.1. General: Install valves where required for proper operation of piping and equipment, including valves in branch lines to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward below horizontal plane.

3.1.2. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

3.1.3. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator.

3.1.4. Mechanical Actuators: Install mechanical actuators as recommended by valve manufacturer.

3.2. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:

3.2.1. Tube Size 2" and Smaller: Threaded valves. Soldered-joint valves may also be used. (Exception: Do not install solder joint valves with silver solder.)

3.2.2. Pipe Size 2" and Smaller: Threaded valves.

3.2.3. Pipe Size 2½" and Larger: Flanged valves.

3.3. Non-Metallic Disc: Limit selection and installation of valves with non-metallic disc to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

3.4. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.

3.5. Installation of Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction flow.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

1. GENERAL

1.1. Drawings and general provisions of Contract, including General Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. This section is a Division-22 Basic Materials and Methods section, and is a part of each Division-22 section referring to or requiring hangers and supports specified herein.

1.3. Extent of supports, anchors, and seals required by this section is indicated on drawings and/or specified in other Division-22 sections.

1.4. Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports, anchors, and seals.

1.5. MSS Standard Compliance:

1.5.1. Provide pipe hangers and supports of which materials, design, and manufacture comply with ANSI/MSS SP-58.

1.5.2. Select and apply pipe hangers and supports, complying with MSS SP-69.

1.5.3. Fabricate and install pipe hangers and supports, complying with MSS SP-89.

1.5.4. Terminology used in this section is defined in MSS SP-90.

1.6. UL Compliance: Provide products which are Underwriters Laboratories listed.

2. PRODUCTS

2.1. Acceptable Manufacturers: Subject to compliance with requirements, provide supports and hangers by Grinnel, Michigan Hanger Company, B-Line Systems, or approved equal.

2.2. Horizontal-Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

2.2.1. Adjustable Steel Clevises: MSS Type 1.

2.2.2. Steel Double Bolt Pipe Clamps: MSS Type 3.

2.2.3. Adjustable Steel Band Hangers: MSS Type 7.

2.2.4. Steel Pipe Clamps: MSS Type 4.

2.2.5. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.

2.2.6. Single Pipe Rolls: MSS Type 41.

2.2.7. Adjustable Roller Hanger: MSS Type 43.

2.2.8. Pipe Roll Stands: MSS Type 44 or Type 47.

2.3. Vertical-Piping Clamps: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps such as Hubbard Enterprises/Holdrite pipe clamps for copper-piping systems.

2.3.1. Two-Bolt Riser Clamps: MSS Type 8.

2.3.2. Four-Bolt Riser Clamps: MSS Type 42.

2.3.3. For vertical mid-span supports of piping 4" and under, use Hubbard Enterprises/Holdrite Stout Brackets™ with Hubbard Enterprises/Holdrite Stout Clamps or two-hole pipe clamps (MSS Type 26).

2.4. Hanger-Rod Attachments: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

2.4.1. Steel Turnbuckles: MSS Type 13.

2.4.2. Malleable Iron Sockets: MSS Type 16.

2.5. Building Attachments: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

2.5.1. Center Beam Clamps: MSS Type 21.

2.5.2. C-Clamps: MSS Type 23.

2.5.3. Malleable Beam Clamps: MSS Type 30.

2.5.4. Side Beam Brackets: MSS Type 34.

2.5.5. Concrete Inserts: MSS Type 18.

2.6. Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

2.6.1. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

2.6.2. Protection Saddles: MSS Type 39; use with rollers, fill interior voids with segments of insulation matching adjoining insulation.

2.7. Miscellaneous Materials:

2.7.1. Metal Framing: Provide products complying with NEMA STD ML 1.

2.7.2. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.

2.7.3. Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

2.7.4. Heavy-Duty Steel Trapezes: Fabricate from steel shapes or continuous channel struts selected for loads required; weld steel in accordance with AWS standards.

3. EXECUTION

3.1. Preparation

3.1.1. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

3.1.2. Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, and installers of other work requiring coordination with work of this section for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.1.3. Secondary Pipe Positioning and Supports: Makeshift, field-devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. These shall be Hubbard Enterprises/Holdrite support systems or Owner-approved equivalent.

3.2. Installation of Building Attachments:

3.2.1. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.2.2. In areas of work requiring attachments to existing concrete, use self-drilling rod inserts, Phillips Drill Co., "Red-Head" or equal.

3.3. Installation of Hangers and Supports:

3.3.1. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69 or as listed herein, whichever is most limiting. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do

not use wire or perforated metal to support piping, and do not support piping from other piping.

3.3.1.1. Horizontal steel pipe and copper tube 1 ½" diameter and smaller: support on 6-foot centers.

3.3.1.2. Horizontal steel pipe and copper tube over 1 ½" diameter: support on 10-foot centers.

3.3.1.3. Vertical steel pipe and copper tube: support at each floor.

3.3.1.4. Plastic pipe: support in accordance with manufacturer's recommendations.

3.3.1.5. Horizontal cast iron pipe inside building: support each length of pipe (at the joint).

3.3.1.6. Vertical cast iron pipe: support at each floor and at the base.

3.3.2. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

3.3.3. Paint all black steel hangers with black enamel. Galvanized steel and copper clad hangers do not require paint.

3.3.4. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

3.3.5. Provision for Movement:

3.3.5.1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

3.3.5.2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

3.3.5.3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

3.3.6. Insulated Piping: Comply with the following installation requirements.

3.3.6.1. Shields: Where low-compressive-strength insulation or vapor barriers are indicated, install coated protective shields. For pipe 8" and over, install wood insulation saddles.

3.3.6.2. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

3.4. Installation of Anchors:

3.4.1. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.

3.4.2. Fabricate and install anchors by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

3.4.3. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and elbows. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.4.4. Where expansion compensators are indicated, install anchors in accordance with expansion

unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

3.5. Equipment Bases:

3.5.1. Provide concrete housekeeping bases for all floor mounted equipment furnished as part of the work of Division 22. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. This section is a Division-22 Basic Plumbing Materials and Methods section, and is part of each Division-22 section referring to or requiring identification devices specified herein.

1.3. Extent of plumbing identification work required by this section is indicated on drawings and/or specified in other Division-22 sections.

1.4. Refer to Division-26 sections for identification requirements of electrical work; not work of this section. Refer to other Division-22 sections for identification requirements for controls; not work of this section.

1.5. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

2. PRODUCTS

2.1. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-22 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.2. Painted Identification Materials

2.2.1. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-¼" high letters for ductwork and not less than ¾" high letters for access door signs and similar operational instructions.

2.2.2. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

2.2.3. Identification Paint: Standard identification enamel.

2.3. Plastic Pipe Markers

2.3.1. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers.

2.3.1.1. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with name as shown or specified.

2.3.1.2. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.4. Valve Tags:

2.4.1. Brass Valve Tags: Provide 19-gauge polished brass valve tags with stamp-engraved piping

system abbreviation in ¼" high letters and sequenced valve numbers ½" high, and with 5/32" hole for fastener. Provide 1-½" diameter tags, except as otherwise indicated.

2.4.2. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high, and with 5/32" hole for fastener. Provide 1-½" square black tags with white lettering, except as otherwise indicated.

2.5. Engraved Plastic-Laminate Signs:

2.5.1. General: Provide engraving stock melamine plastic laminate, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

2.5.2. Thickness: 1/16" for units up to 20 sq. in. or 8" length; c" for larger units.

2.5.3. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.6. Stamped Nameplates: Provide equipment manufacturer's standard stamped nameplates for motors, pumps, etc.

3. EXECUTION

3.1. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2. Piping System Identification:

3.2.1. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

3.2.1.1. Plastic pipe markers.

3.2.1.2. Stenciled markers, black or white for best contrast.

3.2.2. Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces and exterior non-concealed locations.

3.2.2.1. Near each valve and control device.

3.2.2.2. Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.

3.2.2.3. At access doors, manholes and similar access points which permit view of concealed piping.

3.2.2.4. Near major equipment items and other points of origination and termination.

3.2.2.5. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.

3.2.2.6. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.2.3. The following piping shall be color-coded where exposed in mechanical and electrical rooms by completely painting the piping with the indicated color. Use standard colors where exposed in finished spaces. Use standard identification methods in concealed areas.

Gas piping – Yellow

3.3. Valve Identification: Provide coded valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shut-off valves at plumbing fixtures. Coordinate code with operating instructions.

3.4. Plumbing Equipment Identification: Install engraved plastic laminate sign on or near each major item of plumbing equipment and each operational device. Label shall indicate type of system and area served by zone(s) or room numbers. Provide signs for the following general categories of equipment and operational devices:

3.4.1. Main control and operating valves, including safety devices.

3.4.2. Meters, gauges, thermometers and similar units.

3.4.3. Fuel-burning units including hot water heaters.

3.4.4. Pumps, compressors, and similar equipment.

3.4.5. Tanks and pressure vessels.

3.4.6. Other items as required.

3.5. Stamped Nameplates: Equipment manufacturers to provide standard stamped nameplates on all major equipment items such as motors, pumps, AHUs, etc. Where motors are hidden from view (within equipment casing, or otherwise not easily accessible, etc.), the equipment supplier shall furnish a duplicate motor data nameplate to be affixed to the equipment casing in an easily visible location, unless data is already included on the equipment nameplate.

3.6. Adjusting and Cleaning:

3.6.1. Adjusting: Relocate any plumbing identification device which has become visually blocked by work of this division or other divisions.

3.6.2. Cleaning: Clean face of identification devices.

END OF SECTION

SECTION 22 07 00
INSULATION FOR PLUMBING EQUIPMENT AND PIPING

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. Division-22 Basic Plumbing Materials and Methods Sections apply to work of this section.

1.3. Approval Submittals:

1.3.1. Product Data: Submit a producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1.3.1.1. Fiberglass pipe insulation

1.3.1.2. Cellular glass pipe below ground insulation

1.3.1.3. Flexible unicellular piping insulation

1.4. O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

2. PRODUCTS

2.1. Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Armstrong, Schuller, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos-free.

2.2. Flame/Smoke Ratings: Provide composite plumbing insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

2.3. Pipe Insulation Materials:

2.3.1. Fiberglass Pipe Insulation: ASTM C547, Class 1 unless otherwise indicated. (Preformed sleeving with white all-service jacket, suitable for temperatures up to 450°F)

2.3.2. Cellular Glass Pipe Insulation: ASTM C552, Type II, Class 1. (Uncovered.)

2.3.3. Flexible Unicellular Pipe Insulation: ASTM C534, Type I. (Tubular, suitable for use to 200EF.)

2.3.4. Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for applications indicated.

2.3.5. Adhesives, Sealers, Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.

2.3.6. Jackets: ASTM C921, Type I (vapor barrier) for piping below ambient temperature, Type II (vapor permeable) for piping above ambient temperature. Type I may be used for all piping at Installer's option.

3. EXECUTION

3.1. General:

3.1.1. Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

3.1.2. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.

3.1.3. Maintain integrity of vapor-barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE".

3.1.4. Do not apply insulation to surfaces while they are hot or wet.

3.1.5. Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.

3.1.6. Do not install insulation on pipe systems until acceptance tests have been completed except for flexible unicellular insulation. Do not install insulation until the building is "dried-in".

3.2. Fiberglass Pipe Insulation:

3.2.1. Insulate the following piping systems (indoor locations):

3.2.1.1. Domestic hot water: up to 2" pipe - 1½" thick, over 2" pipe 2" thick.

3.2.1.2. Storm water piping above ceilings including roof drain body - 1" thick.

3.2.1.3. Cold water pipe: ½" thick outside insulated envelope of the building.

3.2.2. Apply insulation to pipe with all side and end joints butted tightly. Seal longitudinal lap by pressurizing with plastic sealing tool. Apply 3-inch wide self-sealing butt strips to joints between insulation sections. Insulate all fittings, flanges, valves and strainers with pre-molded insulation. Apply coat of insulating cement to fittings and wrap with glass cloth overlapping each wrap 1" and adjacent pipe 2". Finish with heavy coat of general-purpose mastic. Pre-molded PVC covers may also be used, but no flexible inserts are allowed.

3.2.3. Provide hanger or pipe support shields of 16 gauge (minimum) galvanized steel over the insulation which extends halfway up the pipe insulation cover and at least 6" on each side of the hanger.

3.2.4. Omit insulation on exposed plumbing fixture runouts from faces of wall or floor to fixture; on unions, flanges, strainer blowoffs, flexible connections and expansion joints.

3.3. Cellular Glass Pipe Insulation (Underground):

3.3.1. Insulate the following piping systems:

3.3.1.1. Domestic hot water: smaller than 6" pipe -1½" thick, 6" and larger pipe -2" thick.

3.3.2. Cut insulation in sections at fittings and carefully fit to the pipe and fittings. No stovepipe or single miter insulation is allowed. Apply vapor barrier mastic to all edges of the cellular insulation and between joints in the insulation. Wire the cellular glass in place with stainless steel wire 9 inches on center. Finish with a prefabricated water barrier self-sealing jacket similar to Pittsburg Corning “Pittwrap SSII”, 70 mils thickness. Insulate all anchors, guides, wall penetrations, expansion joints, loops and ells in accordance with the manufacturer's

recommendations. Use rubber spacers at all expansion fittings.

3.4. Flexible Unicellular Pipe Insulation:

3.4.1. Insulate the following piping systems:

3.4.1.1. Horizontal above-grade waste piping receiving condensate from air conditioning units to points of connection receiving waste from 4 or more fixtures - ½" thick.

3.4.1.2. Horizontal above grade waste piping receiving discharge from ice machines, coolers, freezers or similar units to points of connection receiving waste form 4 or more fixtures - ½" thick.

3.4.2. Apply insulation in accordance with the manufacturer's recommendations and instructions. Miter cut insulation to fit pipe fittings. Use approved cement to seal all joints and ends in the insulation.

END OF SECTION

SECTION 22 11 13
SITE WATER DISTRIBUTION PIPING

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. Division-22 Basic Plumbing Requirements and Basic Plumbing Materials and Methods sections apply to work of this section.

1.3. Extent of potable water systems work, is indicated on drawings and schedules, and by requirements of this section.

1.4. Refer to Division-3 sections for concrete work (thrust blocks) required for potable water systems; work of this section.

1.5. Excavation and backfill required in conjunction with water piping is specified in other Divisions (see division 33) but is included as work of this section.

1.6. Quality Assurance:

1.6.1. Comply with all local utility requirements and standards.

1.6.2. Pipe Inspection: The Contractor shall obtain from the pipe manufacturer a certificate of inspection to the effect that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications. All pipe and fittings shall be subjected to visual inspection at time of delivery by rail or truck, also just before they are lowered into the trench to be laid, and joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor. The entire product of any plant may be rejected when, in the opinion of the Owner, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.

1.6.3. Water in Excavation: Water shall not be allowed in the trenches while the pipes are being laid and/or tested. The Contractor shall not open more trench than the available pumping facilities are able to dewater. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipelines being installed be used as drains for such water, and the ends of the pipe shall be kept properly and adequately blocked during construction by the use of approved stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the work any such material has entered the pipelines, it must be cleaned so that the entire system will be left clean and unobstructed.

1.6.4. Prevention of Electrolysis: Where deemed necessary, electrolytic action through the contact of dissimilar metals shall be prevented by either the separation of one material from the other by means of an insulating or dielectric coupling, or by the use of alternative materials, as directed by the Engineer.

1.6.5. Hydrants: Comply with governing regulations pertaining to hydrants, including hose unit threading and similar matching of connections. Provide hydrants that comply with UL 246

"Hydrants for Fire Protection Service", and are listed by UL.

1.7. Approval Submittals:

1.7.1. Product Data: Submit manufacturer's product data and installation instructions for:

1.7.1.1. Details of restrained joints

1.7.1.2. Hydrants

1.7.1.3. Valves

1.7.1.4. Valve boxes

1.8. Test Reports and Verification Submittals:

1.8.1. Hydrostatic Tests: Submit a letter report stating the date, time, pressure and observed leakage for all hydrostatic tests.

1.8.2. Disinfection: Submit results of sampling from laboratory or county Health Department that show evidence of satisfactory disinfection of water mains.

1.9. O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists for hydrants and valves. Include these data in O&M Manual.

2. PRODUCTS

2.1. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with AWWA where applicable. Provide sizes and types matching pipe materials used in potable water systems. Where more than one type of materials or products is indicated, selection is Installer's option.

2.2. Identification: Provide manufacturer's standard permanent, bright-colored, continuous-printed, plastic tape, intended for direct burial service, not less than 6" wide x 4 mils thick. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".

2.3. Ductile Iron Pipe and Fittings:

2.3.1. Ductile Iron Pipe: Ductile iron pipe shall conform to the requirements of ANSI Standard A21.51, Class 51 for 3 in. and 4 in. pipes and Class 50 for all other sizes, unless otherwise specified. Pipe interior shall have a bituminous seal coat over a cement mortar lining conforming to ANSI Standard A21.4. Exterior of pipe shall have a bituminous coating.

2.3.2. All ductile iron fittings shall be mechanical joint or single gasket, push on type with a minimum pressure rating of 350 psi and shall conform to the requirements of ANSI Standard A21.10.

2.3.3. Mechanical joint and/or single gasket, push on type fittings shall be cement lined, seal coated and outside coated as specified above for ductile iron pipe.

2.3.4. Joints: Mechanical joints consisting of bell, socket, gland, gasket, bolts and nuts shall conform to ANSI Standard A21.11. Bolts shall be high strength, annealed, cast iron, or high strength low alloy steel, T-head type having hexagonal nuts. Bolts and nuts shall be machined true and nuts shall be tapped at right angles to a smooth bearing surface. Single seal gasket push on type joints shall conform to the requirements of ANSI A21.11 and shall be "Tyton",

"Fastite", "Super Bell Tite", "Altite", or approved equal.

2.3.5. Gaskets: Gaskets shall be of vulcanized crude rubber or polyvinyl chloride pastisol. Gaskets shall have plain tips unless otherwise specified.

2.4. PVC Pipe and Fittings:

2.4.1. PVC (Polyvinyl Chloride) Pipe 4 Inches and Larger: AWWA C900; Class 150; with bell end and elastomeric gasket, with plain end for cast-iron or ductile-iron fittings, or with plain end for PVC elastomeric gasket fittings.

2.4.2. Gaskets: ASTM F 477, elastomeric seal.

2.4.3. PVC Couplings and Fittings: AWWA C900, with ASTM F 477 elastomeric seal gaskets.

2.4.4. Ductile-Iron and Cast-Iron Fittings: AWWA C110, ductile-iron or cast-iron, 250-psi pressure rating; or AWWA C153, ductile-iron compact fittings, 350-psi pressure rating; of dimension to match pipe outside diameter. Lining shall be AWWA C104, cement mortar.

2.4.5. Gaskets: AWWA C111, rubber.

2.5. Copper Tubing and Fittings:

2.5.1. Copper Water Tube: ASTM B 88, Type L, seamless, annealed temper.

2.5.2. Copper Fittings: ANSI B16.22, wrought-copper, solder-joint pressure type.

2.6. PVC Pipe and Fittings:

2.6.1. PVC (Polyvinyl Chloride) Pipe 3 Inches and Smaller: ASTM D 1785, Schedule 40.

2.6.2. PVC Fittings: Schedule 40 socket-type, solvent cement joint; or elastomeric gasketed joint.

2.6.3. Solvent Cement: ASTM D 2564.

2.6.4. Gaskets: ASTM F 477, elastomeric seal.

2.7. Gate Valves: Gate valves 3 in. in diameter and larger shall be iron body, nonrising stem, bronze mounted gate valves, mechanical joint and/or single gasket push on type, conforming to requirements of the AWWA Standard C500 and shall be provided with a 2 in. square operating nut. Valves shall be of the double-disc type and shall turn to the left (counterclockwise) to open. The seat and disc rings shall have smooth, perfectly machined surfaces and shall be watertight when in contact. All valves shall be provided with O-ring seals. The design and machining of valves shall be such as to permit replacing the O-ring seals while in service without undue leakage.

Acceptable Manufacturers: Subject to compliance with requirements, provide valves of one of the following:

American-Darling Valve
Clow Corp.; Valve Div.
Kennedy Valve
Nibco
Stockham Valves & Fittings Inc.
United States Pipe and Foundry Co.
Waterous Co.

2.8. Valve Boxes: Cast iron valve boxes shall be provided for all valves installed underground. The valve boxes shall be adjustable to fit the depth of earth cover over the valve and shall be designed so as to prevent the transmission of surface loads directly to the valve or piping. Valve boxes shall have an interior diameter of not less than 5 in. The valve boxes shall be provided with covers marked WATER which shall be so constructed as to prevent tipping or rattling. Extension sections shall be cast iron only. The protective ring shall be constructed of Class B concrete.

Approved Manufacturers: Subject to compliance with requirements, provide valve boxes of one of the following (or approved equal):

Clow Corporation No. F-2450
Mueller Company No. H-10357

2.9. Hydrants: Fire hydrants shall be of the compression type with break away upper sections capable of ready replacement without water loss in the event of traffic damage. They shall be designed for a working pressure of 150 pounds per square inch and shall conform to AWWA Standard C502 "Dry Barrel Fire Hydrants". Each hydrant shall have a 6 in. bottom inlet connection and valve opening at least 4-1/2 in. in diameter. Hydrants shall turn to the left (counterclockwise) to open. Each hydrant shall be fitted with one 4-1/2" in. pumper connection, and two 2-1/2 in. hose connections, both having threads that conform to the Fire Department Standard for the area. Hose caps shall be chained to the hydrant barrel and fitted with nuts similar to the hydrant operating nuts. Each hydrant shall have a barrel of sufficient length to bring the bottom of the 6 in. pipe connection 30 in. below the surface of the finished ground. Each hydrant shall be made in at least two sections bolted together. All interior working parts of the hydrant shall be removable from the top of the hydrant to allow repairs without removing the hydrant barrel after it has been installed. Hydrants shall have renewable O-ring stem seals. Hydrant barrels shall be painted reflective yellow red.

Acceptable Manufacturers: Subject to compliance with requirements, provide hydrants of one of the following:

U.S. Foundry Break-A-Way
Mueller Break-A-Way Type No. A-24012
American Darling

2.10. Provide tapping sleeve and valve. All tapping sleeves shall have a test plug. The Romac tapping sleeve shall have 304 stainless steel bolts and lugs and virgin SBR gaskets for water service. Mechanical joint tapping sleeves shall have 200 psig working pressure gaskets a Class 125 outlet flange. Tapping valves shall be resilient seat or wedge.

Acceptable Manufacturers: Subject to compliance with requirements, provide tapping sleeves and valves of one of the following:

Romac SST tapping sleeve
JMC 432 tapping sleeve
Clow 5205 tapping sleeve
Mueller H-615 tapping sleeve
M&H Series 1174 tapping sleeve
American Darling 865 tapping valve
Clow F6114 (MJ x TAP) tapping valve

Waterous Series 500 TV tapping valve
Mueller H-687 tapping valve.

2.11. Concrete: Concrete shall be Grade D conforming to the requirements of Division 3.

2.12. Tie Rods: Steel for tie rods and tie bolts shall conform to the requirements of ASTM Designation A242, and rods shall be galvanized in conformance with requirements of ASTM Designation A123. Tie rods and tie bolts shall be Super Star Tierod Figure No. SS12 and Tiebolt Figure No. SST7 respectively as manufactured by Star National Products, or approved equal.

2.13. Water Meter: Water meter and related piping shall conform to applicable local utility company regulations and AWWA standards.

2.13.1. Water Meter: Provided by local utility company.

3. EXECUTION

3.1. Water mains shall be laid with a minimum cover of 30 in. below finished grade, unless otherwise indicated.

3.2. Bedding:

3.2.1. Pipe Cradle: Upon satisfactory installation of the pipe bedding material as specified in Section 22190, a continuous trough for the pipe barrel recesses for the pipe bells or couplings shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.

3.2.2. Cleanliness: The interior of the pipes shall be thoroughly cleaned of all foreign matter before being gently lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

3.3. Installation:

3.3.1. Pipe Joint Deflection: Whenever it is desirable to deflect pipe, the amount of deflection shall not exceed the maximum limits as shown on AWWA Standard C600 for ductile iron pipe.

3.3.2. Changes in horizontal alignment of 11-1/4 degrees or less may be achieved through use of allowable pipe deflection in lieu of fittings shown on the drawings at the Contractor's option, but subject to approval of the Engineer as to layout. Said deflection shall not exceed limits set forth in applicable AWWA Standards.

3.3.3. Rejects: Any pipe found defective shall be immediately removed and replaced with sound pipe at the Contractor's expense.

3.3.4. Joint Compounds: No sulfur base joint compound shall be used.

3.3.5. Anchors: Concrete thrust blocks shall be placed at all bends, tees, plugs and other fittings to provide lateral support, except when restrained joints are specified. Thrust blocks shall conform to the details shown on the drawings.

3.4. Ductile Iron Pipe Joints

3.4.1. Type: The joints of all pipelines shall be made absolutely tight. The particular joint used shall be approved by the Owner prior to installation. Where shown on the drawings or where, in the opinion of the Engineer, settlement or vibration is likely to occur, all pipe joints shall be bolted.

3.4.2. Mechanical Joints: All types of mechanical joint pipe shall be laid and jointed in full conformance with manufacturer's recommendations, which shall be submitted to the Engineer for review and approval before work is begun. Only specially skilled workmen shall be permitted to make up mechanical joints. Torque wrenches set as specified in AWWA Standard C111, shall be used; or spanner type wrenches no longer that specified therein may be used.

3.4.3. Push On Joints: Push on joints shall be made in strict, complete compliance with the manufacturer's recommendations. Lubricant, if required, shall be an inert, nontoxic, water soluble compound incapable of harboring, supporting, or culturing bacterial life.

3.5. PVC (Polyvinyl Chloride) Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA M23.

3.6. Copper Tube: Install with wrought copper, solder joint, pressure fittings, and lead-free solder in accordance with CDA "Copper Tube" handbook.

3.7. PVC (Polyvinyl Chloride) Pipe: Install with PVC, Schedule 40 socket-type, solvent cement or elastomeric gasketed fittings in accordance with manufacturer's installation instructions.

3.8. Installing Valves and Boxes

3.8.1. Valves: Valves shall be carefully inspected, opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Gate valves, unless shown otherwise, shall be set with their stems vertically above the center line of the pipe. Any valve that does not operate correctly shall be removed and replaced.

3.8.2. Valve Boxes: Valves boxes shall be carefully centered over the operating nuts of the valves so as to permit a valve key to be fitted easily to the operating nut. In areas to be paved, valve boxes shall be set to conform to the level of the finished surface and held in position by a ring of concrete placed under the support flange. The valve boxes shall not transmit surface loads to the pipe or valve. Care shall be taken to prevent earth and other material from entering the valve box. Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dugout and reset. Before final acceptance of the work all valve boxes shall be adjusted to finish grade.

3.8.3. Meter Boxes: Conform to guidelines for valve boxes and comply with utility requirements.

3.9. Installing Hydrants: Hydrants shall be set plumb and in true alignment with mains. They shall be securely braced against the end of the trench with concrete thrust blocks as shown on the drawings. Care shall be taken to ensure the free draining of the hydrant barrel and, to this end, coarse material shall be placed around the drain outlet. Backfilling around hydrants shall be carefully done so as not to disturb the hydrant and shall be thoroughly compacted so as to support the hydrant securely.

3.10. Backfilling:

3.10.1. After pipe has been laid, inspected, and found satisfactory, sufficient backfill shall be placed along the pipe barrel to hold the pipe securely in space during the conduction of the preliminary hydrostatic test. No backfill shall be placed over joints until the preliminary test is satisfactorily completed, leaving them exposed to view for the detection of visible leaks.

3.10.2. Upon satisfactory completion of the preliminary hydrostatic test, backfilling of the trench shall be completed.

3.11. Flushing: All water mains shall be flushed to remove all sand and other foreign matter. The velocity of the flushing water shall be at least 4 feet per second. Flushing shall be terminated at the direction of the Engineer. The Contractor shall dispose of the flushing water without causing a nuisance or property damage.

3.12. Hydrostatic Tests:

3.12.1. All components of the water distribution system, including fittings, hydrants, connections and valves of the water distribution system shall remain uncovered until tested and accepted; provided, however, that pipe trenches under traveled streets or roads or in unstable soil conditions may be backfilled with the permission of the Engineer. No testing shall be done until all concrete thrust blocking is in place and set. If high-early strength concrete is used, testing may be conducted 48 hours after the concrete is placed; otherwise thrust block concrete must cure 5 days before pressure testing commends. In testing, the part of the system under test shall be filled with water and subjected to a sustained pressure of 150 pounds per square inch. The piping shall be tested in sections, thereby testing each valve for secure closure. While the system is being filled, air shall be carefully and completely exhausted. If permanent air vents are not located at all high points, the Contractor shall install corporation stops or fittings and valves at such points so the air can be expelled as the pipe system is slowly filled with water.

3.12.2. Test pressure shall be maintained by pumping for at least 3 hours and until all sections under test have been checked for evidence of leakage. Rate of loss shall not exceed that specified hereinafter. Visible leaks shall be corrected regardless of total leakage shown by test.

3.12.3. The system, or any part, shall be retested after completion of backfilling. Such retest will be required for final acceptance.

3.12.4. All pumps, gauges and measuring devices shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation shall be subject to approval by the Engineer. All pressure and leakage testing shall be done in the presence of the Engineer and a representative of the Owner.

3.12.5. Water for testing and flushing shall be potable water provided by the Contractor from a source approved by the Engineer.

3.13. Allowable Limits for Leakage:

3.13.1. The hydrostatic pressure tests shall be performed and no installation, or section thereof, will be acceptable until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{(SD)(\text{sq. root of } P)}{133200}$$

in which,

L = Allowable leak, in gallons per hour
S = Length of pipe being tested in feet
D = Nominal pipe diameter; in inches
P = Average test pressure during the test, in psi gauge

3.13.2. Water shall be supplied to the main during the test period as required to maintain the test pressure as specified. The quantity used, which shall be compared to the above allowable quantity, shall be measured by pumping from a calibrated container. A 5/8 in. meter installed on the discharge side of the pump may be used to measure the leakage for large mains when approved by the Engineer.

3.14. Correction of Work: Where leakage exceeds the allowable limit, the defective pipe or joints shall be located and repaired. If the defective portions cannot be located, the Contractor shall remove and reconstruct as much of the work as is necessary in order to conform to the specified limits. Any visible leaks or any defective pipe or joint shall be repaired or replaced even though the total leakage is within the specified allowable limits. No additional payment will be made for the correction of defective work, or to damage to other parts of the work resulting from such corrective work.

3.15. Disinfection:

3.15.1. Before any portion of water distribution system is to be placed in service it shall be disinfected in accordance with the requirements of AWWA Standard C601; and its disinfection shall be demonstrated by bacteriological test conducted in accordance with "Standard Methods for Examination of Water and Wastewater" for the coli-aerogenes group, by an approved laboratory, acceptable to the County Health Department having jurisdiction.

3.15.2. The disinfecting agent shall be free chlorine in aqueous solution, with sustained concentration for 12 hours or more of not less than 50 parts per million. Chlorine may be derived from chlorine gas, or 70 percent (high test) calcium hypochlorite (HTH or Perchloron, or equal). Administration may be by any of the several methods described in AWWA Standard C601.

3.15.3. Following contact with chlorine solution, the system shall be thoroughly flushed out. Samples shall then be taken using sterile containers obtained from the local Health Department. Samples shall be taken by the Contractor and delivered by him to the County Health Department or approved laboratory for analysis.

3.15.4. If samples do not demonstrate satisfactory results, the disinfection procedure shall be repeated until two series of satisfactory samples are obtained, the period between such series of samples to be a minimum of 24 hours.

3.16. Connection to Existing System:

3.16.1. All connections to existing mains shall be made after complete disinfection of the proposed system and shall be made under the direction of the Owner of the existing system. Valves separating the mains being installed from existing mains shall be operated by or under the direction of said Owner's representative. The cost of the work in making the connections shall be paid for by the Contractor.

3.16.2. In the event the proposed main is to be connected to a main which has one or more active services between the point of connection and the first existing line valve, a temporary plug or

cap shall be installed on the new main until the pressure tests and disinfecting are completed. Upon satisfactory completion, the cap or plug shall be removed from both mains and the connection made with pipe which has been swabbed out with a solution of chlorine and water. The connections shall be made as swiftly as possible and any water in the ditch shall be kept below the level of the pipe. The pipeline shall then be placed in service by the Owner's personnel.

END OF SECTION

SECTION 22 11 16
DOMESTIC WATER PIPING

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. Division-22 Basic Plumbing Requirements and Basic Plumbing Materials and Methods sections apply to work of this section.

1.3. Extent of potable water systems work, is indicated on drawings and schedules, and by requirements of this section.

1.4. Refer to other Division-22 sections for site water distribution system; not work of this section unless noted.

1.5. Refer to appropriate Division-2 sections for exterior potable water system; not work of this section unless noted.

1.6. Insulation for potable water piping is specified in other Division-22 sections, and is included as work of this section. Insulation requirements include:

1.6.1. Domestic hot water piping.

1.6.2. Cold water piping above ceilings and/or in attics outside insulated envelope of the building.

1.7. Excavation and backfill required in conjunction with water piping is specified in Division 33 but is included as work of this section.

1.8. Code Compliance: Comply with applicable portions of current Florida Building Code, current edition with supplements, pertaining to selection and installation of plumbing materials and products. Comply with local utility requirements.

1.9. Approval Submittals:

1.9.1. All Product Supplied: Purchase products, pipe, pipe fittings, etc. meeting Federal Guidelines for “Low Lead.” Items not meeting the NSF/ANSI 372 “Low Lead Content” Guidelines shall not be installed on this project

1.9.2. Potable-water piping and components are to comply with NSF 14, NSF 61, and NSF 372.

1.10. Product Data: Submit manufacturer's technical product data and installation instructions for:

1.10.1.1. Piping

1.10.1.2. Strainers

1.10.1.3. Hose bibbs

1.10.1.4. Wall hydrants

1.10.1.5. Water hammer arresters

1.10.1.6. Backflow preventers

1.10.1.7. Pressure regulating valves

1.10.1.8. Meters and gauges

1.10.1.9. Relief valves

1.10.1.10. Trap primers

1.10.1.11. Access doors

1.11. Test Reports and Verification Submittals:

1.11.1. Backflow Preventer Test Report: Submit Test Report for each backflow preventer.

1.11.2. Disinfection: Submit report by Health Department.

1.12. O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists for valves, backflow preventers, pressure regulating valves, trap primers. Include these data in O&M manual.

2. PRODUCTS

2.1. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with Florida Plumbing Code where applicable. Provide sizes and types matching pipe materials used in potable water systems. Where more than one type of materials or products is indicated, selection is Installer's option. All domestic water products shall meet NSF 61 requirements for low lead/no lead content.

2.2. Identification: Provide identification complying with Division-22 Basic Plumbing Materials and Methods section "Plumbing Identification". Provide manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct burial service; not less than 6" wide x 4 mils thick. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".

2.2.1. Interior Water Piping:

2.2.1.1. Copper Tube and Fittings:

2.2.1.1.1. Above Grade: Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.

2.2.1.1.2. Below Grade: Copper tube; Type L, soft-annealed temper; no joints below floor.

2.2.1.1.3. Soldering Materials: Solders for domestic water service shall be NSF approved and tested to contain no impurities of lead.

2.2.1.1.3.1. Solder joints will be provided with a lead-free filler material approved by NSF (National Sanitation Foundation) and in compliance with ANSI 61 suitable for domestic water systems.

2.2.1.1.3.2. Solder paste shall be non-toxic water based approved by NSF for use in domestic water systems. Solder paste shall comply with ASTM B813. Solder paste shall be suitable for solder filler material used. Acid flux is prohibited. Use of solder materials not approved by NSF and not in compliance with ANSI 61 are prohibited.

2.2.1.1.4. Tin-Copper Silver Solder: ASTM B-32, Grade 95TA.

2.2.1.2. PVC Pipe and Fittings:

2.2.1.2.1. PVC Pipe - Domestic Water: ASTM D1785, with wall thickness as indicated in "Piping

Applications" Article.

2.2.1.2.2. Source Limitations: Obtain PVC pipe from single manufacturer.

2.2.1.2.3. PVC Socket Fittings: ASTM D2466 for Schedule 40

2.2.1.2.4. PVC Schedule 80 Threaded Fittings: ASTM D2464.

2.2.2. Exterior Water Piping:

2.2.2.1. Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.

2.2.2.2. Polyvinyl chloride pipe (PVC), Schedule 80; PVC socket fittings, solvent cement joints.

2.2.3. Deionized Water: Schedule 40 CPVC, NSF labeled.

2.3. Piping Specialties: Provide piping specialties complying with Division-22 Basic Plumbing Materials and Methods section, "Piping Specialties".

2.4. Supports and Anchors: Provide supports and anchors complying with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

2.5. Interior Valves: Provide valves complying with Division-22 Basic Plumbing Materials and Methods section "Valves", in accordance with the following listing:

2.5.1. Sectional and Shutoff Valves: BA1, BA2.

2.5.2. Drain Valves: BA1, BA2.

2.5.3. Throttling Valves: BA1, BA2.

2.5.4. Check Valves: CK1, CK2, CK3.

2.6. Exterior Valves: Provide as indicated, gate valves, AWWA C500, 175 psi working pressure. Provide threaded, flanged, hub, or other end configurations to suit size of valve and piping connections. Provide inside screw type for use with curb valve box, iron body, bronze-mounted, double disc, parallel seat, non-rising stem. Clow Corp., Dresser Mfg., Fairbanks Co., Kennedy, Stockham.

2.7. Hose Bibbs: Provide rough nickel-plated hose bibbs with lock shield compression stop and removable handle, solid flange, female connection with ¾" male threaded hose end, and straight line type non-removable vacuum breaker with ¾" male threaded hose end. Acorn 8121 RCP or equal model by Woodford or Mifab.

2.8. Wall Hydrants: Provide ¾" wall hydrant with bronze casing, satin bronze box, straight inlet connection, and integral vacuum breaker backflow preventer. Wade W-8635-89 or equal model by Woodford, Mifab, or Acorn.

2.9. Non-freeze Wall Hydrants: Provide ¾" anti-syphon, non-freeze wall hydrant with bronze casing, straight inlet connection, and integral vacuum breaker-backflow preventer. Provide exterior chrome finish box and door. Woodford B67 or equal by Mifab or Acorn.

2.10. Water Hammer Arresters: Provide bellows and piston type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with ANSI/ASSE 110. Arresters shall be sized and placed per manufacturer's directions. Precision Plumbing Products, Josam, Sioux Chief, Wade, Jay R. Smith, or approved equal.

2.11. Backflow Preventers: Provide reduced pressure principle backflow preventers consisting of a

complete assembly including shutoff valves on inlet and outlet and strainer on inlet. Backflow preventers shall include test cocks and pressure-differential relief valve located between 2 positive seating check valves. Construct in accordance with ASSE Standard 1013. Febco Sales, Hersey, Lawler, Watts, or approved equal. Comply with local utility requirements.

2.12. Pressure Regulating Valves: Provide pressure regulating valves, single seated, direct operated type, bronze body, integral strainer, complying with requirements of ASSE Standard 1003. Size for maximum flow rate and the inlet and outlet pressures indicated on drawings. Cash, Claval, Watts, or approved equal.

2.13. Meters and Gauges: Provide meters and gauges complying with Division-22 Basic Plumbing Materials and Methods section "Meters and Gauges", in accordance with the following listing:

2.13.1. Thermometers

2.13.2. Pressure gauges

2.13.3. Calibrated balancing cocks

2.14. Combined Pressure-Temperature Relief Valves: Provide relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code. Provide bronze body, test lever and thermostat complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210°F, and pressure relief at 150 psi. Watts, Cash, Zurn, or approved equal.

2.15. Trap Primers: Provide brass trap primers and distribution units to seal floor drains indicated on drawings. Trap primer valves shall be automatic, self-contained type with no springs or diaphragms and shall not require adjustment. Trap primer valves shall be the type that can be installed anywhere on cold water piping. Distribution units shall supply 1-4 floor drains. Trap primer valves shall comply with ASSE 1018. Precision Plumbing Products PR-500, or approved equal.

2.16. Access Doors: Provide access doors to service all valves and other devices as required in accordance with Division-22 Basic Materials and Methods Section “Access Doors”.

3. EXECUTION

3.1. General: Examine areas and conditions under which potable water systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2. Install plumbing identification in accordance with Division-22 Basic Plumbing Materials and Methods section "Plumbing Identification". Install underground plastic pipe markers during backfill, 6"-8" below grade.

3.3. Install water distribution piping in accordance with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings".

3.3.1. Install piping with 1/32" per foot (¼%) downward slope towards drain point.

3.3.2. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

3.4. Install exterior water piping in compliance with local governing regulations. Water piping shall be installed with a minimum of 30 inches of cover unless otherwise indicated.

3.5. Install piping specialties in accordance with Division-22 Basic Plumbing Materials and Methods section "Piping Specialties".

3.6. Install supports and anchors in accordance with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

3.7. Install valves in accordance with Division-22 Basic Plumbing Materials and Methods section "Valves".

3.7.1. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment connections, and elsewhere as indicated.

3.7.2. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.

3.7.3. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain potable water system.

3.7.4. Check Valves: Install where indicated.

3.7.5. Calibrated Balancing Cocks: Install in each hot water recirculating loop, and elsewhere as indicated.

3.8. Hose Bibbs and Wall Hydrants: Install on concealed piping where indicated with vacuum breaker. Mount 18 inches above grade or finished floor.

3.9. Install backflow preventers where indicated, and where required by Florida Building Code. Locate in same room as equipment being protected. Pipe relief outlet to nearest floor drain or outside as shown on the drawings. Provide test and report by State of Florida Certified Backflow Preventer Specialist.

3.10. Install pressure regulating valves where indicated. Provide inlet and outlet shutoff valves, and throttling valve bypass. Provide pressure gauge on valve outlet.

3.11. Install meters and gauges in accordance with Division-22 Basic Plumbing Materials and Methods section "Meters and Gauges".

3.12. Install relief valves on each water heater, and where indicated in accordance with the manufacturer's instructions. Pipe full size outside or to floor drain. Cut the end of the pipe at a 45° angle and terminate 6 inches above the floor or grade.

3.13. Piping Runouts to Fixtures: Provide hot and cold-water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Florida Building Code.

3.14. Plumbing Equipment Connections: Connect hot and cold-water piping system to plumbing equipment as indicated, and comply with equipment manufacturer's installation instructions. Provide shutoff valve and union for each connection, provide drain valve on drain connection.

3.15. Install water hammer arresters in upright position, in locations and of sizes indicated in accordance with PDI Standard WH-201.

3.16. Install trap primers as indicated, and in accordance with manufacturer's installation instructions. Provide access panels to all trap primers unless accessible through a lay-in ceiling.

3.17. Locate and coordinate installation of access doors for all valves and devices in accordance with

Division-22 Basic Plumbing Materials and Methods section “Access Doors”.

3.18. Piping Tests: Test, clean, and sterilize potable water piping in accordance with testing requirements of Division-22 Basic Plumbing Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems".

END OF SECTION

SECTION 22 15 00
COMPRESSED AIR SYSTEMS

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. Division-22 Basic Materials and Methods sections apply to work of this section.

1.3. Refer to Division-26 sections for the following work; not work of this section.

1.3.1. Power supply wiring from power source to power connection on air compressors and other devices. Include disconnects and required electrical devices, except where specified as furnished, or factory installed, by manufacturer.

1.3.2. Interlock wiring between air compressors and field installed control devices.

1.4. Codes and Standards: Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

1.5. Approval Submittals:

1.5.1. Product Data: Submit manufacturer's technical product and performance data as follows:

1.5.1.1. Air compressors

1.5.1.2. Refrigerated dryers

1.5.1.3. Filters

1.5.1.4. Automatic drains

1.5.1.5. Air separators

1.5.1.6. Valves

1.5.1.7. Relief valves

1.5.1.8. Pressure regulating valves

1.5.1.9. Pressure gauges

1.5.1.10. Vibration isolation

1.5.1.11. Hose reels

1.5.1.12. Equipment mountings

1.5.1.13. Pipe flexible connections

1.5.1.14. Receivers

1.5.1.15. Access doors

1.6. O&M Data Submittals:

1.6.1. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to air compressors. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and

portions to be field-installed.

1.6.2. Maintenance Data: Submit a copy of approval submittals. Submit maintenance data and parts lists for air compressors, dryers, filters, automatic drains, air separators, pressure regulating valves; including "trouble-shooting" maintenance guide. Include these data and wiring diagrams in O&M manual.

2. PRODUCTS

2.1. General: Provide piping materials and factory-fabricated piping products of types, sizes, pressure ratings, temperature ratings, and capacities indicated. Where not indicated, provide proper selection as determined by Installer to comply with the installation requirements. Provide materials and products complying with ASME B31.9 Code for Building Services Piping where applicable, base pressure rating on piping systems maximum design pressures. Provide sizes and types of pipe and equipment to match existing pipe and materials existing to the extent possible.

2.1.1. Air Piping: Schedule 40 black steel with 150 psi malleable iron fittings unless otherwise noted. Type L copper tubing with wrought copper fittings and silver-solder joints (ASTM B-32, Grade 96TS) may be used for runouts to end use devices.

2.1.2. Flexible Hoses: Hoses shall be d" ID, flexible, 2 braid rubber, with helical steel wire inner core. Hose shall be rated for 250 psi working pressure. Provide brass body SAE, D Series Dyna Quip quick disconnects or air hose couplings at each end of hose as required.

2.2. Air Compressors:

2.2.1. Furnish and install self-contained, air-cooled, two-stage air compressors mounted on a ASME stamped receiver. The unit shall be pressure lubricated. Unit shall be complete with compressors, receiver, electric motors, vee-belt drives, operating pressure regulator, and suitable interconnecting piping between all devices.

2.2.2. The motor shall be of adequate size to permit continuous operation at the scheduled pressure. The motor shall be 1750 rpm with ball bearings. Motors shall be high efficiency per Division-22 section “Motors”.

2.2.3. The receiver shall be an ASME code tank rated for the scheduled pressure. Provide auto drain trap and manual shutoff valve at outlet from the receiver. Provide ASME rated safety relief valve set as required.

2.2.4. Control shall be automatic start and stop type by pressure switch.

2.2.5. Acceptable Manufacturers: Subject to compliance with requirements, provide air compressors of one of the following: Ingersoll-Rand, Twin Aire, Gast, Curtis, Quincy, Champion or approved equal.

2.2.6. Accessories: Provide the following:

Pressure gauges.
Belt guard.
Air intake cleaner and silencer.
Safety valve.
Interstage cooler.
Operating pressure control.

Discharge line filter.
Moisture separator.
Combination fused disconnect and magnetic starter.
Refrigerated dryer.
Dessicant dryer.
Drain cock.

2.3. Air Compressors: Provide pre-wired, pre-piped, packaged, oil-injected and oil-cooled rotary screw compressors.

2.3.1. Motor: Provide TEFC type of adequate size to permit continuous operation at the scheduled pressure. The motor shall be 1750 rpm with ball bearings. Motors shall be high efficiency per Division-22 section "Motors".

2.3.2. Starter: Provide full voltage magnetic with 120-volt control transformer.

2.3.3. Drive: Provide multi-V-belt drive with automatic tensioning device.

2.3.4. Control Panel: Provide start-stop switches, indicator lights, air pressure and temperature gauges, coolant temperatures gauge, runtime meter, reset. Provide electrical alternation of compressors to operate each compressor for 12 to 24 hours (adjustable). Provide lead-lag function, such that if the lead fails, the other compressor will automatically maintain air pressure. Provide compressor controls for capacity and idling.

2.3.5. Safety Devices: Provide high discharge air and oil temperature cutouts, low oil pressure cutout, three phase thermal overload protection, wrong direction cutout, loss of drive cutout, safety valve, and oil level sight glasses.

2.3.6. Air/Coolant System: Provide air and oil piping, oil charge, pressure differential system, dry air intake filter, oil/air separation oil filter, oil stop valve, vent valve, oil temperature control, air-cooled oil cooler, air-cooled after-cooler, air circulation fan, and cooling air filters. Oil carryover shall not exceed 10 ppm at design conditions.

2.3.7. Maintenance: Provide oil change pressurization valve and drain hose. Provide gasketed and hinged doors for access to all components.

2.3.8. Cabinet: Provide insulated cabinets with soundproofing and vibration isolation to limit noise level to 75 dB (A).

2.3.9. Warranty: Provide 24-month warranty on the air end of the compressors.

2.3.10. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following: Kaeser or approved equal.

2.4. Air Dryer: Provide pre-wired, pre-piped, packaged, cycling, refrigerated air dryers manufactured by Zeks or approved equal.

2.4.1. Capacity: Meet or exceed total air compressor capacity at 35°F dew point.

2.4.2. Control Panel: Provide on-off switch, thermal overload protection, indicator lights, high temperature light and automatic condensate trap. Provide pressure gauges and high temperature cutout.

2.4.3. Dryer System: Provide precooler, heat exchanger, separator, complete cycling refrigeration system, and all required operating and safety controls. Maximum working pressure: 200

psig.

2.4.4. Cabinet: Provide painted steel cabinet.

2.5. Filters: Provide filters rated for total air compressor capacity at working pressure, capable of removing moisture, particulates, and oil. Clean pressure drop shall not exceed 1.5 psi.

2.5.1. Prefilter: 3-micron particulate absolute filter with replaceable cartridge. Basis of Design: Zeks Accraflow with two extra replacement cartridges, or approved equal.

2.5.2. Final Filter: Coalescing filters for "oil-free" air, 0.3 0.1 micron with 99.97% DOP efficiency with replaceable cartridge. Basis of Design: Zeks Accralesor with two extra replacement cartridges, or approved equal.

2.6. Automatic Drains: Provide 120 volt, single phase, direct acting automatic drain valves in NEMA 1 enclosure with cord and grounded plug. Working pressure rating: 150 psig. Provide adjustable drain cycle and drain period with indicating lights. Basis of Design: Sure Drain, or approved equal.

2.7. Air Separators: Provide automatic air separators with integral automatic drains. Working pressure rating: 150 psig. Basis of Design: Air System Products, or approved equal.

2.8. Basic Valves: Provide valves complying with Division-22 Basic Materials and Methods section “Valves”, in accordance with the following listing.

2.8.1. Standard Service Valves: BA1, BA2.

2.8.2. High Pressure Service: Provide with port area equal to or greater than connecting pipe area, include blow-out proof stem, adjustable stem gland, Teflon seats, nickel-plated brass body, chrome plated brass ball, stainless steel handle with yellow grips, and female thread ends. Working pressure 500 psi or greater. Legris 433 (4912), or approved equal.

2.8.3. Air Compressor Lift Check Valves: Size to 2", straight pattern, threaded ends, pressure rated for 300 psi air, flat stainless-steel disc, renewable stainless steel seat ring, stainless steel spring, screw-in cap, bronze body.

2.9. Relief Valves: Provide ASME Standard N.B. Certified valves set as required. Valves shall be all brass construction with steel ball stem and manual lift ring. Kingston, or approved equal.

2.10. Pressure Regulating Valves: Provide automatic, adjustable, pressure regulating valves capable of maintaining pressure at the specified working pressure. Working pressure rating: 150 psig. Basis of Design: Watts, or approved equal.

2.11. Basic Meters and Gauges: Provide meters and gauges complying with Division-22 Basic Plumbing Materials and Methods section "Meters and Gauges", in accordance with the following listing:

2.11.1. Pressure gauges

2.12. Vibration Isolation: Provide vibration isolation complying with Division-22 Basic Materials and Methods section “Vibration Isolation”, and in accordance with the following listing:

2.12.1. Air Compressor Mounting: EM5.

2.12.2. Compressed Air Discharge Piping: PF2.

2.13. Receivers: Provide vertical horizontal steel receivers of capacity shown on the drawings. The

receiver shall be ASME code stamped, National Board registered with tappings for pressure relief valve, drain, pressure gauge, inlet, and outlet. Provide welded steel support stand.

2.14. Drain Piping: Copper tubing with soldered joints.

2.15. Provide piping specialties, gauges, and supports and anchors complying with other Division-22 sections.

2.16. Laboratory air cocks are furnished by the laboratory equipment supplier.

2.17. Laboratory air cocks are specified in Division-22 section "Plumbing Fixtures, Equipment & Trim".

2.18. Hose Reels: Provide retractable hose reels where shown on the drawings.

2.19. Quick Connects: Provide male and female ends, size as shown on the drawings.

2.20. Access Doors: Provide access doors to service all valves and other devices as required in accordance with Division-22 Basic Materials and Methods Section “Access Doors”.

3. EXECUTION

3.1. Install air compressors on a reinforced concrete pad. Install dryers as shown on the drawings. Set and level units on vibration isolation pads. Install flexible connector in discharge piping. Start units in accordance with manufacturer's printed instructions.

3.2. Install piping, pipe fittings, piping specialties, valves, gauges, and supports and anchors complying with other Division-22 sections. Install concentric reducers where pipe is reduced in size.

3.3. Install lift check valves in air compressor discharge piping.

3.4. Install air piping with 1/32" per foot (¼%) downward slope in the direction of flow.

3.5. Install intake a minimum of 10 feet from all plumbing vents, exhaust fans, vents or stacks.

3.6. Locate groups of pipes parallel to each other, spaced to permit servicing of valves. All branches and outlets shall be taken from the top of the main.

3.7. Install filters, automatic drains, and air separators where shown on the drawings. Pipe to drains.

3.8. Provide ½" air riser blow off and shut off valve at location shown on the plans. Blow off shall be turned down and terminated 4" above finished floor.

3.9. Quick disconnects shall be mounted 42" above the floor unless otherwise noted and shall be installed with a tee in the branch line or drop. Provide 6-inch drip leg with d" blow off valve at all quick disconnects.

3.10. Locate and coordinate installation of access doors for all valves and devices in accordance with Division-22 Basic Plumbing Materials and Methods section “Access Doors”.

3.11. Test and clean compressed air piping systems complying with Division-22 section "Testing, Cleaning and Sterilization of Piping Systems".

3.12. Check entire assembly for correctness of installation, alignment and control sequencing. Start all component parts in proper sequence. Make all adjustments required to insure proper smooth quiet operation.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

1. GENERAL

1.1. The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2. Related Documents:

1.2.1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2.2. This is a Basic Mechanical Requirements Section. Provisions of this section apply to work of all Division 23 sections.

1.2.3. Review all other contract documents to be aware of conditions affecting work herein.

1.2.4. Definitions:

1.2.4.1. Provide: Furnish and install, complete and ready for intended use.

1.2.4.2. Furnish: Supply and deliver to project site, ready for subsequent requirements.

1.2.4.3. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.3. Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.4. Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data.

1.5. Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

1.6. Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be constructed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

1.7. Field Measurements and Coordination:

1.7.1. The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

1.7.2. Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.

1.7.3. Coordinate work in this division with all other trades in proper sequence to ensure that the total work is completed within contract time schedule and with a minimum cutting and patching.

1.7.4. Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on mechanical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.

1.7.5. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval. Provide sleeves at all concrete penetrations.

1.7.6. Carefully examine any existing conditions, piping, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instructions will be issued to resolve discrepancies.

1.7.7. Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, ductwork, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or piping cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

1.8. Guarantee:

1.8.1. The Contractor shall guarantee labor, materials and equipment for a period of one (1) year from Substantial Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.

1.8.2. Owner reserves right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.9. Approval Submittals:

1.9.1. When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

1.9.1.1. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following.

1.9.1.1.1. Submittals shall be properly organized in accordance with the approved submittal control log.

1.9.1.1.2. Submittals shall not include items from more than one specification section in the same submittal package.

1.9.1.1.3. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.

1.9.1.1.4. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date.

1.9.1.1.5. Submittals that include a series of fixtures or devices (such as HVAC units or valves) shall be organized by the fixture number or valve type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.

1.9.1.1.6. The electrical design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

1.9.2. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.

1.9.3. Review of submittals, product literature, catalog data, or schedules by the Engineer shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

1.9.4. Submit shop drawings and any other drawings specifically called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than ¼" per foot), with dimensions clearly showing the installation. Direct copies of small-scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment

furnished under other sections and shall show space allotted for it. Include construction details and materials.

1.10. Test Reports and Verification Submittals: Submit test reports, certifications and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports and take corrective action within the scheduled contract time.

1.11. O&M Data Submittals: Submit Operation and Maintenance (O&M) data as called for in other sections. Submit a draft of the O&M manuals at the 50% construction requisition. When a copy of approval submittals is included in the O&M Manual, only the final “Approved” or “Approved as Noted” copy shall be used. Contractor shall organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein. Submit manuals at the Substantial Completion inspection. Submit O&M manuals in electronic format on a disk separate from the "As-Built" drawings.

2. PRODUCTS

2.1. All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

2.2. Access Doors

2.3. Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by Milcor, Jay R. Smith, Zurn, BOICO, Elmdor, or approved equal.

2.4. General: Where floors, walls and ceilings must be penetrated for access to mechanical work, provide types of access doors indicated. Furnish sizes indicated or, where not otherwise indicated, furnish adequate size for intended and necessary access. Minimum size allowed shall be 12"x12". Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.

2.5. Access Door Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth; 16-gauge frames and 14-gauge flush panel doors; 175° swing with concealed spring hinges; flush screw-driver-operated cam locks; factory-applied rust-inhibitive prime-coat paint finish.

2.6. Locks: Where indicated, provide flat pass key type 5-pin or 5-disc type cylinder locks, individually keyed unless otherwise indicated, 2 keys.

2.7. Locks: Provide Folger Adams or approved equal Model 415-6 high security deadlock six lever Number 12. All access doors shall be keyed the same throughout. Coordinate with the General Contractor.

2.8. Fire Rated Access Doors: Where required furnish with 20-gauge insulated sandwich panel, automatic closing mechanism, cylinder type lock (self-latching with inside release mechanism), and continuous concealed steel hinge pin. Access doors shall carry the UL 1-½ hour "B" label.

2.9. Equipment and Materials:

2.9.1. Shall be new and the most suitable grade for the purpose intended. Products installed shall be approved by Engineer and Owner's representative. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.

2.9.2. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.

2.9.3. The label of the approving agency, such as UL, IBR, ASME, ARI, AMCA, by which a standard has been established for the particular item shall be in full view.

2.9.4. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.

2.9.5. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

2.9.6. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

2.9.7. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.

2.9.8. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.9.9. All equipment and material shall be manufactured and assembled in the United States.

2.10. Requests for Substitution:

2.10.1. Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified.

2.10.2. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

2.10.2.1. Required product cannot be supplied in time for compliance with Contract time requirements.

2.10.2.2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.

2.10.2.3. Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

2.10.3. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

Principal of operation.
Materials of construction or finishes.
Thickness of gauge of materials.
Weight of item.
Deleted features or items.
Added features or items.
Changes in other work caused by the substitution.
Performance curves.

If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

3. EXECUTION

3.1. Workmanship: All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

3.2. Coordination:

3.2.1. The Contractor shall be responsible for full coordination of the mechanical systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping, ductwork, or other equipment passing through slabs or walls. Contractor shall be responsible for coordination with the Commissioning Agent for submittal review, mechanical installation verification, and functional performance testing.

3.2.2. Any additional steel supports required for the installation of any mechanical equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.

3.2.3. It shall be the Contractor's responsibility to see that all equipment such as valves, dampers, filters and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.

3.2.4. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

3.2.5. The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

3.2.6. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

3.2.7. Start of work will be construed as acceptance of suitability of work of others.

3.3. Access doors shall be installed to operate and service all mechanical equipment including valves, dampers, duct access panels, and other items requiring maintenance that are concealed above or behind finished construction. Access doors shall be installed in walls, chase and floors as necessary, but are not required in accessible suspended ceiling systems. Access doors shall have factory applied protective phosphate coating and baked enamel primer suitable for field painting.

3.4. Access doors shall be installed by the Division installing the substrate construction. However, responsibility for furnishing and determining location of access doors is part of this Division's work. The style of access door shall be suitable for construction into which installed.

3.5. Access doors shall be sized and located as required to provide proper maintenance and service access in accordance with the manufacturer's recommendations and code authority requirements for all devices and equipment.

3.6. Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

3.7. Phasing: Provide all required temporary valves, piping, ductwork, equipment and devices as required. Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

3.8. Cutting and Patching: Notify General Contractor to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.

3.9. Equipment Setting: Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.

3.10. Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 23. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.11. Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

3.12. Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be

done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.13. Climate Control: Operate heating and cooling systems as required after initial startup to maintain temperature and humidity conditions to avoid freeze damage and warping or sagging of ceilings and carpet.

3.14. Record Drawings:

3.14.1. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, ductwork, equipment, and other systems which are not installed exactly as shown on the contract drawings.

3.14.2. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.

3.15. Acceptance:

3.15.1. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

3.15.2. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.

3.15.3. Operation and Maintenance Manuals: Furnish four complete manuals bound in ring binders with Table of Contents, organized, and tabbed by specification section. Manuals shall contain:

Detailed operating instructions and instructions for making minor adjustments.
Complete wiring and control diagrams.
Routine maintenance operations.
Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
Copies of approved submittals.
Copies of all manufacturer's warranties.
Copies of test reports and verification submittals.

3.15.4. Record Drawings: Submit record drawings.

3.15.5. Test and Balance Report: Submit four certified copies. The Report shall be submitted for review prior to the Substantial Completion Inspection unless otherwise required by Division 1.

3.15.6. Acceptance will be made on the basis of tests and inspections of job. A representative of firm that performed test and balance work shall be in attendance to assist. Contractor shall furnish necessary mechanics to operate system, make any necessary adjustments and assist with final inspection.

3.15.7. Control Diagrams and Piping Diagram: Frame under glass and mount on equipment room wall.

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SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

1. GENERAL

1.1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Section apply to work of this Section.

1.2. This section is a Division 23 Basic Mechanical Materials and Methods section, and is part of each Division 23 section making reference to motors specified herein.

1.3. Extent of motors required by this section is indicated on drawings and/or specified in other Division-23 sections.

1.4. Comply with the requirements of Division 26.

1.5. UL Compliance: Comply with applicable UL standards pertaining to motors.

1.6. Approval Submittals:

1.6.1. Product Data: When required by other Division-23 sections, submit manufacturers standard product data sheets for each type of motor provided. Submit with Division-23 section using the motors, not as a separate submittal. Mark data sheet with arrows indicating product being supplied and list by unique descriptive name all motors to which each data sheet applies. Clearly indicate type, service factor, rpm, duty cycle, voltage, phase, nominal full load efficiency, power factor and insulation class. Field verify and coordinate mounting and frame requirements for matching the drive.

1.7. O&M Data Submittals: Submit a copy of approval submittals. Submit operation and maintenance data for each type of motor. Include these data in O&M Manual. Submit two copies of nameplate data sheet for each motor. One copy shall be included with the O&M Manual and a second copy shall be inserted in a waterproof pouch or bag and attached to the motor. Nameplate data sheets shall be typed or neatly printed and shall include all data on the motor nameplate plus a unique motor description such as "AHU-3 Fan Motor", "Distribution Pump #1" or similar description.

2. PRODUCTS

2.1. Acceptable Manufacturers: Subject to compliance with requirements, General Electric, Baldor, US Electric, or approved equal.

2.2. General:

2.2.1. Motors shall conform to applicable portions of NEMA Standard MG-1, Motors and Generators.

2.2.2. Motors shall be sized for the application such that when the driven equipment is operated at rated capacity the motor current will not exceed the full-load nameplate current. Service factor shall not be used in normal operation.

2.3. Motor Design:

2.3.1. Integral Horsepower Motors:

2.3.1.1. Motors shall be open drip-proof or totally enclosed fan cooled as shown on the drawings or listed in the Division 23 section requiring motors.

2.3.1.2. Motors shall be three phase, 60 hertz, nominal 1800 rpm, rated at 200 volts for 208 volt systems, 230 volts for 240 volt systems and 460 volts for 480 volt systems. 230/208 volt motors shall not be permitted on 208 volt systems.

2.3.1.3. Motors shall be NEMA Design B and shall have 1.15 service factor or greater at 60 hertz.

2.3.1.4. Insulation Systems

2.3.1.4.1. In fixed speed applications, motors shall have Class B insulation with 80EC rise over 40EC ambient.

2.3.1.4.2. For variable frequency drive (VFD) applications, motors shall have Class F insulation with 105EC rise over 40EC ambient. Motor manufacturer shall identify motors being used for VFD applications by marking the motor with a stainless steel name-plate “Inverter Duty”. Motors shall be provided with one set of thermostatic sensors. Motors to be premium efficiency. Motor nameplate shall be marked “Suitable for Variable Frequency Drive”. Motors 3-horsepower or larger utilizing a VFD shall be provided with bearing protection rings to prevent shaft grounding.

2.3.1.5. Motor efficiencies shall be based on IEEE-112, Test Method B, as specified in NEMA Standard MG1-12.53. NEMA motor efficiency and power factor shall be clearly shown on the motor nameplate. Inverter duty motors shall have a CIV rating based on NEMA.

2.3.1.6. Motors shall be premium efficiency type and shall meet or exceed the following minimum nominal efficiencies at rated voltage.

HORSEPOWER RANGE	MINIMUM NOMINAL EFFICIENCY	MINIMUM ACCEPTABLE POWER FACTOR
1 hp	85.5. pct.	78.0 pct
1.5 hp	86.5 pct.	78.0 pct
2 hp	86.5 pct.	83.0 pct
3 hp	89.5 pct.	80.0 pct
5 hp	89.5 pct.	80.0 pct
7.5 hp	91.7 pct.	81.0 pct
10 hp	91.7 pct.	82.0 pct
15 hp	92.4 pct.	82.0 pct
20 hp	93.0 pct.	86.0 pct
25 hp	93.6 pct.	84.0 pct
30 hp	93.6 pct.	83.0 pct
40 hp	94.1 pct.	86.0 pct
50 hp	94.5 pct.	87.0 pct

60 hp	95.0. pct.	86.0 pct
75 hp	95.4 pct.	87.0 pct
100 hp	95.4 pct.	90.0 pct
125 hp	95.8 pct.	88.0 pct
150 hp	96.2 pct.	86.0 pct
200 hp	96.2 pct.	87.0 pct
>200 hp	96.2 pct.	87.0 pct

Specialty Motors: Specialty motors such as C-Face, multi-speed, and vertical pump motors shall meet the above efficiency requirements where possible. If motors meeting these efficiencies are not available, "Premium Efficiency" motors shall be provided.

2.3.1.7. Motors 25 hp and larger which are to be installed outdoors or in other high humidity areas shall be equipped with silicone rubber space heaters. Space heaters shall be energized when motor is de-energized.

2.3.2. Fractional Horsepower Motors one-half hp and above:

2.3.2.1. Motors shall be open drip-proof or totally enclosed fan cooled ECM high efficiency type as shown on the drawings or listed in the Division 23 section requiring motors.

2.3.2.2. Motors shall be three phase, 60 hertz, nominal 1800 rpm, rated at 200, 230 or 460 volts as shown on the drawings.

2.3.2.3. Motors shall be NEMA Design B with class B insulation, unless used with variable frequency drives.

2.3.3. Fractional Horsepower Motors less than one-half hp:

2.3.3.1. Motors shall be single phase, ECM high efficiency type, 60 hertz, rated at 120 volts with integral thermal protection.

2.4. Overload Protection: Properly sized overload protection shall be provided for each motor. This protection shall be an integral part of the motor. Provide three phase protection for all three phase motors. Provide solid state overloads for poly phase motors. Contractors shall set overloads at start-up and be recorded on startup sheets.

3. EXECUTION

3.1. Motor Size and Location:

3.1.1. Size and location of motors shown on the drawings are based on a particular design and may change with a different manufacturer. Submittal of shop drawings or product literature indicating motor sizes or locations different from that designed indicates that Contractor has fully coordinated any required changes to the electrical system with other trades. Approval (if made) is on this basis and no additional cost will be allowed for any changes.

3.1.2. Contractor shall verify and make any necessary adjustments to electrical service, branch circuit wiring, branch circuit protection, overload protection, disconnect and controller (starter), or VFD based on actual nameplate data of the motors supplied prior to installation. Where applicable, connect motor winding thermostat to VFD.

3.2. Motor Voltages: Contractor shall field verify system voltage prior to ordering or installing any motors. Submittal of shop drawings or product literature indicating motor voltages indicates that Contractor has fully coordinated the motor with the electrical system and that any discrepancies have been resolved. Approval (if made) is on this basis and no additional cost will be allowed for any changes.

3.3. Motor Mounting: Adjust motor mounting as required to adjust the drive train for proper belt operation and to accommodate sheave changes or other requirements of the test and balance work.

3.4. Motor Nameplate: All motors shall have a nameplate with voltage, phase, full load amps, service rating, serial number, manufacturer's model number, date of manufacture.

3.5. Motor Mounting: Install the new motor and mounting hardware as required to properly drive the existing equipment. Provide all necessary hardware and modifications to the existing equipment necessary to achieve a system that has the proper alignment and can drive the equipment in a smooth, quiet, vibration-free manner. Provide for proper servicing of the motor and drive.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING FOR HVAC

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section. Division-23 Basic Mechanical Materials Sections apply to work of this section.

The work of this section is intended to be performed by a test and balance contractor under a separate, stand-alone contract.

1.2. Description of Work:

1.2.1. Extent of testing, adjusting, and balancing work (TAB) is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required.

The work of this section is intended to be performed by a test and balance contractor under a separate, stand-alone contract.

1.2.2. Pretesting: Where required by the drawings or other Division 23 sections, pretest existing HVAC systems as directed and report findings prior to start of demolition work or any other modifications to the existing systems. Results of pretesting shall be reported to the Engineer in a timely manner. Comply with standards for final TAB reports described herein.

1.2.3. Coordination: Coordinate with the General Contractor and Mechanical Contractor responsible for the HVAC system installation as required to complete the TAB work.

1.3. The intent of this specification is to balance HVAC systems within the tolerances listed, maintaining the pressure relationships indicated, with a minimum of noise.

1.3.1. Airflow Tolerances:

1.3.1.1. Air Handling: The supply air, return air and outdoor air quantities shall be balanced within ±5% of design values.

1.3.1.2. Exhaust Fans: The exhaust fan quantities shall be set as required to maintain the design exhaust terminal flows within ±5% of design values. If no exhaust terminals exist, exhaust fan air quantities shall be balanced within ± 10% of design values.

1.3.1.3. Terminal Units: The air quantities associated with VAV boxes, fan coil units, self-regulating air valves, unit heaters and other similar devices shall be balanced within ±5% of design values.

1.3.1.4. Ceiling Diffusers, Supply Grilles, Return and Exhaust Inlets: Balance to an air quantity within ±10% of the design values.

1.3.2. Temperature Tolerances:

1.3.2.1. Air Handling Temperatures: The controlled temperatures at AHUs shall be verified to be under control within ±1°F of design values.

1.3.2.2. Hot Water Temperatures: The heating hot water-controlled temperatures from boilers and heat exchangers and other similar devices shall be under control within ±5°F.

1.3.2.3. Chilled Water Temperatures: The chilled water-controlled temperature from chillers shall be under control within ±1°F.

1.3.2.4. Process Cooling Water Temperatures: The process cooling water-controlled temperature shall be under control within ±5°F.

1.3.2.5. Room Temperatures: Balance systems and controls within ±2°F of indicated settings.

1.3.3. Pressure Relationships: Where code or design indicates a specific pressure relationship, the pressure relationship shall take precedence over airflow tolerances. Airflow tolerances may need to be held tighter than allowed tolerances to meet pressure relationships. Demonstrate the existence of positive or negative pressure to Engineer and authority having jurisdiction by making direct measurements of room relative pressure and/or flow direction.

1.3.4. Laboratory Systems: In addition to demonstrating proper airflow and temperature control, verify that all setback VAV systems operate correctly and maintain pressure relationships at reduced air flows.

1.3.5. Fume Hoods: Balance fume hood systems as required to maintain +10%-0% of the specified face velocity at the indicated sash position. Coordinate with authority having jurisdiction (EH&S) to ensure proper fume hood certification.

1.3.6. Hydronic Flow: Balance hydronic flow rates to within ±10% of design values.

1.4. Quality Assurance: The TAB Contractor shall be certified as follows:

1.4.1. Tester: A firm certified by National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, who is not the Installer of the systems to be tested and is otherwise independent of the project. Comply with NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" as applicable to this work.

1.4.2. Industry Standards: Comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

1.5. Job Conditions:

1.5.1. Do not proceed with testing, adjusting, and balancing work until HVAC work (including Controls) has been completed and is operable. Ensure that there is no residual work still to be completed.

1.5.2. Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt and discarded building materials.

1.5.3. Do not proceed until architectural work that would affect balancing (walls, ceiling, windows, doors) have been installed.

1.5.4. Testing may proceed system by system, but each HVAC system must be complete as described herein.

1.5.5. The mechanical contractor shall make any changes in pulleys, belts, and dampers, and/or add

dampers as required for correct balancing.

1.6. Approval Submittals:

1.6.1. Submit the name of the proposed test and balance company for the Engineer's approval within thirty (30) days after awarding of contract.

1.7. Test Reports and Verification Submittals:

1.7.1. Submit two (2) copies of a preliminary report two weeks prior to Substantial Completion listing all noted deficiencies. Submit four (4) copies of the dated test and balance report upon completion of TAB work and before the Final Completion Inspection. The report shall include a list of instruments used for the work. The report shall be signed by the supervisor who performed the TAB work. The report shall be certified by a professional engineer (registered in Florida) who is a regular employee of the TAB company.

2. PRODUCTS

2.1. Patching Materials: Except as otherwise indicated, use the same products as used by original Installer for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

2.2. Test Instruments: Utilize test instruments and equipment of the type, precision, and capacity as recommended in the referenced standard. All instruments shall be in good condition and shall have been calibrated within the previous six (6) months (or more recently if required by standard).

3. EXECUTION

3.1. General:

3.1.1. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Do not proceed with TAB work until unsatisfactory conditions have been corrected in a manner acceptable to Tester.

3.1.2. Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards, and as modified or detailed herein. Test and balance shall be performed prior to installation of ceiling tiles.

3.1.3. Test, adjust and balance systems during summer season for air conditioning systems and during winter season for heating systems, including at least a period of operation at outside conditions within 5°F wet bulb temperature of maximum summer design condition, and within 10°F dry bulb temperature of minimum winter design condition. When seasonal operation does not permit measuring final temperatures, then take final temperature readings when seasonal operation does permit. The Contractor shall return for a change of seasons test at no additional cost to the Owner and submit the revised TAB report.

3.1.4. Punch List: Prepare a deficiency (punch)list for the Contractor with a copy of the Engineer that lists all items that are incorrectly installed or are functioning improperly. Provide a retest after all items are corrected.

3.1.5. Prepare TAB report of test results, including instrumentation calibration reports, in format recommended by applicable standards, modified as required to include all data listed herein.

3.1.6. Patch holes in insulation, ductwork and housings, which have been cut or drilled for test

purposes, in manner recommended by original Installer.

3.1.7. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.

3.1.8. Include in the TAB report recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.1.9. Include an extended warranty of ninety (90) days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck, or resetting of any component as listed in test report. The TAB company shall provide technicians and instruments and make any tests required by the Engineer during this period.

3.2. Controls:

3.2.1. Check all HVAC controls for proper location, calibration and sequence of operation.

3.2.2. Check operation of all controllers and controlled devices to verify proper action and direction. Check the operation of all interlocks.

3.2.3. Check all motorized face and bypass zone damper motors for leakage when in closed position. If leakage is more than 5%, mechanical contractor shall reset damper linkages.

3.2.4. Check all control valves for complete closure and correct action under all operating conditions.

3.2.5. Check all labs supply and exhaust system controls. Check setback functions.

3.3. Air Balancing:

3.3.1. Leakage tests on ductwork must have been completed before air balancing.

3.3.2. Set dampers, volume controls and fan speeds to obtain specified air delivery with minimum noise level. Rebalance as required to accomplish this.

3.3.3. Set grille deflections as noted on plans. Modify deflections if required to eliminate drafts or objectionable air movement.

3.3.4. Record air terminal velocity after completion of balance work.

3.3.5. Record final grille and register deflection settings if different from that specified on contract drawings.

3.3.6. Record all fan speeds.

3.3.7. Balance multizone double duct systems with all air through the cold deck. Recheck for noise level in occupied spaces at 50% bypass.

3.3.8. Variable Volume Systems: Measure static pressure at all major branches. Adjust fan controllers for minimum required static pressure at the end of each branch. Report the value of the minimum static pressure that will provide proper air flow in the TAB Report and set the static pressure controller for this value. Balance outlets. Check at both modulated and full cooling condition. Traverse main supply and return ducts. Balance the return system. All branches must be above the minimum required static pressure. The supply fan and return fan (if applicable) must track and deliver the proper air quantity with no objectionable noise. The system must be stable and operate properly at 50% of design maximum airflow.

3.4. Water Balancing:

3.4.1. Verify proper operation of all hydronic system devices to ensure the proper flowrate, flow direction and pressure are maintained.

3.4.2. Set balancing cocks and flow control devices to obtain specified water flow rates to all terminal units, coils, chillers, cooling towers, boilers, and heat exchangers. Coordinate with variable speed drives to achieve balance with minimum pump speed. Report the value of the minimum differential pressure that will provide proper flow in the TAB Report and set the differential pressure controller for this value. Pump balancing cocks (if present) shall be fully open. Set maximum speed control for variable speed pumps.

3.4.3. Impeller Trim: Record the initial suction and discharge pressure and flow rate of each pump with all cocks fully open. The Engineer will compare this data with the "balanced system" data and will determine if pump impellers should be trimmed for the piping system as installed. Impeller trimming, if required, will be accomplished by change order. Additional TAB work to accomplish impeller trimming shall be performed at no additional cost to the Owner.

3.4.4. Variable Speed Pumps: Verify proper operation of variable speed pumps and the associated distribution system at 50% and 100% flow.

3.5. Boiler Performance:

3.5.1. Boilers shall be operating at greater than 50% of full load.

3.5.2. Record the following in addition to other requirements:

3.5.2.1. Boiler nameplate data.

3.5.2.2. Setting of all safety and operating controls.

3.5.2.3. Stack temperature.

3.5.2.4. CO_2 reading in flue gas.

3.5.2.5. Stack smoke.

3.5.2.6. Gas burner pressure.

3.5.2.7. Gas flow rate.

3.5.3. Calculate the following:

3.5.3.1. Combustion efficiency in %.

3.5.3.2. Boiler output in Btu/hr (500 x GPM X DT).

3.5.3.3. Boiler input in Btu/hr (CFH x HV).

3.5.3.4. Boiler efficiency in % (Output/Input).

3.5.4. Coordination:

3.5.4.1. Coordinate with the boiler factory-trained representative for performance tests.

3.5.4.2. Temperatures and flow rates are required to be recorded elsewhere in this section. This data may be used for the performance calculations provided steady state conditions are established at the required load, and all systems have been balanced and are operating as specified.

3.5.5. Abbreviations:

3.5.5.1. GPM - gallons per minute.

3.5.5.2. DT - temperature difference across boiler.

3.5.5.3. CFH - cubic feet of gas per hour.

3.5.5.4. HV - heating value of gas (Btu/cu. ft.). Obtain from gas company.

3.6. Chiller Performance:

3.6.1. Chiller shall be operating at full load (plus or minus 10%).

3.6.2. Record the following in addition to other requirements:

3.6.2.1. Chiller nameplate data.

3.6.2.2. Compressor head pressure and suction pressure.

3.6.2.3. Refrigerant liquid and suction temperature.

3.6.2.4. Type of refrigerant and charge.

3.6.2.5. Oil pressure.

3.6.2.6. Unit kW consumption (not only amp draw).

3.6.2.7. Ambient air temperature.

3.6.3. Calculate the following:

3.6.3.1. Chiller output in tons (500 x GPM x DT/12,000).

3.6.3.2. Chiller EER at test conditions in Btu/watt hr

3.6.4. Coordination:

3.6.4.1. Coordinate with the chiller factory-trained representative for performance tests.

3.6.4.2. Temperatures and flow rates are required to be recorded elsewhere in this section. This data may be used for the performance calculations provided steady state conditions are established at the required load, and all systems have been balanced and are operating as specified.

3.6.5. Abbreviations:

3.6.5.1. GPM - gallons per minute.

3.6.5.2. DT - temperature difference across chiller.

3.6.5.3. TONS- 12,000 Btu/hr.

3.6.5.4. kW - kilowatts (1,000 watts).

3.7. Data Collection:

3.7.1. In addition to the data required for any specified performance tests, measure and record the temperatures, pressures, flow rates, and nameplate data for all components listed herein.

3.7.2. It is the intent of this section to record data on balanced systems, under normal operating or design conditions.

3.7.3. Temperatures:

3.7.3.1. Outside dry and wet bulb temperatures.

3.7.3.2. Dry bulb temperature in each room and at least one wet bulb temperature in each zone.

3.7.3.3. Refrigerant liquid and suction temperatures.

3.7.3.4. Inlet and outlet temperature of each heat exchange device - both fluids.

3.7.3.5. Entering and leaving air temperatures (dry bulb and wet bulb) for each air handler.

3.7.4. Pressures:

3.7.4.1. Suction and discharge static pressure of each fan.

3.7.4.2. Suction and discharge pressure of each pump.

3.7.4.3. Each refrigerant suction and discharge pressure.

3.7.4.4. Water pressure drop through each heat exchanger.

3.7.5. Flow rates:

3.7.5.1. Flow rate through each fan.

3.7.5.2. Flow rate through each pump.

3.7.5.3. Flow rate through each coil or heat exchange device.

3.7.6. Nameplate Data:

3.7.6.1. Complete nameplate data for all equipment.

3.7.6.2. Motor data to include horsepower, phase, voltage, RPM, full load nameplate current, fuse rating in disconnect switch, number or manufacturer's size designation, and ampere rating of overcurrent and low voltage protection devices in starters.

4. FUME HOOD TESTING

4.1. Conform to all applicable requirements of Parts 1.0, 2.0 and 3.0 herein.

4.2. Ensure room air balance is satisfactory prior to initiating fume hood testing.

4.3. General Requirements:

4.3.1. Each fume hood, when properly installed in a laboratory and connected to an exhaust fan of the proper capacity, shall contain and remove fumes generated within the hood. The face velocity range shall be 100 fpm with the sash fully open16" open. No reverse flows of air will be allowed along the sides, top, bottom, or front of the hood. The Owner and/or a designated representative may view the tests, and successful results are contingent upon concurrence by the Owner and/or the representative.

4.3.2. The performance test requirements listed in this section shall be used for the establishment of baseline performance characteristics for comparison with future periodic evaluations of laboratory chemical fume hoods.

4.4. Performance Test Procedures:

4.4.1. "Properly installed" means that the hood is in an area where there is at least 5 feet clear space

in front for observation of the airflow pattern entering the hood. This area shall be without cross drafts or other air currents exceeding 20 fpm that would affect the hood performance in the area in front and around the hood.

4.4.2. Fume hood face velocity shall be verified as follows: with exhaust system on, the quantity of air being exhausted shall be determined by measuring the velocity of air entering the hood face and multiplying this velocity by the square feet of hood opening. The hood sash shall be in the fully raised 16" open position. The air velocity shall be determined by averaging at least nine velocity readings taken at the hood face. Readings shall be taken in the center of a grid made up of 3 sections across the middle of the hood face and 3 sections each across the bottom and top of the hood face. Readings shall not vary more than $\pm$ 10 fpm from the average face velocity. Report all readings in the TAB Report.

4.4.3. When the selected face velocity has been established, a smoke bomb (one-half minute size, as available from E. Vernon Hill Company, San Francisco, California) shall be discharged within the hood area to show the exhaust capability of the hood and its design efficiency. No reverse air flows will be permitted. Place lighted bomb in the hood area and move it to various places, meanwhile checking end panels and working surface to verify that no reverse air flows exist at any point. Lower the sash to closed position to verify that a sufficient air volume is flowing through the hood working area to carry away fumes from a massive fume source. Immediately after the smoke bomb stops discharging smoke, the hood area shall be purged of smoke. Report results in the TAB Report.

4.4.4. Check sash operation by raising and lowering sash. Sash shall glide smoothly and freely, and hold at any height without creeping, assuring proper counterbalance. No metal-to-metal contact shall be allowed between the sash and the sash track.

4.5. All test openings in ductwork shall be resealed in an approved manner.

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3. Extent of refrigerant piping work is indicated on drawings and schedules, and by requirements of this section.

1.4. Refer to other Division 23 sections for insulation of refrigerant piping; not work of this section.

1.5. Codes and Standards:

1.5.1. ANSI Compliance: Fabricate and install refrigerant piping in accordance with ANSI B31.5 "Refrigeration Piping". Extend applicable lower pressure limits to pressures below 15 psig.

1.5.2. ASHRAE Compliance: Fabricate and install refrigerant piping in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".

1.6. Approval Submittals:

1.7. Test Reports and Verification Submittals:

1.7.1. Submit brazing certificates.

1.8. O&M Data Submittals: Submit a copy of approval data. Submit maintenance data and parts lists for solenoid valves, evaporator pressure regulators, expansion valves. Include all data in O&M manual.

2. PRODUCTS

2.1. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.5 Code for Refrigeration Piping where applicable, base pressure rating on refrigerant piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in refrigerant piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2. Basic Identification: Plastic pipe markers.

2.3. Basic Pipes and Pipe Fittings: Provide pipes and pipe fittings complying with Division-23 Basic Mechanical and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

2.3.1. Tube Size 4" and Smaller: Copper tube; Type ACR, hard-drawn temper; wrought-copper, solder-joint fittings; soldered joints.

2.3.2. Tube Size 4" and Smaller: Copper tube; Type ACR, hard-drawn temper; wrought-copper,

solder-joint fittings; brazed joints.

2.3.3. Tube Size ¾" and Smaller: Copper tube; Type ACR, soft annealed temper; cast copper-alloy fittings for flared copper tubes; flared joints.

2.3.4. Tube Size 7/8" through 4": Copper tube; Type ACR, soft annealed temper; wrought-copper, solder-joint fittings; soldered joints.

2.3.5. Tube Size 7/8" through 4": Copper tube; Type ACR, soft annealed temper; wrought-copper, solder-joint fittings; brazed joints.

2.3.6. Soldered Joints: Solder joints using silver-lead solder, ASTM B 32, Grade 96 TS.

2.3.7. Brazed Joints: Braze joints using American Welding Society (AWS) classification BCuP-4 for brazing filler metal.

2.4. Basic Piping Specialties: Provide piping specialties complying Basic Mechanical Materials and Methods section "Piping Specialties".

2.5. Basic Supports and Anchors: Provide supports and anchors complying with Division-23 Basic Mechanical Materials and Methods section "Supports and Anchors".

2.6. Basic Vibration Control: Provide vibration control products complying with Division-23 Basic Mechanical Materials and Methods section "Vibration Controls for HVAC Piping and Equipment" and in accordance with the following listing:

2.6.1. Flexible Pipe Connectors: Type PF5.

3. EXECUTION

3.1. General: Examine areas and conditions under which refrigerant piping systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2. Installation of Basic Identification: Install mechanical identification in accordance with Division-23 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3. Installation of Refrigerant Piping: Install refrigerant piping in accordance with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", and in compliance with equipment manufacturer's recommendations.

3.3.1. Install refrigerant piping with ¼" per foot (1%) downward slope in direction of oil return to compressor. Provide oil traps and double risers where indicated, and where required to provide oil return.

3.3.2. Clean refrigerant piping by swabbing with dry lintless (linen) cloth, followed by refrigerant oil-soaked swab. Remove excess oil by swabbing with cloth soaked in high flash point petroleum solvent, squeezed dry.

3.3.3. Bleed dry nitrogen through refrigerant piping during brazing operations.

3.4. Installation of Supports and Anchors: Install supports and anchors in accordance with requirements of Division-23 Basic Mechanical Materials and Methods section "Hangers and Supports for HVAC Piping and Equipment".

3.5. Equipment Connections: Connect refrigerant piping to mechanical equipment as indicated, and comply with equipment manufacturer's instructions where not otherwise indicated.

Install flexible connections where indicated.

3.6. Locate and coordinate installation of access doors for all valves and devices in accordance with Division-23 Basic Mechanical Materials and Methods section “Access Doors”.

3.7. Refrigerant Piping Leak Test: Prior to initial operation, clean and test refrigerant piping in accordance with ANSI B31.5, "Refrigeration Piping". Perform initial test with dry nitrogen, using soap solution to test all joints. Perform final test with 27" vacuum, and then 150 psi using a suitable tracer refrigerant and dry nitrogen, or a suitable refrigerant. Perform final leak tests with an electronic halide leak detector having a sensitivity of at least 1/2 ounce per year. The system shall be entirely leak-free.

3.8. Repair or replace refrigerant piping as required to eliminate leaks, and retest as specified to demonstrate compliance.

3.9. Evacuation: After completing the successful pressure test, multiple-evacuate the system. For charged condensing units, leave the compressor isolation valves shut and connect the vacuum pump to both the high and low sides. Evacuate the system to an absolute pressure of 1,500 microns. Then break vacuum to 2 psig with dry nitrogen. Repeat this process. Install the proper drier in the liquid line and evacuate the system to 500 microns. Leave vacuum pump running for at least two hours without interruption. Apply heat to pockets, elbows, and low spots in piping. Maintain system vacuum for at least 5 hours after closing the vacuum pump valve. Break vacuum with the refrigerant to be used and raise pressure to 2 psig. Do not operate compressors during the evacuation procedure.

3.10. Charging: After completing the successful evacuation procedure, charge refrigerant directly to the system from the original containers through a filter drier. Charge to the manufacturer's stated conditions of pressure for required temperature. Weigh the refrigerant added and record on the startup report.

END OF SECTION

SECTION 23 34 00
HVAC FANS

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3. Extent of fan work required by this section as indicated on drawings and schedules, and by requirements of this section.

1.4. Coordination:

1.4.1. Furnishing prefabricated roof curbs is part of this section's work.

1.4.2. Refer to Division-23 section "Testing, Adjusting, and Balancing for HVAC" for balancing of fans.

1.4.3. Refer to Division-23 HVAC control systems sections for control work required in conjunction with fans.

1.4.4. Refer to Division-26 sections for power supply wiring from power source to power connection on fans. Division-26 work will include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.5. Codes and Standards:

1.5.1. AMCA Compliance: Provide fans which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.

1.5.2. UL Compliance: Provide fans which are listed by UL and have UL label affixed.

1.5.3. Florida Building Code Compliance: All fans mounted exterior of the building shall indicate they are designed and tested to withstand the wind loading and missile impact testing for the area they are installed. Submittal shall indicate installation and mounting details. Manufacturer shall provide wind-load calculations as required for permitting including associated installation and anchoring details.

1.5.3.1. Performance ratings: Conform to AMCA standard 210, 260 and 300. Fans must be tested in accordance with AMCA 210, 260 and 300 in an AMCA accredited laboratory and certified for air and sound performance. Fan shall be licensed to bear the AMCA ratings seal for air performance (AMCA 210), sound performance (AMCA 300), and induced flow fan for high plume dilution blowers (AMCA 260).

1.5.3.2. Classification for Spark Resistant Construction conform to AMCA 99.

1.5.3.3. Each fan shall be vibration tested before shipping, as an assembly, in accordance with AMCA 204-05. Each assembled fan shall be test run at the factory at the specified fan RPM and vibration signatures shall be taken on each bearing in three planes - horizontal, vertical, and axial. The maximum allowable fan vibration shall be less than 0.10 in./sec peak velocity; filter-in reading as measured at the fan RPM. This report shall be provided at no charge to the customer upon request.

1.6. Approval Submittals:

1.6.1. Product Data: Submit manufacturer's technical data for fans, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions. Submit assembly-type drawings showing unit dimensions, construction details, methods of assembly of components, and field connection details. Include statement that resin selection is suitable for chemical resistance to the specific application at 170ºF.

1.6.1.1. Fans

1.6.1.2. Vibration Control

1.6.1.3. Roof Curbs

1.7. O&M Data Submittals: Submit maintenance data and parts list for each type of fan, accessory, and control. Include these data, a copy of approved submittals, and wiring diagrams in O&M Manual.

2. PRODUCTS

2.1. General: Except as otherwise indicated, provide standard prefabricated fans of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation. Provide accessories as listed in the schedule on the drawings and as described herein. Motors shall be high efficiency per Division-23 section "Motors".

2.2. Acceptable Manufacturers: Subject to compliance with requirements provide fans manufactured by Twin City, Greenheck, Cook, Penn-Barry or approved equal unless otherwise noted herein.

2.3. Centrifugal Roof Exhausters:

2.3.1. Housing: Provide heavy gauge aluminum hood, housing, and base with a galvanized steel frame.

2.3.2. Fan Wheels: Provide aluminum air foil type, statically and dynamically balanced.

2.3.3. Drive: Provide direct or belt drive as scheduled with pre-lubricated, ball bearing, continuous duty type high efficiency (see 23115) motors. Provide vibration isolation equipment for the entire drive.

2.3.4. Square Hood Fans: Where indicated provide low silhouette style fans. Hoods shall be hinged with locking device that operates in both the open and closed position.

2.3.5. Round Hood Fans: Where indicated provide fans with motors mounted in a separate compartment out of the air stream.

2.3.6. Upblast Fans: Where indicated provide upblast discharge fans with integral grease trough and drain fitting. Motors shall be out of the air stream and cooled by clean, outside air only.

2.3.7. Fan motors ¼, ½, or ¾HP shall be 115V/1Ø, DC electronic commutation type motor (ECM) specifically design for fan applications.

2.4. Centrifugal Wall Exhausters:

2.4.1. Housing: Provide heavy gauge aluminum weatherproof housing and base with external drip ring to prevent exhaust contaminants from running down the wall.

2.4.2. Fan Wheel: Provide aluminum air foil type, statically and dynamically balanced.

2.4.3. Drive: Provide direct or belt drive as scheduled with pre-lubricated, ball bearing, continuous duty type motors. Provide vibration isolation equipment for the entire drive.

2.5. Centrifugal Ceiling Exhausters:

2.5.1. Fan Assembly: Provide steel housing, plastic or aluminum grille, backdraft damper, statically and dynamically balanced fan wheel, permanently lubricated motor with internal thermal overloads, vibration isolation and all required mounting hardware and brackets. Provide acoustically treated housing for all fans larger than 60 cfm. Mounting type shall be as indicated on the drawings or on the schedule.

2.5.2. Connectors: Provide adaptors, connectors, and eave elbows as required to connect fan discharges to outlets.

2.5.3. Outlets: Provide where shown on the drawings (or required by the installation) wall caps, vent caps, or roof jacks, each with bird screen, to match fans and surrounding construction.

2.6. Propeller Upblast Roof Exhausters:

2.6.1. Housing: Provide weatherproof heavy gauge steel housing, curb base, and frame with a baked epoxy finish. Provide service access panels.

2.6.2. Fan: Provide air foil design propellers with all-welded construction, statically and dynamically balanced.

2.6.3. Drive: Provide belt drive with pre-lubricated ball bearing, continuous duty type, 1750 rpm motors. Provide vibration isolation equipment for the entire drive. Motors shall be located out of the exhaust air stream and shall be protected by a weatherproof enclosure.

2.6.4. Backdraft Dampers: Provide butterfly type reinforced aluminum dampers with magnetic latches and nylon bearings.

2.7. Propeller Roof Fans:

2.7.1. Housing: Provide heavy gauge aluminum hood and housing with galvanized steel structural supports. Hoods shall be low silhouette, square type with hinge. Provide a locking device operable in the open and closed positions.

2.7.2. Fan: Provide air foil design propellers with all-welded construction, statically and dynamically balanced.

2.7.3. Drive: Provide belt drive with pre-lubricated ball bearing, continuous duty type, 1750 rpm motors. Provide vibration isolation equipment for the entire drive.

2.8. Propeller Wall Fans:

2.8.1. Housing: Provide heavy duty all-welded steel housing and supports with epoxy finish. Panels shall have streamlined orifices.

2.8.2. Fan: Provide air foil type steel or aluminum propellers.

2.8.3. Drive: Provide direct or belt drive as scheduled with pre-lubricated, ball bearing, continuous duty type motors. Provide vibration isolation equipment for the entire drive.

2.8.4. Wall Collar or Housing: Provide galvanized steel fan wall collar or housing as required.

2.8.5. Fan Guard: Provide OSHA approved galvanized steel mesh fan guard.

2.9. Filtered Supply Fans:

2.9.1. Housing: Provide heavy gauge galvanized steel head and housing with quick-release cover latches for access to internal components. Provide insulated cover.

2.9.2. Fan: Provide DWDI blowers, statically and dynamically balanced.

2.9.3. Drive: Provide belt drives with pre-lubricated, ball bearing, continuous duty type, 1750 rpm, open. Provide vibration isolation equipment for the entire drive.

2.9.4. Filters: Provide 1-inch thick, aluminum, washable filters.

2.10. Air Curtain Fans:

2.10.1. Acceptable Producers: Mars, Dynaforce, Greenheck or approved equal.

2.10.2. Performance: Units shall meet USDA standards for insect control.

2.10.3. Air Curtains: Provide air curtains with weatherproof housing, direct drive, continuous duty, air cooled motor, DWDI fan, double deflection discharge air grille, internal thermal overloads, and all required mounting supports and hardware. Where units are mounted outside, provide waterproof junction boxes.

2.10.4. Air Curtain Accessories:

2.10.4.1. Provide where indicated door switch to energize unit when door is opened.

2.10.4.2. Provide where indicated volume controls with 50% range, except for insect control units.

2.11. In-Line Centrifugal Fans:

2.11.1. Housing: Provide round aluminum or square weather tight housing constructed of steel and painted inside and out with an epoxy finish. Provide venturi type inlet.

2.11.2. Fan Wheels: Provide aluminum air foil type, backward curved, statically and dynamically balanced.

2.11.3. Drive: Provide direct or belt drive as scheduled with pre-lubricated, ball bearing, continuous duty type motors. Provide vibration isolation equipment for the entire drive.

2.11.4. Isolation and Support: Provide spring type vibration isolators and fan support brackets.

2.12. Belt Driven Tubeaxial Fans:

2.12.1. Housing: Provide round, reinforced steel housing painted inside and out. Provide Eisenheiss Heresite special coating.

2.12.2. Fan Wheels: Provide aluminum, non-sparking propeller, keyed to the shaft, statically and dynamically balanced.

2.12.3. Drive: Provide belt drive as scheduled with pre-lubricated, ball bearing, continuous duty type motors. Provide vibration isolation equipment for the entire drive.

2.13. Upblast Fume Exhaust Utility Sets:

2.13.1. Housing: Provide AMCA B construction. Provide welded steel fan housing with Eisenheiss coating on all surfaces exposed to the air stream. Provide flanged discharge. Fan

configuration shall be as scheduled. Provide scroll drain and plug. Provide shaft seal. Provide companion flange for discharge duct.

2.13.2. Fan Wheel: Provide aluminum, non-sparking air foil type, statically and dynamically balanced.

2.13.3. Drive: Provide belt drive as scheduled, with pre-lubricated ball bearing explosion proof motor. Provide non-sparking belts. Provide weatherproof drive enclosure. Provide vibration isolation equipment to mount entire fan assembly.

2.14. Utility Sets:

2.14.1. Housing: Provide welded steel fan housing with epoxy coating inside and out. Provide flanged discharge in the configuration shown on the drawings or indicated in the schedule. Provide companion flange for discharge duct. Provide shaft seal and scroll drain with plug.

2.14.2. Fan Wheel: Provide aluminum, air foil type, statically and dynamically balanced.

2.14.3. Drive: Provide belt drive as scheduled, with pre-lubricated ball bearing, continuous duty, open drip proof motor. Provide weatherproof enclosure. Provide vibration isolation equipment to mount entire fan assembly.

2.15. High Plume Fume Dilution Exhaust Fan Sets:

2.15.1. General:

2.15.1.1. Base fan performance at standard conditions (density 0.075 Lb/ft3).

2.15.1.2. Fans selected shall be capable of accommodating static pressure and flow variations of +/-15% of scheduled values. Provide variable frequency drives and motors, see Section 23955.

2.15.1.3. Each fan shall be belt driven in AMCA arrangement 1, 9, or 10 according to drawings.

2.15.1.4. Fans to be equipped with lifting lugs.

2.15.1.5. Fasteners exposed to corrosive exhaust shall be 316 stainless steel.

2.15.2. Corrosion Resistant Coating:

2.15.2.1. All fan and system components (fan, nozzle, wind band, plenum) shall be corrosion resistant coated with LabCoat™, a two part electrostatically applied and baked, sustainable, corrosion resistant coating system; or Heresite P-413C. Standard finish color to be gray.

All parts shall be cleaned and chemically prepared for coating using a multi-stage wash system which includes acid pickling that removes oxide, increases surface area, and improves coating bond to the substrate.

The first powder coat applied over the prepared surface shall be a zinc rich epoxy primer (no less than 70% zinc) and heated to a gelatinous consistency (partial cure) at which the second powder coat of polyester resin shall be electrostatically applied and simultaneously be cured at a uniform temperature of 400°F.

The coating system shall not be less than a total thickness of 6 mils, is not affected by the UV component of sunlight (does not chalk), and has superior corrosion resistance to acid, alkali, and solvents. Coating system shall exceed 4000 hour ASTM B117 Salt Spray Resistance.

Note that 10-20 mil thick wet coating systems pollute the environment (air and water), and that these manually applied coatings are not uniform over the impeller surface and can cause fan imbalance and vibration.

2.15.3. Fan Housing and Outlet:

2.15.3.1. Fan housing to be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence.

2.15.3.2. Fan housing shall be centrifugal involute scroll, allowing all drive components including the motor to be serviced without contact of the contaminated airstream, and manufactured of welded steel. Housing to be corrosion resistant coated per specification section 2.3.2.

2.15.3.3. Fan housings that are fabricated of polypropylene or fiberglass that have lower mechanical properties than steel, have rough interior surfaces in which corrosive, hazardous compounds can collect, and / or which chalk and structurally degrade due to the UV component of the sunlight shall not be acceptable.

2.15.3.4. An air induction discharge nozzle shall be supplied by the fan manufacturer and be designed to efficiently handle an outlet velocity of up to 7000 FPM. The nozzle shall induce ambient air up to 270% of the fan capacity. Nozzle / Wind band assemblies fabricated of plastic or resins, having mechanical properties less than steel shall not be acceptable.

2.15.3.5. An integral fan housing drain shall be used to drain rainwater when the fan is de-energized.

2.15.3.6. A bolted housing access door shall be supplied for impeller inspection.

2.15.3.7. Fan assembly shall be AMCA type C spark resistant construction minimum or as noted on the schedule.

2.15.4. Fan Impeller:

2.15.4.1. Fan impeller shall be centrifugal, single width single inlet, backward inclined airfoil blade design with non-stall characteristics. The impeller shall be electronically balanced both statically and dynamically exceeding AMCA Standards.

2.15.4.2. Fan impeller shall be manufactured of welded steel and meet specification section 2.15 for corrosion resistant coating. Plenums that are fabricated of plastics or resins that are combustible and have mechanical properties less than steel shall not be acceptable.

2.15.4.3. Fan impellers that are fabricated of polypropylene or fiberglass that have lower mechanical properties than steel, and lower maximum tip speeds are not acceptable.

2.15.5. Bypass Air Plenum:

2.15.5.1. For constant volume systems, the fan / nozzle assembly shall be connected directly to exhaust duct without the need of the bypass air plenum.

2.15.5.2. For variable volume systems, the fan manufacturer shall provide a bypass air plenum as shown on drawings. The plenum shall be provided with bypass air damper(s) for introducing outside air at roof level upstream of the fan, complete with bypass air rain hood and bird screen.

2.15.5.3. The plenum shall be constructed of welded steel and meet specification section 2.15 for corrosion resistant coating. Plenums that are fabricated of plastics or resins that are combustible and have mechanical properties less than steel shall not be acceptable.

2.15.5.4. The bypass air plenum shall be mounted on an insulated curb. An optional combination integral fan platform / plenum curb provided by the fan manufacturer, if shown on the project drawings.

2.15.5.5. Bypass air damper(s) shall be opposed-blade design for airflow control, airfoil design, fabricated of steel for structural rigidity, and coated with a minimum of 4 mils of chemically resistant Hi-Pro Polyester resin, electrostatically applied and baked. Bypass dampers shall have stainless steel damper rods, bearings and jamb seals and the blades shall have polymer edge seals. Dampers shall be suitable for application up to 15 inches wg. Damper blade drive linkage shall be set by manufacturer and welded to eliminate linkage slippage. All damper access and service (drive actuators) shall be performed outside of the contaminated plenum interior.

2.15.5.6. If stated in the schedule notes, an optional, integral bypass air packed acoustic attenuator, fabricated of 304 stainless steel, shall be provided by the fan manufacturer (if shown on the drawings). Acoustic insertion loss shall be as follows:

63	125	250	500	1K	2K	4K	8K
3	8	12	21	31	24	16	11

2.15.5.7. Fan isolation damper(s) shall be parallel-blade design, airfoil design, fabricated of steel for structural rigidity, and coated with a minimum of 4 mils of chemically resistant Hi-Pro Polyester resin, electrostatically applied and baked. Bypass dampers shall have stainless steel damper rods, bearings and jamb seals and the blades shall have polymer edge seals. Dampers shall be suitable for application up to 15 inches wg. Damper blade drive linkage shall be set by manufacturer and welded to eliminate linkage slippage. All damper access and service, (including removal and replacement and drive actuators) shall be performed outside of the contaminated plenum interior.

2.15.5.8. Isolation damper actuator(s) shall be factory mounted and wired to a step-down transformer in a NEMA enclosure with wiring provided to each motor disconnect for field installation by others.

2.15.5.9. Plenum shall include a removable bypass air weather hood that is properly sized for low inlet velocity of the bypass air, minimizing the possibility of moisture entrainment.

2.16. Acceptable Manufacturers: Subject to compliance with requirements provide fans manufactured by Greenheck, Stobic, Twin City, Cook, or approved equal unless otherwise noted herein.

3. EXECUTION

3.1. General: Except as otherwise indicated or specified, install fans in accordance with manufacturer's installation instructions and recognized industry practices to insure that fans serve their intended function.

3.2. Coordinate fan work with work of roofing, walls, and ceilings as necessary for proper interfacing. Framing of openings, caulking, and curb installation is not work of this section.

3.3. Ductwork: Refer to Division-23 section "Ductwork". Connect ducts to fans in accordance with manufacturer's installation instructions. Provide flexible connections in ductwork at fans.

3.4. Install fans on vibration isolation equipment as required. Set level and plumb. Provide hurricane tie-down kits for all fans mounted outside or on the roof and secure fans to withstand wind loading for area installed per Florida Building Code.

3.5. Roof Curbs: Furnish roof curbs to roofing Installer for Installation.

3.6. Upblast Lab Fans shall be mounted on a combination integral fan platform / plenum curb, fabricated and supplied by the fan manufacturer. Individual fan rails and curbs shall not be acceptable.

3.7. Set level and plumb. Provide hurricane tie-down kits for all fans mounted outside or on the roof and secure fans to withstand wind loading for area installed per Florida Building Code.

3.8. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.9. Remove shipping bolts and temporary supports within fans. Adjust dampers for free operation.

3.10. Testing: After installation of fans has been completed, test each fan to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

3.11. Cleaning: Clean factory-finished surfaces. Remove all tar and soil. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 23 81 26
SPLIT-SYSTEM AIR-CONDITIONERS

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3. Refer to other Division-23 sections for testing, adjusting, and balancing of air conditioning units (ACUs).

1.4. Approval Submittals:

1.4.1. Product Data: Submit manufacturer's technical product data, including dimensions, ratings, electrical characteristics, weight, capacities, materials of construction, and installation instructions.

1.4.1.1. Split system units

1.4.1.2. Vibration Isolation

1.5. O&M Data Submittals: Submit manufacturer's maintenance data including parts lists. Include these data, a copy of approval submittals, product data, and wiring diagrams in O&M manual.

2. PRODUCTS

2.1. Quality Assurance:

2.1.1. Provide units tested by UL, ARL or ETL.

2.1.2. Construct refrigeration system in accordance with ASHRAE 15 (ANSI B 9.1) "Safety Code for Mechanical Refrigeration".

2.1.3. Test and rate ACUs in accordance with the applicable ARI standards and provide certified rating seal. Sound test and rate units in accordance with ARI 270.

2.1.4. Furnaces shall be tested and certified by AGA.

2.1.5. Provide units with an efficiency that meets the Florida Energy Conservation Code and the schedules on the drawings.

2.1.6. Acceptable Manufacturers: Subject to compliance with requirements provide units by: Carrier, Trane, Lennox, Addison or approved equal.

2.2. General:

2.2.1. Units shall be factory-assembled, wired and tested. All controls shall be factory-adjusted and preset to the design conditions.

2.2.2. Casings: Construct of heavy gauge steel (or aluminum) formed panels rigidly reinforced and braced. Each unit shall be provided with removable panels to permit the unit (including fans and compressors) to be properly maintained and serviced. Entire casing shall be painted with factory-applied finish. Casing for outdoor units shall be provided with weatherproof

construction with all seams bolted. Provide stainless steel hardware.

2.2.3. Supports: Provide 12" high (above roof surface) continuous-welded, full perimeter supports of galvanized steel construction; Pate or equal. Provide concrete pad 4" larger than the unit on all sides for ground-mounted units.

2.3. Condensing Unit:

2.3.1. Condenser Fans and Drives: Fan shall of rustproof construction: hot-dipped galvanized steel, stainless steel or aluminum. Unit shall have a variable speed motor suitable for the duty indicated. Provide a close fretwork galvanized steel or non-ferrous fan and guard. Motors shall be the permanently lubricated type, resiliently mounted.

2.3.2. Condenser Coil: Construct of copper nonferrous nonferrous tubes and copper nonferrous fins. Provide inlet guard to protect condenser fins. Provide seacoast or heresite coating on the condenser coil where noted.

2.3.3. Compressor: Shall be scroll hermetic or semi-hermetic reciprocating design for R410a refrigerant with vibration isolation. Each compressor shall have separate refrigerant circuit. Motors shall be ball bearing, high starting torque, low starting current type for compressor service. Compressors shall not produce objectionable noise or vibration inside the building. Compressors shall have five (5) year warranty.

2.3.4. Service Valves: Provide for high and low pressure readings.

2.4. Evaporator Unit:

2.4.1. Interior of unit shall be thermally and acoustically insulated with minimum R=4.2 insulation. Provide double wall construction. Provide removable panels to permit the unit to be properly serviced and maintained.

2.4.2. The evaporator shall include centrifugal fan, fan motor, direct drive vee belt drive, cast-iron sheaves, vari-pitch fan motor sheave, and lubricated bearings. Motors shall be high efficiency type as per Division-23, Basic Mechanical Materials and Methods section, "Motors". Provide cooling coils constructed of copper nonferrous tubes and copper aluminum fins. Provide seacoast or heresite coating on the coils. Filters and coils shall be selected for a maximum face velocity of 500 fpm. Provide thermal expansion valve, sight glass, refrigerant drier, strainer, controls and other necessary devices for a completely automatic unit.

2.4.3. Each unit shall be equipped with sloped IAQ plastic or stainless-steel drain pans under the entire evaporator coil to prevent condensate carry-over. Provide side return unit stand on all air handlers.

2.5. Gas Furnace Section:

2.5.1. Type: Provide natural gas or LP-fired, natural draft furnace with a combustion efficiency of at least 90%.

2.5.2. Heat Exchanger: Provide coated steel heat exchanger with aluminized steel burners for corrosion resistance.

2.5.3. Accessories: Provide automatic vent damper.

2.5.4. Gas Furnace Controls: Provide electronic pilot ignition, automatic and manual main and pilot gas valves, pilot safety, gas pressure regulator, prewired fan relay to delay fan operation on

heating starting to minimize drafts, and limit control to prevent overheating. All shall meet AGA requirements.

2.5.5. Gas Vents: Provide Type B gas vents meeting the requirements of 23440.

2.6. Filters: Filters shall be minimum MERV 13 angular filters.

2.7. Electric Heater Section:

2.7.1. Provide electric heating coils controlled by one or more magnetic contactors. Provide SCR control for the first stage of electric heat. Control shall be UL listed and have specified capacity for not less than 100,000 cycles. Three phase coils shall be wired for balanced current in each wire, if possible. Furnish and install necessary overheating and air flow controls to meet the requirements of the National Electric Code. Provide built-in air flow switch and heater interlock relay.

2.7.2. Heaters shall be factory mounted and wired with all required fuses and contactors to provide single point connection.

2.8. Unit Controls:

2.8.1. All safety and operational controls shall be factory wired.

2.8.2. Safety and Operational Control Features:

Internal compressor overtemperature protection.
Crankcase heaters.
Individual motor overcurrent protection.
High pressure cutout.
Low pressure cutout.
Anti-recycle timer (5 minute)
Timer-type defrost control.
Phase failure and low voltage protection and phase/voltage monitors.
EDA liquid soldering or on/off hot gas reheat coil
Liquid line solenoid.
Hot gas bypass.
Air proving switch.

2.8.3. Each unit shall be provided with a combination thermostat/humidistat, located per floor plan, which shall be low voltage, programmable remote-mounted with sub-base and temperature and humidity sensors for controlling heating and cooling cycles. Provide battery backup (with batteries) for all thermostats. The fan selector shall include "AUTO-ON" controls. Provide automatic changeover thermostats with fan that run continuously. The room thermostats shall be manually adjustable by occupants and shall indicate setting and temperature in degrees Fahrenheit. Provide a minimum of two heating stages.

2.8.4. Outdoor air thermostat shall energize electric heat below 35° F on call for heating by second stage of room thermostat.

2.8.5. Smoke Detector Operation: Duct-mounted smoke detectors are provided by Division-23 in the supply air stream and the return air stream that stop the ACU and heater when actuated.

2.9. Refrigerant Piping:

2.9.1. Copper tubing ¾" and smaller: Type ACR, soft annealed temper; cast copper-alloy fittings for flared copper tubes; flared joints.

2.9.2. Copper tubing 1" - 4": Type ACR, hard-drawn temper tubing; wrought-copper, solder-joint fitting; brazed joints and long radius elbows.

2.9.3. Silver solder material: Silver solder bearing at least 15% silver; Sil Fos.

2.10. Basic Vibration Isolation: Provide vibration isolation products complying with Division-23 section "Vibration Isolation" and the following list:

2.10.1. Equipment Mounting: Type EM1 EM5

2.11. Supports: Provide hurricane tie-down kits for outside units.

3. EXECUTION

3.1. Installation: Install in accordance with producer's printed instructions. Brush out fins on all coils.

3.2. Support: Anchor rooftop units to curbs with cadmium-plated self-tapping screws, lag screws, or bolts, as directed by curb construction. Secure outdoor unit to comply with Florida Building Code wind loading requirements. The curb shall be installed by the roofing contractor. Mount units on concrete pads with manufacturer’s recommended service and operating clearance.

3.3. Hang air handling units level and plumb from structure using threaded rods and vibration isolators. Where units are above ceilings, provide secondary drain pans. Mount units on vibration isolation and concrete pads.

3.4. Brush out fins on all coils.

3.5. Refrigerant Piping: Comply with ANSI B31.5, “Refrigerant Piping,” (except lower pressure limits below 15 psig), and ASHRAE 15 (ANSI B9.1). Make all joints carefully and neatly. Clean pipe and fittings before fluxing. Remove burrs. Braze by the sweat method using Sil Fos. Install field installed refrigerant devices and valves as required.

3.6. Testing: After job erection, or modification of factory installed piping, pressure test for leaks at 150 psig using a nominal amount of a suitable tracer refrigerant and dry nitrogen or a suitable refrigerant. Perform leak tests with an electronic halide leak detector having a sensitivity of at least ½ ounce refrigerant per year. Refrigeration piping will not be accepted unless it is gas tight.

3.7. Evacuation: After completing the successful pressure test, multiple-evacuate the system. Leave the compressor isolation valves shut and connect the vacuum pump to both the high and loq sides. Evacuate the system to an absolute pressure of 1,500 microns. Then break vacuum to 2 psig with dry nitrogen. Repeat this process. Install the proper biflow drier in the liquid line and evacuate the system to 500 microns. Leave vacuum pump running for at least two hours without interruption. Break vacuum with the refrigerant to be used and raise pressure to 2 psig. Do not operate compressors during the evacuation procedure.

3.8. Charging: After completing the successful evacuation procedure, charge refrigerant directly to the system from the original containers through a filter drier. Charge to the manufacturer’s stated conditions of pressure for required temperature. Weigh the

refrigerant added and record on the startup report.

3.9. Coordinate connection to gas supply and verify proper gas pressure to unit. Install gas vents in accordance with 23440.

3.10. Construction Filters: Provide 1" thick filters in all units during construction. After construction (but prior to the test and balance being performed) install clean final filters.

3.11. Construction Filters: Provide MERV 8 or better filtration during construction after installation of units and ductwork. After construction (but prior to test and balance) replace with MERV 14 final filters.

3.12. Cleaning: Clean tar and all other soil from housing exterior. Leave ready for Division 7, Caulking Work. Caulk around pipe sleeves.

3.13. Condensate Drain: Pipe trapped copper condensate drain (full size of unit outlet) to nearest floor/roof drain or as shown on the drawings. Refer to Division-23 section "Insulation" for pipe insulation.

3.14. Startup: Check entire assembly for correctness of installation, alignment, and control sequencing. Start all component parts in proper sequence. Make all adjustments required to insure proper smooth quiet operation.

3.14.1. Replace all filters with new media with specified final filters prior to occupancy.

3.14.2. Indoor equipment shall be stored in dry areas only. Move shipped indoor equipment to dry area during off-loading.

3.14.3. Seal AC unit ends per SMACNA “Duct Cleanliness for New Construction.”

3.14.4. Do not run air conditioning during drywall sanding or painting including installing V.C.T.

3.14.5. Confirm all casings, coils, fans, ducts, and grilles are clean before air quality testing. Failure to provide clean equipment and ductwork will require remediation and further testing to be provide by the installing contractor(s).

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

1. GENERAL

1.1. The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the electrical work as herein called for and shown on the Drawings.

1.2. Related Documents:

1.2.1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2.2. Provisions of this Section apply to work of all Division 26 Sections.

1.2.3. Review all project Drawings to be aware of conditions affecting work herein.

1.2.4. Definitions:

1.2.4.1. Provide: Furnish, install, and test, complete and ready for intended use.

1.2.4.2. Furnish: Supply and deliver to project site, ready for subsequent requirements.

1.2.4.3. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, test complete ready for intended use, and similar requirements.

1.3. Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.4. Verification of Owner's Data: Prior to commencing work the Contractor shall satisfy himself as to the accuracy of all data indicated on the Drawings and/or provided by the Owner. Should the Contractor discover any inaccuracies, inconsistencies, errors, omissions in the data, ambiguities, or other conditions which might prevent construction being provided as indicated, Contractor shall immediately notify the Engineer. Commencement of work by the Contractor shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data. If any portions of the Contract Documents or any other such data provided by the Owner is inconsistent or otherwise ambiguous, Contractor shall provide materials and labor necessary in the Bid Amount to provide the most expensive of the possible interpretations of the requirements of this Contract for Construction. A credit to the Owner shall be provided by the Contractor if a less expensive interpretation is actually provided; no additional time or addition to the Contract Amount shall be provided if the Contractor fails to comply with this requirement of the Contract Documents. Contractor shall coordinate exact requirements of Division 26 with the requirements of other divisions of this Contract prior to Bid.

1.5. Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and damage.

1.6. Extent of work is indicated in the Drawings, Schedules, and Specification. Singular references shall not be construed as requiring only one device if multiple devices are shown on the Drawings or are required for proper system operation.

1.7. Field Measurements and Coordination:

1.7.1. The intent of the Drawings and Specifications is to obtain a complete and satisfactory installation. Separate divisional Drawings and Specifications shall not relieve the Contractor or Subcontractors from full compliance of work of his trade indicated on any of the Drawings or in any Section of the Specifications. Report conflicts prior to start of work.

1.7.2. Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all Contract Documents and approved shop drawings to verify exact dimension and locations. Do not scale electrical drawings, rely on dimensions shown on architectural or structural drawings.

1.7.3. Coordinate work in this Division with all other trades in proper sequence to insure that the total work is completed within Contract time schedule and with minimum cutting and patching.

1.7.4. Locate all equipment, materials, and apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on electrical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.

1.7.5. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval from Engineer or Architect.

1.7.6. Carefully examine any existing conditions, piping, and premises. Compare Drawings with existing conditions. Report any observed discrepancies. Written instructions will be issued by the Engineer to resolve discrepancies.

1.7.7. Because of the small scale of the Drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate material, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and shall not order materials or perform work without verification. No extra compensation will be allowed because field measurements vary from the dimensions on the Drawings. If field measurements show that equipment or material cannot be fitted, the Engineer shall be consulted. Remove and relocate, without additional compensation, any item that

is installed and is later found to encroach on space assigned to another use.

1.8. Interpretation of the Contract Documents is sometimes necessary due to perceived ambiguities or conflicts in the contract requirements. Where ever more than one interpretation of the requirements of the Contract Documents can be made, the Contractor shall provide materials and labor necessary to accommodate providing the most expensive of the different interpretations. No change order shall be processed for a failure to comply with this requirement.

1.9. Guarantee and Service

1.9.1. Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.10. Approval Submittals

1.10.1. Before ordering any materials or equipment, and within 30 days after the award of Contract the Contractor shall submit to the Engineer one complete submittal control log showing the make, type, manufacturer's name and trade designation of all equipment.

1.10.1.1. This log shall be accompanied by pdf copies of the manufacturer's printed specifications and shop drawings for each piece of equipment or specialty and shall give dimensions, diagrams, descriptive literature, capacity or rating, kind of material, finish, guarantee, etc., and such other detailed information as the Engineer may require.

1.10.1.2. When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

1.10.1.3. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following.

1.10.1.3.1. Submittals shall be properly organized in accordance with the approved submittal control log.

1.10.1.3.2. Submittals shall not include items from more than one specification section in the same submittal package.

1.10.1.3.3. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.

1.10.1.3.4. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved"

stamp with a signature and date; or at a minimum, stamp shall indicate the exceptions taken by the Contractor and these exceptions shall not indicate substantial deviations from the requirements of the Contract Documents in the judgement of the Engineers.

1.10.1.3.5. Submittals that include a series of fixtures or devices shall be organized by the fixture number or device type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.

1.10.1.3.6. The electrical design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

1.10.2. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.

1.10.3. Review of submittals, product literature, catalog data, or schedules by the Engineer shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

1.10.4. Submit shop drawings and any other drawings specifically called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than ¼" per foot), with dimensions clearly showing the installation. Direct copies of small-scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials.

1.11. Independent Testing Agency: Where testing by an independent testing agency is required or selected by the Contractor, the requirements below shall be met.

1.11.1. The testing firm shall be an independent testing organization which shall function as

an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.

1.11.2. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

1.11.3. The testing firm shall utilize technicians who are regularly employed by the firm for testing services.

1.11.4. The testing firm shall submit proof of the above qualifications with bid documents.

2. PRODUCTS

2.1. All materials shall be new and unused, the best of their respective kinds, suitable for the conditions and duties imposed on them. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following Sections.

2.2. Equipment and Materials:

2.2.1. Equipment and materials furnished under this Division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar equipment or materials.

2.2.2. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.

2.2.3. The label of the approving agency, such as UL or NEMA, by which a standard has been established for the particular item shall be in full view. Materials shall be UL-listed for the application specified or indicated on the Drawings or Specifications. All materials provided shall be installed in conformance with their UL-Listing requirements and with their manufacturer’s installation instructions.

2.2.4. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the Drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products meet detailed specifications and that size and arrangement of equipment are suitable for installation.

2.2.5. Model Numbers: Catalog numbers and model numbers indicated in the Drawings and Specifications are used as a guide in the selection of the equipment and are only listed for the Contractor's convenience. The Contractor shall determine the actual model numbers for ordering equipment and materials in accordance with the written description of each item and with the intent of the Drawings and Specifications.

2.3. Requests for Substitution:

2.3.1. Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified. Other systems, products, equipment or materials may be accepted only if in the opinion of the Engineer, they are equivalent in quality and workmanship and will perform satisfactorily its intended purpose. All such substitutions in materials or equipment shall be approved in writing by the Engineer.

2.3.2. In making requests for substitutions, the Contractor shall list the particular system, product, equipment or material he wishes to substitute and at bid time the Contractor shall state the amount he will add or deduct from his base bid if the substitution is approved by the Engineer. If no deduction or addition to the base bid is allowed by the Contractor for such substitution, it shall be so stated on the request.

2.3.3. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

2.3.3.1. Required product cannot be supplied in time for compliance with Contract time requirements.

2.3.3.2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.

2.3.3.3. Substantial cost advantage is offered Owner after deducting off-setting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

2.3.4. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

Principle of operation.

Materials of construction or finishes.

Thickness of materials.

Weight of item.

Deleted features or items.

Added features or items.

Changes in other work caused by the substitution.

Performance and rating data.

If the approved substitution contains differences or omissions not specifically called to the attention of the Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products at the Contractor's expense.

3. EXECUTION

3.1. Workmanship: All materials, fixtures, and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Engineer.

3.2. Coordination:

3.2.1. The Contractor shall be responsible for full coordination of the electrical systems with shop drawings of the building construction so the proper openings and sleeves or supports etc., are provided for conduit, devices, or other equipment passing through slabs or walls.

3.2.2. Means of Support for all lighting fixtures, raceway, devices, or other items suspended from the ceiling (or otherwise from above) shall be fully coordinated with and in compliance with all requirements and recommendations of the manufacturer of equipment suspended.

3.2.3. Coordination with Other Divisions of this Contract shall be provided, prior to bid, as necessary to properly supply power to equipment in compliance with the UL Listings of this equipment. The division 26 design may provide a number of branch circuits, phases, ampacity, and overcurrent protection devices for design-basis equipment, provided by other divisions of this contract, conforming with the equipment manufacturer’s specifications available at the time of design. Manufacturer’s specifications available at the time of design often differ substantially from the specifications of the equipment actually provided under the contract for construction due to value engineering, due to the use of alternate approved equipment manufacturers, or due to periodic changes in the specifications of the equipment provided by other divisions of this contract. Prior to bid, Contractor shall coordinate with specifications, recommendations, and requirements of equipment to actually be provided under contract for construction. If requirements of equipment actually provided are different from electrical design, Contractor shall make all changes required without increase in contract amount or time schedule. Such changes may include – but shall not be limited to – changing the size, type, or quantity of conductors, conduits, circuit breakers, fuse protection, panelboards, switchboards, and disconnect switches. No changes in time schedule or contract amount shall be approved due to a failure to perform this required coordination.

3.2.4. It shall be the Contractor's responsibility to see that all equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the Drawings.

3.2.5. All Optional Color Selections which are made for any electrical materials shall be approved by the Architect and Owner prior to ordering any materials.

3.2.6. All connections to fixtures and equipment shown on the Drawings shall be considered diagrammatic unless otherwise indicated by a specific detail on the Drawings. The actual connections shall be made to fully suit the requirements of each case and adequately provide for servicing.

3.2.7. The Contractor shall protect equipment and fixtures at all times during storage and construction. He shall replace all equipment and fixtures which are damaged as a result of inadequate protection.

3.2.8. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

3.2.9. Start of work will be construed as acceptance of suitability of work of others.

3.3. Construction Electrical Utilities: Provide all temporary wiring for power and light required for construction purposes and remove such temporary wiring when use is no longer required.

3.4. Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Engineer and Owner and this work shall be done at the time best suited to the Owner. Outages must be scheduled through the Engineer. Extent, length, and timing of outages shall be reviewed by the Engineer. Services shall be restored the same day. Provide temporary power or other services as required during outages.

3.5. Cutting and Patching: Contractor shall be responsible for cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under these Specifications. Obtain permission from Engineer before cutting any structural items.

3.6. Equipment Setting: Bolt equipment directly to concrete pads or foundations, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.

3.7. Additional Steel Support Hardware required for the installation of any electrical or other equipment provided shall be provided by the Contractor. Contractor shall provide materials and labor necessary to ensure that all products are rigidly secured to structure pursuant to applicable portions of NEC 300-11. This shall include – but shall not be limited to – providing additional threaded rods, metal framing, and other hardware required to minimize horizontal as well as vertical movement. Means of support shall be clearly indicated and fully described in the submittal for items suspended. Threaded rods shall not be used as sole means of support for suspended raceway unless approved in writing by engineer or unless assembly can be demonstrated to be substantially free from significant horizontal or vertical sway or movement as is required to comply with NEC. Threaded rods shall not be used as

means of support for lighting fixtures unless approved in writing by engineer.

3.8. Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 26. Obtain matched color coatings from the manufacturer and apply as directed by manufacturer. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.9. Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, Contractor is to carefully clean and leave premises free from debris and in a safe condition.

3.10. Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.11. Record Drawings:

3.11.1. During the progress of the work the Contractor shall record on their field set of Drawings the corrections, variations, and deviations for systems which are not installed exactly as shown on the Contract Drawings.

3.11.2. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 Sections.

3.12. Acceptance:

3.12.1. Request inspections as required under the Supplementary or General Conditions. Conceal no work until inspected.

3.12.2. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

3.12.3. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with the project, for a period deemed necessary by the Owner to instruct permanent operating personnel in the operation of equipment and control systems.

3.12.4. Operation and Maintenance Manuals: Furnish PDF of complete manuals organized by system or section. Manuals shall contain:

3.12.4.1. Detailed operating instructions and instructions for making minor adjustments.

3.12.4.2. Complete wiring and control diagrams.

3.12.4.3. Routine maintenance operations.

3.12.4.4. Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.

3.12.5. Test together and separately to determine that:

3.12.5.1. System is free from short circuits and other faults.

3.12.5.2. Motor starter overload devices are sized correctly.

3.12.5.3. Motors rotate correctly.

3.12.5.4. All equipment operates correctly and as specified.

3.12.6. Warranties: Submit copies of all manufacturer's warranties.

3.12.7. Record Drawings: Submit "Record Drawings".

3.12.8. Install engraved metal or plastic nameplates or tags on controls, panels, switches, starters, timers, and similar operable equipment, keyed by number to operating instructions. Dymo type labels are not acceptable.

3.12.9. Controls Wiring and Alarm Wiring shall be labeled by tags at all junction boxes, device boxes, and all enclosures.

3.12.10. Labeling for Boxes and Electrical Devices – Provide box and device labeling as follows:

3.12.10.1. Switches – Each light switch shall be marked by panel name and circuit number using numbered vinyl cloth adhesive markers, 1/4" minimum height. Locate marker behind device cover plate so it can be readily identified by removal of the cover plate. Thomas and Betts E-Z Code Markers are acceptable.

3.12.10.2. Receptacles – Each receptacle shall be marked by panel name and circuit number using numbered vinyl cloth adhesive markers, 1/4" minimum height. Locate marker behind device cover plate so it can be readily identified by removal of the cover plate. Thomas and Betts E-Z Code Markers are acceptable.

3.12.10.3. Boxes –

3.12.10.3.1. All medium voltage junction box covers shall be marked using a printed label or stencil ¾” minimum height. Locate label inside of box as well as on cover.

3.12.10.3.2. Branch Circuits : label panel number and circuit (Use CKT abbreviation for circuit followed by number)

3.12.10.3.3. Feeder Circuits : Label feeding panel and load panel

3.12.10.3.4. Auxiliary Systems junction and pull box covers

Fire Alarm Systems	Red
Access Control Security Systems	Yellow
Telecommunication Systems	Blue
Other Systems	Paint a Unique Color 1. Do not use any of the above colors, Green or White

3.12.10.3.5. For areas with no ceilings where all systems above the ceiling shall be painted a single color, all junction boxes shall have a printed label on them with Voltage, power source if needed (e power), Panel number (or feeding and load panel numbers),

circuit(s) number or with the service in the junction box (fire alarm, access control, telecom/data, HVAC/BAS, etc.). Locate label inside of box as well as on cover. Labels shall be self-adhesive type, with ¾"tall black letters on a white or clear background.

3.12.11. Acceptance will be on the basis of tests and inspections of the work. A representative of the firm which performed the testing shall be in attendance to assist during inspection. Contractor shall furnish necessary electricians to operate system, make any necessary adjustments and assist with final inspection.

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.2. This Section is a Division-26 Basic Materials and Methods Section, and is part of each Division-26 Section making reference to or requiring products specified herein.

1.3. Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow. This shall include submittal for means of support of equipment, if necessary, as indicated below in this section.

2. PRODUCTS

2.1. As indicated, products listed herein may be common to various Division 26 Sections for this project.

2.2. All materials and equipment specified herein shall be UL listed or approved according to the requirements of applicable NEC articles.

2.3. Metal Framing System:

2.3.1. Steel channel sections shall be rolled from commercial grade steel.

2.3.2. The cross-sectional width dimension of the channel shall be a minimum of 1½." The depth shall be sized to satisfy the load requirements and deflection.

2.3.3. Channels 1½" in depth or greater shall be rolled from 12-gauge steel. Channels smaller than 1½" in depth may be 14-gauge steel.

2.3.4. Attachment holes shall be factory punched on hole centers equal to the channel cross-sectional width dimension and shall be maximum of 9/16" diameter.

2.3.5. The finish on steel components shall be electro-galvanizing for use in dry locations indoor only, hot dip galvanized elsewhere.

2.3.6. Nuts, bolts, washers, straps, threaded rod and other parts shall be protected with the same finish as the channels.

2.4. Equipment Backboards: Equipment Backboards shall be exterior grade ¾" plywood finished on one side. Finish backboard with fire retardant gray paint before mounting.

3. EXECUTION

3.1. General:

3.1.1. Materials and equipment shall be installed in a neat and workmanlike manner according to the standards of the industry. Materials and equipment installed and not meeting the standards of the industry may be rejected and required to be removed and reinstalled by the Contractor at no additional cost to the Owner.

3.1.2. Contractor is responsible for the safety and conditions of the materials and equipment installed

until Owner's beneficial occupancy or acceptance.

3.1.3. Minor location changes from those indicated may be necessary so that work can conform with the building as constructed, to fit work of other trades or to comply with the rules of authorities having jurisdiction.

3.2. Equipment Supports: Concrete bases and structural steel to support this Division's equipment and raceways, and not specifically shown on Structural or Architectural Drawings shall be furnished by Contractor whose equipment or raceways is to be supported. Provide a raised reinforced 4" concrete base for all floor supported equipment, or as indicated on the Drawings.

3.2.1. Setting in Concrete: Place all inserts in concrete forms prior to time concrete is poured. If additional inserts are required in existing concrete work, use self-drilling screw anchors.

3.2.2. Support Spacing: Comply with codes and regulations referenced earlier and as follows:

3.2.2.1. Support no electrical work from piping, ductwork, etc. Where metal decking is used, provide supports independent of decking so that loads will not be transferred to decking. Drill through decking and secure supports to concrete slab.

3.2.2.2. Vertical conduit inside building shall be supported at each floor level and at 10'0" intervals.

3.2.2.3. Support conduit within one foot of changes of direction, and within one foot of each enclosure to which it is connected.

3.3. Additional Steel Support Hardware required for the installation of any electrical or other equipment or devices provided shall be provided by the Contractor. Contractor shall provide materials and labor necessary to ensure that all products are rigidly secured to structure pursuant to applicable portions of NEC 300.11. This shall include – but shall not be limited to – providing additional threaded rods, metal framing, and other hardware required to minimize horizontal as well as vertical movement. Means of support shall be clearly indicated and fully described in the submittal for items suspended. Threaded rods shall not be used as sole means of support for suspended raceway unless approved in writing by engineer or unless assembly can be demonstrated to be substantially free from significant horizontal or vertical sway or movement as is required to comply with NEC. Lighting fixtures shall not be supported by threaded rods or chains unless approved in writing by engineer. See Project Manual Section, “Lighting Fixture Supports, Standards and Poles.”

3.3.1. NEC Working Space Shall Be Indicated – Areas that pertain to Working Space in Article 110.26 of the NEC shall have yellow striping installed diagonally with stripes being three inches wide and three inches apart. The center of the area shall have the words “Safety Zone” installed with letters at least four inches high. Architect or Engineer shall be consulted for projects in which this area is carpeted, tiled, or otherwise has flooring which is not appropriate for such painting.

3.3.2. Finish in areas not listed or otherwise noted shall be black enamel.

3.3.3. Hangers, supports, structural steel and equipment that are not factory finished shall be prime coated and finished coated with color to match the area in which it will be located.

3.4. Equipment Backboards: Locate equipment backboards where indicated on the Drawings. Install straight and plumb. Secure to structure using screws, toggle bolts or masonry anchors. DO NOT use plastic or wood plugs in masonry or concrete. Do not install combustible

backboards in air handling space, plenums or where prohibited by the local governing authority.

END OF SECTION

SECTION 26 05 44
SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.2. This Section is a Division-26 Basic Materials and Methods Section, and is part of each Division-26 Section making reference to or requiring products specified herein.

1.3. Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow. This shall include submittal for means of support of equipment, if necessary, as indicated below in this section.

2. PRODUCTS

2.1. As indicated, products listed herein may be common to various Division 26 Sections for this project.

2.2. All materials and equipment specified herein shall be UL listed or approved according to the requirements of applicable NEC articles.

2.3. Sleeves: Sleeves shall be hot dip galvanized metal flanged type or schedule 40 galvanized steel pipe.

2.4. Fire Barrier Penetration Seals:

2.4.1. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for electrical components such as conduit or electrical boxes.

2.4.2. Cracks, voids, or holes up to 4" diameter shall be filled with putty, caulking, or one-piece intumescent elastomer which is non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat.

2.4.3. For openings 4" or greater use a sealing system capable of passing 3-hour fire test in accordance with ASTM E-814. Sealing system shall consist of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350EF.

2.5. Painting: Painting products are specified in Division 9 - “Finishes”.

3. EXECUTION

3.1. General:

3.1.1. Materials and equipment shall be installed in a neat and workmanlike manner according to the standards of the industry. Materials and equipment installed and not meeting the standards of the industry may be rejected and required to be removed and reinstalled by the Contractor at no additional cost to the Owner.

3.1.2. Contractor is responsible for the safety and conditions of the materials and equipment installed until Owner's beneficial occupancy or acceptance.

3.1.3. Minor location changes from those indicated may be necessary so that work can conform with

the building as constructed, to fit work of other trades or to comply with the rules of authorities having jurisdiction.

3.2. Sleeves, Inserts and Supports:

3.2.1. Sleeves Through Roofs: Coordinate setting with Division 7. Contractor shall provide penetrations complying with Architectural requirements.

3.3. Caulking and Seals:

3.3.1. Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases in accordance with Division 7 requirements. Fire stop shall be UL listed and NFPA approved for such service. Completely fill and seal clearances between raceways and openings with the fire stop material. Adhere to manufacturer's installation instructions.

3.3.2. At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight.

3.4. Painting:

3.4.1. Painting for Division 26 work shall be by the Division 9 finishes contractor and as provided in Division 9 - finishes.

3.4.2. The Division 26 Contractor shall be responsible for coordinating with the Division 9 - Finishes Contractor the painting of the materials and equipment of Division 26.

3.4.3. Refer to the Finish Schedule on drawings for location and type of paint.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2. Division-26 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3. Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

1.4. Depth Coordination: Provide panelboards with depths coordinated with wall thicknesses in locations shown on electrical drawings. Refer to architectural drawings for all dimensions. Include cost of any accommodations for dimensions of proposed panelboards in bid; no adjustments will be made in contract amount for lack of coordination.

2. PRODUCTS

2.1. Acceptable Producers: General Electric Co., ABB, Siemens, Cutler-Hammer, and Square D. Products shall be furnished by one producer.

2.2. General: Panelboards shall be UL listed, bolt-in circuit breaker type, with copper bus and door-in-door covers for all NEMA 1 enclosures unless noted otherwise on the drawings. Door-in-door enclosure shall not require the use of any tools or the removal of any screws or other attachment hardware in order to access wiring compartment; only a separate key shall be required for this access. Piano-Hinge type enclosures are not suitable for this requirement. Door-in-door covers are not required for enclosure types other than NEMA 1. See panel schedules on Drawings for electrical characteristics.

2.3. Bus Assembly and Temperature Rise: Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the panelboard schedule. Ratings shall be established by heat rise tests in accordance with Underwriters Laboratories Standard UL 67. Provide copper bus assembly and copper only lugs for copper conductors. Bus bars shall be copper.

2.4. Circuit Breakers: Circuit breakers shall be full module, bolt-on type, equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Large permanent, individual circuit numbers shall be affixed adjacent to each breaker in a uniform position. Trip indication shall be clearly shown by the breaker handle. Provisions for additional breakers shall be such that no additional connectors will be required to add circuit breakers.

2.5. Provide shunt trip feature where indicated on the Drawings.

2.6. Equipment Short Circuit Rating: Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the equipment rating shown on the panelboard schedule on the Drawings, but under no circumstances less than 10,000 amperes. Panelboard and circuit breakers shall be fully rated for interrupting ratings indicated. Under no circumstances will series rated equipment be acceptable. Every overcurrent device provided shall be UL approved to individually interrupt its rated short circuit current and shall not

depend upon operation of another overcurrent device to achieve its rating.

2.7. Grounding Terminals: Provide each panelboard unit with a ground terminal bar and with lugs for equipment ground wires. Ampacity shall be the same as the full capacity of the main bus. Ground bar or lugs shall be copper.

2.8. Neutral Terminals: Provide each panelboard unit with an insulated neutral terminal bar. Ampacity of neutral bar shall be the same as the full capacity of the main bus bars. Neutral bar shall be copper.

2.9. Enclosure: Panelboard boxes shall be hot-dip zinc galvanized steel constructed in accordance with UL 50 requirements. Unpainted galvannealed steel is not acceptable. The size of wiring gutters shall be in accordance with UL Standard 67. Enclosure doors shall be door in door type and shall meet strength and rigidity requirements per UL 50 standards. Door shall also have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel. Doors over 48” high shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. Minimum depth of enclosures shall be 5-3/4” and minimum width shall be 20”. Cabinet shall not have ventilating openings.

2.10. Safety Barriers: The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breakers shall be barriered.

2.11. UL Listing: Panelboards shall be listed by Underwriters Laboratories and shall bear the UL label. When indicated, panelboards shall be suitable for use as service equipment.

2.12. Nameplates: Provide an engraved laminated phenolic identification plate 1" high by 3" wide with minimum 1/4" letters indicating the panelboard identification shown on the drawings. Nameplate shall be affixed to the exterior of the panelboard, visible with door closed.

In addition, panelboard shall bear a nameplate showing Manufacturer, Voltage, Ampacity, Type of Panelboard, Manufacturer's Order No. and Date, Interrupting Rating - RMS Sym.

2.13. Ground Fault Protection: Provide ground fault protection as indicated on the Drawings. Ground fault protection provisions shall comply with NEC Article 230.95.

3. EXECUTION

3.1. Provide circuit breakers with I.C. Ratings, amperes and number of poles as specified in the schedules on the Drawings.

3.2. Circuit breakers shall be UL listed.

3.3. Shunt trip device shall operate with the contact closure of pushbutton, ground fault relay or other pilot device to trip open associated circuit breakers upon command.

3.4. Coils of shunt trip device shall be rated continuous duty and shall include interlock arrangement to clear power from coil after operation.

3.5. Mount adjacent panelboards so that they are aligned and do not touch each other.

3.6. Provide a typewritten circuit directory with a protective covering in a frame inside the door. In this directory, provide unique labeling for each feeder or branch circuit which indicates load type (REC, LTG, AHU-1, etc.), room number(s) or other location description of the area served, and directional information where needed (N, NE, NW, SW, S, etc.) to clarify location. No two descriptions shall be the same in this directory.

3.7. Mount panelboards so maximum height of circuit breakers above finished floor does not exceed 78 inches.

3.8. Wiring Gutters: Feeder and Branch circuit conductors are sized for circuit ampacity and anticipated voltage drop and may be larger than the allowable ampacities in Table 310.16 of the NEC. Contractor shall provide cabinets with gutters sized to accommodate the conductors and connections actually being installed complying with Article 366 and Article 310.4.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2. Division-26 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3. Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1. Acceptable Producers: Leviton, General Electric, Hubbell, Pass and Seymour, Sierra, Bryant, or Eagle Electric.

2.2. General: Devices shall be specification grade. Use white finished devices throughout except as hereinafter noted otherwise. Any color selection shall be approved by Architect prior to ordering. See Electrical Drawings for gang switches, receptacles and notes for special wiring devices. All wiring devices, including dimmer switches, shall be rated for 20A, minimum.

2.3. Switches:

2.3.1. Single Pole, 20-amp, 120/277V shall be Hubbell 1221 or approved equal.

2.3.2. Double Pole, 20-amp, 120/277V shall be Hubbell 1222 or approved equal.

2.3.3. Three-Way, 20-amp, 120/277V shall be Hubbell 1223 or approved equal.

2.3.4. Four-Way, 20-amp, 120/277V shall be Hubbell 1224 or approved equal.

2.3.5. Single Pole, 30-amp, 120/277V shall be Hubbell 3031 or approved equal.

2.3.6. Lock Type, same Hubbell catalog numbers above except add suffix "L". Furnish associated key with each lock type device.

2.3.7. Lighted Handle devices with handle lighted in "OFF" position shall be same catalog numbers as above or approved equals except suffixes shall be "IL" for 120V and "IL7" for 277V.

2.3.8. Lighted Handle, toggle type devices with handle lighted "ON" position shall be same catalog numbers as above or approved equals except suffixes shall be "PL" for 120V and "PL7" for 277V.

2.3.9. Narrow Wood or Metal Jambs and Partitions: Devices for installation in narrow wood or metal jambs and partitions shall be Pass and Seymour catalog numbers ACD201-I, ACD203-I or approved equal.

2.3.10. 20-ampere Interchangeable Switches: Provide pass and Seymour No. ACD201-I or approved equal, with identification engraved on cover plate. Engraving shall be 1/8" block letters, black enamel filled.

2.4. Receptacles:

2.4.1. Catalog numbers indicated below are for Hubbell devices. Hubbell catalog numbers are used

to give a standard for bidding purposes. However, approved equals will be accepted as indicated in other sections of these specifications.

Where indicated on the Drawings, the following suffixes shall be added to the Hubbell catalog numbers depending on the required color finish:

I Ivory

R Red

GY Grey

WHI White

No suffix indicates black or brown color finish. Add prefix IG to indicate isolated ground devices. Add prefix GF to indicate ground fault interrupting devices.

2.4.2. Single Receptacle Devices:

20-amp, 2 pole, 3 wire, 125V, NEMA 5-20R Hubbell #5361

30-amp, 2 pole, 3 wire, 125V, NEMA 5-30R Hubbell #9308

50-amp, 2 pole, 3 wire, 125V, NEMA 5-50R Hubbell #9360

20-amp, 2 pole, 3 wire, 250V, NEMA 6-20R Hubbell #5461

30-amp, 2 pole, 3 wire, 250V, NEMA 6-30R Hubbell #9330

50-amp, 2 pole, 3 wire, 250V, NEMA 6-50R Hubbell #9367

30-amp, 2 pole, 3 wire, 277V, NEMA 7-30R Hubbell #9315

50-amp, 2 pole, 3 wire, 277V, NEMA 7-50R Hubbell #9365

20-amp, 3 pole, 4 wire, 125/250V, NEMA 14-20R Hubbell #8410

30-amp, 3 pole, 4 wire, 125/250V, NEMA 14-30R Hubbell #9430

50-amp, 3 pole, 4 wire, 125/250V, NEMA 14-50R Hubbell #9450

60-amp, 3 pole, 4 wire, 125/250V, NEMA 14-60R Hubbell #9460

20-amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-20R Hubbell #8420

30-amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-30R Hubbell #8430

50-amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-50R Hubbell #8450

60-amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-60R Hubbell #8460

2.4.3. Duplex Receptacle Devices:

20-amp, 2 pole, 3 wire, 125V, NEMA 5-20R Hubbell #5362

20-amp, 2 pole, 3 wire, 250V, NEMA 6-20R Hubbell #5462

20-amp, 2 pole, 3 wire, 125V, NEMA 5-20R One boss, 250V,

NEMA 6-20R second boss Hubbell #5492

2.4.4. Locking Type Devices:

20-amp, 2 pole, 3 wire, 125V, NEMA L5-20R Hubbell #2310

30-amp, 2 pole, 3 wire, 125V, NEMA L5-30R Hubbell #2610

20-amp, 2 pole, 3 wire, 250V, NEMA L6-20R Hubbell #2320

30-amp, 2 pole, 3 wire, 250V, NEMA L6-30R Hubbell #2620

20-amp, 2 pole, 3 wire, 277V, NEMA L7-20R Hubbell #2330

30-amp, 2 pole, 3 wire, 277V, NEMA L7-30R Hubbell #2630

20-amp, 2 pole, 3 wire, 480V, NEMA L8-20R Hubbell #2340

30-amp, 2 pole, 3 wire, 480V, NEMA L8-30R Hubbell #2640

20-amp, 3 pole, 4 wire, 125/250V, NEMA L14-20R Hubbell #2410

30-amp, 3 pole, 4 wire, 125/250V, NEMA L14-30R Hubbell #2710

20-amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA L15-20R Hubbell #2420

30-amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA L15-30R Hubbell #2720

20-amp, 3 pole, 4 wire, 480V, 3PH, No Neutral NEMA L16-20R Hubbell #2430

30-amp, 3 pole, 4 wire, 480V, 3PH, No Neutral NEMA L16-30R Hubbell #2730

20-amp, 4 pole, 5 wire, 120/208V, 3PH, NEMA L21-20R Hubbell #2510

30-amp, 4 pole, 5 wire, 120/208V, 3PH, NEMA L21-30R Hubbell #2810

20-amp, 4 pole, 5 wire, 277/480V, 3PH, NEMA L22-20R Hubbell #2520

30-amp, 4 pole, 5 wire, 277/480V, 3PH, NEMA L22-30R Hubbell #2820

2.4.5. Weatherproof receptacles shall be installed in flush weatherproof box with cast gasketed cover and self-closing spring door.

2.5. Plates: Except as noted below, all wiring device plates shall be nylon or fiberglass reinforced with smooth white finish. Any color selections shall be approved by Architect prior to ordering.

2.5.1. Exposed wiring devices shall be provided with galvanized steel plates with rounded corners.

2.5.2. Unless noted otherwise in the Contract Documents, floor outlet cover plates and raceways shall be satin bronze or chrome plated.

2.5.3. Boxes in which no devices are installed shall be equipped with blank plates.

3. EXECUTION

3.1. Outlet box heights shall be considered to be measured to the center-line of the box unless noted otherwise. Unless noted otherwise, light switches shall be provided at one of the following elevations: if the switch is in an area which is required to be compliant with the Accessibility requirements for the Americans with Disabilities Act and if it is above a counter-top or other such permanent obstruction which would prevent the close approach of a wheelchair, then the switch shall be located at an elevation of 45-1/2" above the finished floor; and otherwise, the switch shall be at an elevation of 47-1/2" above the finished floor or grade.

3.2. Determine door swings from architectural documents before installing room switch boxes.

Install switches on latch side of door.

3.3. Provide ground wire (#12 AWG green) in each conduit in addition to phase and neutral wires. Ground wires shall interconnect equipment grounds, receptacle grounds, outlets and exposed equipment conductive surfaces with ground bars in panelboards.

3.4. Furnish template for receptacles, switches and other cutouts in casework to the Millwork supplier.

3.5. Where switches are located in tile wall finish, install them in tile, varying standard mounting height if necessary. Do not mount over 48" above finished floor unless so indicated on the Drawings.

3.6. Where several rows of lights are to be controlled, the switch nearest the door shall control the row nearest the interior wall, and the switch furthest from the door shall control the row furthest from the interior wall.

3.7. Switches that control remote outlets, fans, etc., shall have engraved plastic name tags indicating the outlets, fans, etc. that are controlled.

3.8. A Special Receptacle shall be provided in any mechanical room in which coils are located, unless such a receptacle is found to be existing to remain in that room. This receptacle shall be a NEMA 6-20R receptacle supplied with 208V power, and it shall be located near the door into the room and within 50 feet of any coils. Unless stated otherwise elsewhere in the Contract Documents, provide materials and labor necessary to supply these receptacles from the nearest available power sources with sufficient capacity. Coordinate the exact requirements with field conditions, if coils or air handlers with coils are added to an existing building.

3.9. Receptacle Outlets: Mounting heights for receptacle outlets shall be 18" above finished floor or as indicated on the Drawings.

3.10. Wiring Devices and Plates: Wiring devices shall be rigidly installed properly aligned and plumb with wall and floor lines. A device plate shall be furnished for each device. Plates shall be installed with all four edges in continuous contact with the finish. Plates shall not support the wiring devices. Gaskets shall be installed where necessary to insure watertight and vapor tight construction.

END OF SECTION

SECTION 26 28 13
FUSES

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2. Division-26 Basic Electrical Materials and Methods Sections apply to the work of this Section.

1.3. Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1. Acceptable Producers: Bussman, General Electric, Gould & Brush Fuse.

2.2. General: Products listed herein are common to various Divisions and Specification Sections for this project and as shown on this project's Drawings.

2.3. All fuses furnished shall be by the same producer.

2.4. Voltage Rating:

2.4.1. Provide 600-volt fuses for 277/480 volt systems.

2.4.2. Provide 250-volt fuses for 120, 208 and 240 volt systems.

2.5. Ampere Ratings: Ampere ratings of fuses shall be as indicated on the Drawings.

2.6. Interrupting Ratings: Interrupting ratings of fuses shall be as indicated on the Drawings.

2.7. Current Limitation: Current limiting fuses shall be provided where indicated by the symbol C/L on the Drawings.

2.8. Rejection Fuse Clips: Provide fuse with rejection feature for switches required to have the rejection feature as indicated on the Drawings.

2.9. Class of Fuses: Provide fuses of Class J, K, L or R. Class H fuses shall be provided only if indicated on the Drawings.

3. EXECUTION

3.1. Coordinate fuse type and ampacity with fuse holder.

3.2. Provide one set of fuses of each type and ampacity for spares. Voltage to correspond with circuit to be protected.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1. GENERAL

1.1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2. Division-26 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3. Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1. Acceptable Producers: General Electric, Square D, Cutler-Hammer, Westinghouse, and Siemens ITE, or approved equal. Products shall be furnished by one provider.

2.2. Enclosed Switches: Provide NEMA Heavy Duty type H.D., Underwriters Laboratories listed safety switches of voltage, amperes, and number of poles as indicated on the Drawings. Provide UL rated for service entrance use where indicated on the Drawings.

2.2.1. Mechanism: Switch operating mechanism shall be quick make, quick break. Switches shall have a dual interlock to prevent opening of door when switch is in "ON" position or closing of switch when door is in "OPEN" position.

2.2.2. Switch Interior: Interior of switch shall have fully visible switch blades in "OFF" position when door is open. Switches shall be dead front construction with permanently attached arc suppressors hinged or otherwise attached to permit easy access to line-side lugs, without removal of arc suppressor. Lugs shall be UL listed for copper conductors and shall be front removable. All current carrying parts shall be tin or silver plated by electrolytic processes. Provide ground lug in each switch for the grounding conductor.

2.2.3. Ratings: Safety switches for motors shall be horsepower rated for AC or DC as specified on the Drawings. All fusible switches rated 100 through 600 amperes at 240 volts, and 30 through 600 amperes at 600 volts, shall have the capability of field conversion from standard Class H fuse spacing to Class J fuse spacing without affecting the UL listing. The switch also must accept Class R fuses and have field installable UL listed rejection feature to reject all fuses except Class R. UL listed short circuit ratings, when equipped with Class J or Class R fuses shall be 200,000 ampere RMS symmetrical. 800 and 1200 ampere switches shall have provisions for Class L fuses.

2.2.4. Fuses: Fuses shall be provided where indicated and sized as shown on the drawings. See Section "Fuses."

2.2.5. Fuse Enclosures: Use NEMA 3R enclosures for all exterior locations and interior locations in wet or humid areas except NEMA4 where indicated. Use NEMA 1 enclosures elsewhere, except as noted otherwise on the Drawings. Furnish NEMA 1 switches with knockouts. Enclosures for NEMA 1 switches shall be code gauge (UL 98) sheet steel with rust inhibiting phosphate treatment and baked enamel finish. NEMA 3R enclosures shall be of code gauge (UL 98) galvanized steel with rust inhibiting phosphate and baked enamel finish.

2.3. Circuit Breakers:

2.3.1. Provide molded case circuit breakers with a minimum AIC rating of 10,000 amperes RMS symmetrical and with higher AIC ratings as indicated on the Drawings. Any circuit breaker provided in an existing panelboard or in an existing switchboard shall have minimum short circuit interrupting ratings (AIC) equal to the highest ratings of any of the existing overcurrent devices in the same panelboard or switchboard at the given voltage of the panelboard or switchboard. All circuit breakers shall be fully rated for the interrupting ratings indicated and shall not be series rated. Every overcurrent device provided shall be UL approved to individually interrupt its rated short circuit current and shall not depend upon operation of another overcurrent device to achieve its rating. Series-rated devices are not acceptable.

2.3.2. Individual circuit breakers shall be safety dead front units in NEMA Type enclosure.

2.3.3. Molded case circuit breakers shall have overcenter, trip free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle indication. All breakers shall be bolt-on type.

2.3.4. Two and three pole circuit breakers shall have a common trip.

2.3.5. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.

2.3.6. The circuit breaker shall be constructed to accommodate the supply connections at either end.

2.3.7. Circuit breakers provided shall be HACR-type as required by the manufacturers of the equipment supplied; see paragraph 3.1, below.

2.3.8. Circuit breaker operating handle shall assume a center position when tripped.

2.3.9. Circuit breakers shall be calibrated for operation in an ambient temperature of 40° C.

2.3.10. Provide molded case circuit breakers with shunt trip features where indicated on the Drawings.

2.3.11. Circuit Breaker Enclosures: Enclosures shall be NEMA type with factory finish baked enamel or as indicated on drawings. NEMA 1 enclosures shall be furnished with knockouts and fabricated of steel. NEMA 3R enclosures, rainproof shall be furnished with raintight hubs sized for the conduit as shown on the Drawings. Enclosures shall be fabricated from zinc coated steel. Provide enclosure with ground bus or terminal and fully insulated neutral bar or terminals.

3. EXECUTION

3.1. Enclosed Switches:

3.1.1. Provide unfused or fused disconnect switch, as indicated on the Drawings at each motor which is out of sight of its controller or 50 or more feet away from the controller.

3.1.2. Do not stack switches to touch each other, either horizontal or vertically. Allow space between enclosures.

3.1.3. Switch symbols on electric Drawings do not indicate exact switch locations. Locate switches adjacent to motor or equipment unless shown otherwise.

3.1.4. Individual circuit breaker enclosure shall be identified with an engraved laminated plastic legend plate.

3.1.5. Install a wireway for wiring between multiple units. Wireway fill shall not exceed 20% of cross-sectional area.

3.1.6. Exterior units shall be in NEMA Type 3R raintight enclosure or as indicated on the Drawings.

3.1.7. Clean and touch-up paint on disconnect switches damaged or scratched during installation.

3.2. Circuit Breakers:

3.2.1. Contractor shall coordinate exact electrical requirements and circuit breaker types with that which is required by manufacturers of the equipment supplied – as necessary to maintain equipment's UL Listing; coordinate with other divisions of this contract. Contractor shall provide HACR-type circuit breakers as required by manufacturers of equipment supplied. See paragraph 3.2.3 of Section 26005 of the Project Manual.

3.2.2. Provide circuit breakers as specified in the Panelboard Schedules on the Drawings. Ampere ratings and the number of poles are indicated on the Panelboard Schedules.

3.2.3. Circuit breakers shall be suitable for mounting and operating in any position.

3.2.4. Circuit breakers shall be UL listed.

3.2.5. Shunt trip device where required shall operate in conjunction with contact closure of push button, ground fault relay or other pilot device to trip open associated circuit breakers upon command.

3.2.6. Coils of shunt trip device shall be rated continuous duty and shall include interlock arrangement to clear power from coil after operation.

3.2.7. Control Power: Where no other source of control power is indicated, energy to actuate tripping devices through action of pilot device shall be 120 volts, 60 Hz as follows:

3.2.7.1. 120/208 Volt Panelboards: Energy shall be from dedicated branch circuit breaker of panelboard set to trip at not greater than 20 amperes.

3.2.7.2. 277/480 Volt Panelboards: Energy shall be from control power transformer, with secondary voltage of 120 volts, 60 Hz and with primary leads protected by current limiting fuses mounted in plug-in style, dead front fuse block. Locate fuse block within panelboard and locate C.P.T. adjacent to panelboard in protected housing. Connect transformer primary at load side of circuit breaker to be tripped.

3.2.7.3. Switchboards: Energy shall be as specified above for 277/480 volt panelboards, except locate transformer accessibly within switchboard near fuse block.

3.2.7.4. Testing: Test all circuit breakers which are rated 200 amps or greater, both main and feeders, using standard tests to verify overcurrent and time delay settings and characteristics. Defective devices shall be replaced and the replacement device tested. All testing shall be performed by and independent electrical testing organization regularly involved in such work. Submit name of testing agency thirty days prior to test and advise engineer of test time and date at least two weeks in advance. Submit four copies of test results, including device operating characteristics plotted on log-log time-current paper and operating and maintenance manuals.

END OF SECTION

SECTION 26 51 19
LED INTERIOR LIGHTING

1 GENERAL

1.1 Related Documents:

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

1.2 Summary:

1.3 Section Includes:

1.3.1 Interior solid-state luminaires that use LED technology.

1.3.2 Lighting fixture supports.

1.3.3 Related Requirements:

1.3.3.1 Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.

1.4 Definitions:

1.4.1 CCT: Correlated color temperature.

1.4.2 CRI: Color Rendering Index.

1.4.3 Fixture: See "Luminaire."

1.4.4 IP: International Protection or Ingress Protection Rating.

1.4.5 LED: Light-emitting diode.

1.4.6 Lumen: Measured output of lamp and luminaire, or both.

1.4.7 Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.5 ACTION SUBMITTALS

1.5.1 Product Data: For each type of product.

1.5.1.1 Arrange in order of luminaire designation.

1.5.1.2 Include data on features, accessories, and finishes.

1.5.1.3 Include physical description and dimensions of luminaires.

1.5.1.4 Include emergency lighting units, including batteries and chargers.

1.5.1.5 Include life, output (lumens, CCT, and CRI), and energy efficiency data.

1.5.1.6 Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

1.5.1.6.1 Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.5.2 Shop Drawings: For nonstandard or custom luminaires.

1.5.2.1 Include plans, elevations, sections, and mounting and attachment details.

1.5.2.2 Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.5.2.3 Include diagrams for power, signal, and control wiring.

1.5.3 Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.6 Informational Submittals:

1.6.1 Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1.6.1.1 Lighting luminaires.

1.6.1.2 Suspended ceiling components.

1.6.1.3 Partitions and millwork that penetrate the ceiling or extend to within 300 mm of the plane of the luminaires.

1.6.1.4 Structural members to which equipment and or luminaires will be attached.

1.6.1.5 Initial access modules for acoustical tile, including size and locations.

1.6.1.6 Items penetrating finished ceiling, including the following:

1.6.1.6.1 Other luminaires.

1.6.1.6.2 Air outlets and inlets.

1.6.1.6.3 Speakers.

1.6.1.6.4 Sprinklers.

1.6.1.6.5 Access panels.

1.6.1.6.6 Ceiling-mounted projectors.

1.6.1.7 Moldings.

1.6.2 Qualification Data: For testing laboratory providing photometric data for luminaires.

1.6.3 Sample warranty.

1.7 Closeout Submittals:

1.7.1 Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1.7.1.1 Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.8 Maintenance Material Submittals:

1.8.1 Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.8.1.1 Lamps: Ten (10) for every 100 of each type and rating installed. Furnish at least one of each type.

1.8.1.2 Diffusers and Lenses: One (1) for every 100 of each type and rating installed. Furnish at least one of each type.

1.8.1.3 Globes and Guards: One (1) for every 20 of each type and rating installed. Furnish at least one of each type.

1.9 Quality Assurance:

1.9.1 Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

1.9.2 Provide luminaires from a single manufacturer for each luminaire type.

1.9.3 Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9.4 Mockups (where indicated on plans or notes): For interior lighting luminaires in room or module mockups, complete with power and control connections.

1.9.4.1 Obtain Architect's approval of luminaires in mockups before starting installations.

1.9.4.2 Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.9.4.3 Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.10 Delivery, Storage and Handling:

1.10.1 Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.11 Warranty:

1.11.1 Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1.12 Warranty Period: Five (5) years from date of Substantial Completion.

2 PRODUCTS

2.1 Luminaire Requirements:

2.1.1 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.1.2 NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

2.1.3 Coordinate "FM Global Compliance" Paragraph below with Drawings.

2.1.4 FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

2.1.5 Recessed Fixtures: Comply with NEMA LE 4.

2.1.6 Bulb shape complying with ANSI C79.1.

2.1.7 Lamp base complying with ANSI C81.61.

2.1.8 CRI of 80 CCT of 4000K unless noted otherwise on drawings.

2.1.9 Rated lamp life of 50,000 hours.

2.1.10 Lamps dimmable from 0 - 100 percent of maximum light output.

2.1.11 Internal driver.

2.1.12 Nominal Operating Voltage: universal voltage 120-227V

2.1.12.1 Lens Thickness: At least 0.125-inch (3.175 mm) minimum unless otherwise indicated.

2.1.13 Housings:

2.1.13.1 As specified in Luminaire Schedule

2.2 Materials:

2.2.1 Metal Parts:

2.2.1.1 Free of burrs and sharp corners and edges.

2.2.1.2 Sheet metal components shall be steel unless otherwise indicated.

2.2.1.3 Form and support to prevent warping and sagging.

2.2.2 Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

2.2.3 Diffusers and Globes:

2.2.3.1 As specified in Luminaire Schedule

2.2.4 Housings:

2.2.4.1 As specified in Luminaire Schedule.

2.2.5 Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.2.5.1 Label shall include the following lamp characteristics:

2.2.5.1.1 "USE ONLY" and include specific lamp type.

2.2.5.1.2 Lamp diameter, shape, size, wattage, and coating.

2.2.5.1.3 CCT and CRI for all luminaires.

2.3 Metal Finishes:

2.3.1 Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 Luminaire Fixture Support Components:

2.4.1 Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

2.4.2 Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

2.4.3 Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gauge (2.68 mm)

2.4.4 Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

2.4.5 Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

3 EXECUTION

3.1 Examination:

3.1.1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

3.1.2 Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Temporary Lighting:

3.2.1 If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 Installation:

3.3.1 Comply with NECA 1.

3.3.2 Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

3.3.3 Install lamps in each luminaire.

3.3.4 Supports:

3.3.4.1 Sized and rated for luminaire weight.

3.3.4.2 Able to maintain luminaire position after cleaning and re-lamping.

3.3.4.3 Provide support for luminaire without causing deflection of ceiling or wall.

3.3.4.4 Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

3.3.5 Flush-Mounted Luminaire Support:

3.3.5.1 Secured to outlet box.

3.3.5.2 Attached to ceiling structural members at four points equally spaced around circumference of luminaire.

3.3.5.3 Trim ring flush with finished surface.

3.3.6 Wall-Mounted Luminaire Support:

3.3.6.1 Attached to a minimum 20 gauge backing plate attached to wall structural members.

3.3.6.2 Do not attach luminaires directly to gypsum board.

3.3.7 Ceiling-Mounted Luminaire Support:

3.3.7.1 As specified in Luminaire Schedule

3.3.8 Suspended Luminaire Support:

3.3.8.1 As specified in Luminaire Schedule

3.3.9 Ceiling-Grid-Mounted Luminaires:

3.3.9.1 Secure to any required outlet box.

3.3.9.2 Retain first subparagraph below to require ceiling grid to be connected to building structure at four corners of luminaire opening.

3.3.9.3 Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

3.3.9.4 Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.3.10 Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 Identification:

3.4.1 Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 Field Quality Control:

3.5.1 Perform the following tests and inspections:

3.5.1.1 Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

3.5.1.2 Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

3.5.2 Luminaire will be considered defective if it does not pass operation tests and inspections.

3.5.3 Prepare test and inspection reports.

3.6 Startup Service:

3.6.1 Comply with requirements for startup specified in Section 26 09 43.23 "Relay-Based Lighting Controls."

3.7 Adjusting:

3.7.1 Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

3.7.1.1 During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.

3.7.1.2 Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.7.1.3 Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION