

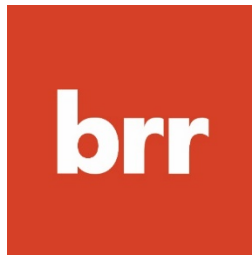


WoodSpring Suites

1010 NW Ward Road
Lee's Summit, MO 64086

PROJECT MANUAL

August 16, 2023



www.brrarch.com

8131 Metcalf Avenue, Suites 300, Overland Park, KS 66204 MAIN 913-262-9095

Project 31000541

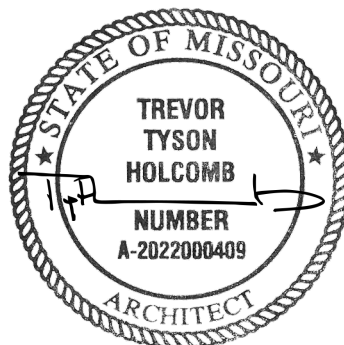
SECTION 000107 - SEAL PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

ARCHITECT OF RECORD

BRR Architecture, Inc.
8131 Metcalf Avenue, Suite 300
Overland Park, Kansas 66204

The specification sections intended to be authenticated by my seal are those in Divisions 01 – 33 except where indicated as prepared by other design professionals of record, and the Geotechnical Report which is not a Contract Document.



08/17/2023

Architect of Record

Date

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

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B. STRUCTURAL ENGINEER OF RECORD

Steven N. Busey, P.E.
BSE Structural Engineers, LLC
11320 West 79th Street
Lenexa, Kansas, 66214

I hereby specify that the specification sections intended to be authenticated by my seal are limited to:

033000	CAST-IN-PLACE CONCRETE
042000	UNIT MASONRY
051200	STRUCTURAL STEEL FRAMING
055000	METAL FABRICATIONS
061000	ROUGH CARPENTRY
061733	WOOD -I-JOISTS
061753	SHOP-FABRICATED WOOD TRUSSES



Structural Engineer of Record

08/16/2023
Date

C. MECHANICAL ENGINEER OF RECORD

Randall Nelson
Acertus Consulting Group
11880 College Blvd. Ste 475
Overland Park, KS 66210

I hereby specify that the specification sections intended to be authenticated by my seal are limited to:

210517	SLEEVES AND SLEEVES SEALS FOR FIRE-SUPPRESSION PIPING
210518	ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING
210548.13	VIBRATION CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT
211119	FIRE DEPARTMENT CONNECTIONS
211313	WET-PIPE SPRINKLER SYSTEMS
211316	DRY-PIPE SPRINKLER SYSTEMS
220513	COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENTS
220516	EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING
220517	SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING
220518	ESCHUTCHEONS FOR PLUMBING PIPING
220519	METERS AND GAGES FOR PLUMBING PIPING
220523.12	BALL VALVES FOR PLUMBING PIPING
220523.14	CHECK VALVES FOR PLUMBING PIPING
220523.15	GATE VALVES FOR PLUMBING PIPING
220529	HANGERS AND SUPPORTS FOR PLUMBING PIPTING AND EQUIPMENT
220553	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
220716	PLUMBING EQUIPMENT INSULATION
220719	PLUMBING PIPING INSULATION
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221119	DOMESTIC WATER PIPING SPECIALTIES
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221429	SUMP PUMPS
223400	FUEL-FIRED, DOMESTIC-WATER HEATERS
224213.13	COMMERCIAL WATER CLOSETS
224216.16	COMMERCIAL SINKS
224223	COMMERCIAL SHOWERS
230713	DUCT INSULATION
231123	FACILITY NATURAL-GAS PIPING
233113	METAL DUCTS
233300	AIR DUCT ACCESSORIES
233423	HVAC POWER VENTILATORS
233713.13	AIR DIFFUSERS
233713.23	REGISTERS AND GRILLES
233723	HVAC GRAVITY VENTILATORS

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

238113.11 PACKAGED TERMINAL-AIR CONDITIONERS
238126 SPLIT-SYSTEM AIR-CONDITIONERS
238239.19 WALL AND CEILING UNIT HEATERS



08/15/2023

Randall Nelson
Mechanical Engineer of Record

08/15/23
Date

D. ELECTRICAL ENGINEER OF RECORD

Randall Nelson
Acertus Consulting Group
11880 College Blvd. Ste 475
Overland Park, KS 66210

I hereby specify that the specification sections intended to be authenticated by my seal are limited to:

260519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526	GROUND AND BONDING FOR ELECTRICAL SYSTEMS
260529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
260544	SLEEVES AND SLEEVES SEALS FOR ELECTRICAL RACEWAYS AND CABLING
260548.16	SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
260553	IDENTIFICATION FOR ELECTRICAL SYSTEMS
260923	LIGHTING CONTROL DEVICES
262413	SWITCHBOARDS
262416	PANELBOARDS
262713	ELECTRICITY METERING
262726	WIRING DEVICES
262813	FUSES
262816	ENCLOSED SWITCHES
264313	SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
265119	LED INTERIOR LIGHTING
265219	EMERGENCY AND EXIT LIGHTING
265613	LIGHTING POLES AND STANDARDS
265619	LED EXTERIOR LIGHTING
270526	GROUNDING AND BONDING FOR COMMUNICATIONS
270528	PATHWAYS FOR COMMUNICATIONS SYSTEMS
270528.29	HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
270544	SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING
271100	COMMUNICATION EQUIPMENT ROOM FITTINGS
271500	COMMUNICATIONS HORIZONTAL CABLING
280513	CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY
283111	DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM



Randall Nelson
Electrical Engineer of Record

08/15/23
Date

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264313	SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
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SECTION 003131 – INFORMATION AVAILABLE TO BIDDERS

1.1 SOIL INVESTIGATION DATA

A. Investigation:

1. Soil and subsurface investigation were conducted at the site, the results of which are to be found in the report issued by Cook, Flatt & Strobel Engineers, P.A., dated June 14, 2023, CFS Project No.22-5831.
2. Bidders shall examine soils investigation data and make their own investigation of the site prior to bidding.

B. Interpretation

1. Soil investigation data is provided only for information and the convenience of the bidders. The Owner and Architect disclaim any responsibility for the accuracy of the data prepared by others.
2. The report is not intended to convey or imply any guarantee as to variations of subsurface conditions between or beyond boring locations.
3. Soil investigation data is not a part of the proposed Construction Documents.
4. Refer to the Geotechnical Engineering Report for sub-grade, building pad, and paving designs.

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END OF SECTION 003131

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Work covered by the Contract Documents.
2. Work under separate contracts.
3. Purchase contracts
4. Owner-furnished products.
5. Use of premises.
6. Owner's occupancy requirements.
7. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: WoodSpring Suites Hotel.

1. Project Location: Lee's Summit, MO
2. Owner: Genesis Companies
3. Owners Location: 4420 Madison Ave., Kansas City, MO 64111
4. Owner's Representative: Renita Sommers, (804) 363-7712

B. Architect: BRR Architecture, Inc.

1. Contact: Culin Thompson, (913) 262-9095

C. The Work consists of the following:

1. The Work includes a 4-story hotel building of wood stud frame with EIFS, manufactured stone veneer, and TPO membrane roof.

D. Project will be constructed under a single prime contract.

1.3 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Owner has awarded separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Television equipment: Provided by Owner. Contractor to provide boxes and/or plaster rings and wiring for all telephone, television, energy management, computer, and security camera systems. Contractor to coordinate with Owner's Vendor.
2. Telephone equipment: Provided by Owner. Contractor to provide boxes and/or plaster rings and wiring for all telephone, television, and energy management, computer, and security camera systems. Contractor to coordinate with Owner's Vendor. Punch down of telephone system to be provided by Owner.
3. Exterior Signage (Wall Mount and Pole Mount): Provided by Owners' LED Sign Contractor. Contractor shall provide electrical service to the sign's J-box and 1" non-metallic sleeve for data line to the sign. Owner to Coordinate with sign vendor and local jurisdiction.
4. Energy Management: Owner installed under separate contract. Contractor shall coordinate. Contractor to provide boxes and/or plaster rings and wiring for all telephone, television, and energy management, computer, and security camera systems. Contractor to coordinate with Owner's Vendor.
5. Security Equipment: Owner to supply security equipment and Contractor to install security camera wire at each exterior entry, guest laundry and stair wells. Contractor to provide boxes and/or plaster rings and wiring for all telephone, television, and energy management, computer, and security camera systems. Contractor to coordinate with Owner's Vendor.
6. Fixture signage (wall mount). Exterior signage required by code (i.e. Fire lane, Handicap, etc.) provided and installed by Contractor.
7. Interior Signage and graphics. Provided by Owner.

1.4 PURCHASE CONTRACTS

- A. General: Owner has negotiated purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum, unless otherwise indicated.
 1. Contractor's responsibilities are same as if Contractor had negotiated purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.

1.5 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.
- B. Owner-Furnished Products:
 1. Furniture.
 2. Point of Sales Equipment. Contractor to provide electrical service.
 3. Miscellaneous operational supplies and equipment, linens and towels (in bundles). Stocked in Owner designated areas by Contractor.

1.6 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- C. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine constructions operations to the property.
 - 2. Owner Occupancy: Allow for Owner occupancy of Project site.
 - 3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work but shall constitute acceptances of areas occupied.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy. Substantial Completion shall have been achieved when all public and back-of-house areas are thoroughly completed and 75% of total guestrooms have been unconditionally accepted by Owner.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy. Certificate of Occupancy must be issued a minimum of 14 calendar days prior to property opening (Contract Completion Date).
 - 3. Before partial Owner occupancy, mechanical, electrical and fire alarm/protection systems shall be fully operational and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 49-division format and CSI/CSC's "MasterFormat" 2004 numbering system.
 - 1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section specifies administrative and procedural requirements for handling and processing Contract modifications, including actual costs of allowances and unit-price work.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions." Or approved alternate. If a cost adjustment is necessary the Contractor must notify the Owner within three (3) days in writing.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications and the estimated sum of their costs.
 - 1. Proposal Requests issued by Owner are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Owner.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship.
 6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests or approved alternate.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Owner to prepare a Change Order for signatures of Owner and Contractor on AIA Document G701 or approved alternate. Any work performed without a fully executed change order will be done at the risk of the contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION - 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets Submittals Schedule and Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values or owner required bid form breakdown. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 - 3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 - 4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - 5. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

6. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application, and individual line item(s) for each change order.
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Owner by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.

8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Project meetings.
- B. Related Sections:
 - 1. Section 011000 "Summary" for a description of the division of Work among separate contracts and responsibility for coordination activities not in this Section.
 - 2. Section 017000 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid

conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
 3. Number of Copies: Submit opaque copies of each submittal. Architect will return one copy.
 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

1.4 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for requests for interpretations (RFIs).
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. LEED requirements.
 - l. Preparation of Record Documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Construction waste management and recycling.
 - r. Parking availability.
 - s. Office, work, and storage areas.
 - t. Equipment deliveries and priorities.
 - u. First aid.
 - v. Security.
 - w. Progress cleaning.
 - x. Working hours.
 3. Minutes: Record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with

- other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related requests for interpretations (RFIs).
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Provide a copy of the minutes to the Owner.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Requests for interpretations (RFIs).
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
3. Minutes: Record and distribute to Contractor the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections:
 - 1. Section 014000 "Quality Requirements" for submitting test and inspection reports.
 - 2. Section 017700 "Closeout Procedures" for submitting warranties.
 - 3. Section 017839 "Project Record Documents" for submitting Record Drawings.
 - 4. Section 012900 "Payment Procedures" for application for payment and schedule of values.
 - 5. Section 013100 "Project Management and Coordination" for coordination of drawings.
 - 6. Section 017823 "Operation and Maintenance Data" for operation and maintenance data.
- C. Record Specifications and Record Product Data.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.
- C. Closeout Submittals: Written information for operating and maintaining the new system and closing out the project.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
- C. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
- D. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
- E. Resubmittal Review: Allow 5 days for review of each resubmittal.
- F. Identification: Place a permanent label or title block on each submittal for identification.
 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 3. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - a. Number and title of appropriate Specification Section.
 - b. Drawing number and detail references, as appropriate.
 - c. Location(s) where product is to be installed, as appropriate.
 - d. Other necessary identification.
- G. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- H. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 1. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

- I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 - 1. Transmittal Form: Use Contractor's standard transmittal form.
- J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked "Reviewed or as indicated."
- K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- L. Use for Construction: Use only final submittals with mark indicating "Reviewed or as indicated" taken by Architect.

1.4 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files may be provided to Contractor for Contractor's use in connection with Project upon receipt of the Contractor signing an Electronic File Transfer Agreement provided by the Architect.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Manufacturer's catalog cuts.
 - e. Wiring diagrams showing factory-installed wiring.
 - f. Printed performance curves.

- g. Operational range diagrams.
 - h. Compliance with specified referenced standards.
 - i. Testing by recognized testing agency.
- C. Number of Copies: Submit electronic copies of Product Data, unless otherwise indicated.
- D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of Architect's CAD Drawings is otherwise permitted.
- E. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - 1. Dimensions.
 - 2. Identification of products.
 - 3. Fabrication and installation drawings.
 - 4. Roughing-in and setting diagrams.
 - 5. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - 6. Shop work manufacturing instructions.
 - 7. Templates and patterns.
 - 8. Schedules.
 - 9. Notation of coordination requirements.
 - 10. Notation of dimensions established by field measurement.
 - 11. Relationship to adjoining construction clearly indicated.
 - 12. Seal and signature of professional engineer if specified.
 - 13. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- F. Number of Copies: Submit electronic copy of each submittal. Architect will return electronic copy.
- G. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
- H. Identification: Attach label on unexposed side of Samples that includes the following:
 - 1. Generic description of Sample.
 - 2. Product name and name of manufacturer.
 - 3. Sample source.
 - 4. Number and title of appropriate Specification Section.
- I. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

- J. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
- K. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- L. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- M. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned.
- N. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.
- O. Number of Copies: Submit electronic copies of product schedule or list, unless otherwise indicated. Architect will return electronic copies.
- P. Application for Payment: Comply with requirements specified in Section 012900 "Payment Procedures."
- Q. Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
- B. Number of Copies: Submit electronic copies of each submittal, unless otherwise indicated. Architect will not return copies.
- C. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- D. Test and Inspection Reports: Comply with requirements specified in Section 014000 "Quality Requirements."
- E. Coordination Drawings: Comply with requirements specified in Section 013100 "Project Management and Coordination."

- F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- H. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- I. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- J. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- K. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- L. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- N. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- O. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- P. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- Q. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Statement on condition of substrates and their acceptability for installation of product.
 - 2. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

2.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- B. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.
- C. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions.
- B. Mark with Contractor's review stamp before submitting to Architect.
- C. Contractor's review Stamp: Stamp each submittal with a uniform, review stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's review, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's review stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. Reviewed
 - 2. Rejected
 - 3. Furnish as Corrected
 - 4. Revise and Resubmit
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Closeout Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- E. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Related Sections:
 - 1. Section 017329 "Cutting and Patching" for contract document requirements.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- D. See Divisions 02 through 16 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

1.3 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article 1.5 to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

1.5 CLOSEOUT SUBMITTALS

- A. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual

Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service to Owner and Architect.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
6. Contractor Responsibility:
 - a. Subgrade.
 - b. Concrete.
 - c. Paving.
 - d. Lightweight concrete fill.

e. Welding.

- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Section 017329 "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADAAG	Americans with Disabilities Act (ADA)
CFR	Code of Federal Regulations
CRD	Handbook for Concrete and Cement
DOD	Department of Defense Military Specifications and Standards
DSCC	Defense Supply Center Columbus (See FS)
FED-STD	Federal Standard (See FS)
FS	Federal Specification
FTMS	Federal Test Method Standard (See FS)
MIL	See MILSPEC
MS MIL	See MILSPEC
MILSPEC	Military Specification and Standards
UFAS	Uniform Federal Accessibility Standards

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA	Aluminum Association, Inc. (The)
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AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists (The)
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute/ACI International
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AFPA	American Forest & Paper Association (See AF&PA)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts

APA	APA - The Engineered Wood Association
APA	Architectural Precast Association
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCA	Architectural Spray Coaters Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (The American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	AWCI International (Association of the Wall and Ceiling Industries International)
AWCMA	American Window Covering Manufacturers Association (See WCSC)
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
CCC	Carpet Cushion Council

CCFSS	Center for Cold-Formed Steel Structures
CDA	Copper Development Association Inc.
CEA	Canadian Electricity Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CGSB	Canadian General Standards Board
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet & Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association
FCI	Fluid Controls Institute

FGMA	Flat Glass Marketing Association (See GANA)
FM	Factory Mutual System (See FMG)
FMG	FM Global (Formerly: FM - Factory Mutual System)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America (Formerly: FGMA - Flat Glass Marketing Association)
GRI	Geosynthetic Research Institute
GTA	Glass Tempering Division of Glass Association of North America (See GANA)
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (See NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAS	International Approval Services (See CSA)
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance (The)

ILI	Indiana Limestone Institute of America, Inc.
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Services
IWS	Insect Screening Weavers Association (Now defunct)
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association
LPI	Lightning Protection Institute
LSGA	Laminated Safety Glass Association (See GANA)
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association
MFMA	Metal Framing Manufacturers Association
MH	Material Handling Industry of America (See MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NAAMM	North American Association of Mirror Manufacturers (See GANA)
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAIMA	North American Insulation Manufacturers Association (The)
NAMI	National Accreditation and Management Institute, Inc.
NBGQA	National Building Granite Quarries Association, Inc.
NCMA	National Concrete Masonry Association

NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFPA	NFPA International (National Fire Protection Association International)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	National Oak Flooring Manufacturers Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo and Mosaic Association, Inc.
NTRMA	National Tile Roofing Manufacturers Association (See RTI)
NWWDA	National Wood Window and Door Association (See WDMA)
OPL	Omega Point Laboratories, Inc.
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting and Decorating Contractors of America
PDI	Plumbing & Drainage Institute

PGI	PVC Geomembrane Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
RTI	Roof Tile Institute (Formerly: NTRMA - National Tile Roofing Manufacturers Association)
SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPI/SPFD	Society of the Plastics Industry, Inc. (The) Spray Polyurethane Foam Division (See SPFA)
SPRI	SPRI (Single Ply Roofing Institute)
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings

STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association (See WCSC)
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WIC	Woodwork Institute of California
WMMPA	Wood Molding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

BOCA BOCA International, Inc.

CABO Council of American Building Officials (See ICC)

IAPMO International Association of Plumbing and Mechanical
Officials (The)

ICBO International Conference of Building Officials

ICBO ICBO Evaluation Service, Inc.
ES

ICC International Code Council, Inc.
(Formerly: CABO - Council of American Building Officials)

SBCCI Southern Building Code Congress International, Inc.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CE Army Corps of Engineers

CPSC Consumer Product Safety Commission

DOC Department of Commerce

EPA Environmental Protection Agency

FAA Federal Aviation Administration

FDA Food and Drug Administration

GSA General Services Administration

HUD Department of Housing and Urban Development

LBL Lawrence Berkeley Laboratory (See LBNL)

LBNL Lawrence Berkeley National Laboratory

NCHRP National Cooperative Highway Research Program (See TRB)

NIST National Institute of Standards and Technology

OSHA Occupational Safety & Health Administration

PBS Public Building Service (See GSA)

RUS Rural Utilities Service (See USDA)

SD State Department

TRB Transportation Research Board

USDA Department of Agriculture

USPS Postal Service

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CAPU (See CPUC)
C

CBHF State of California, Department of Consumer Affairs
Bureau of Home Furnishings and Thermal Insulation

CPUC California Public Utilities Commission

TFS Texas Forest Service
Forest Products Laboratory

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections:
 - 1. Section 017000 "Execution" for progress cleaning requirements.
 - 2. Section 017700 "Closeout Procedures" for final cleaning requirements.
 - 3. Section 061000 "Rough Carpentry" for lumber and plywood.
 - 4. Section 142100 "Electric Traction Elevators" for temporary use of elevators.
 - 5. Section 142400 "Hydraulic Elevators" for temporary use of elevators.
 - 6. Section 221423 "Storm Drainage Piping Specialties" for disposal of ground water at Project site.
 - 7. Section 321216 "Asphalt Paving" for asphalt roads.
 - 8. Section 321313 "Concrete Paving" for concrete roads.
- C. See Divisions 02 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.2 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

- A. General: Cost of use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials for use as required.
- B. Pavement: Comply with pavement Sections 321216 "Asphalt Paving", 321313 "Concrete Paving".
- C. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
- D. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.
- E. Wood Enclosure Fence: Plywood, 6 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.
- F. Lumber and Plywood: Comply with requirements in Section 061000 "Rough Carpentry."
- G. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.
- H. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas, natural gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
 - 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities will not be permitted.
- F. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operation
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 02 Section "Earthwork."
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- F. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
 - 1. Provide temporary, directional signs for construction personnel and visitors.
 - 2. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 01700 "Execution" for progress cleaning requirements.
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- I. Temporary Elevator Use: Refer to Section 142100 and 142400 for temporary use of new elevators.

- J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- K. Temporary Use of Permanent Stairs: Cover finished permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
2. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

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END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections:
 - 1. Section 017700 "Closeout Procedures" for submitting warranties for Contract closeout.
 - 2. Section 013300 "Submittal Procedures"
- C. See Divisions 02 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use Contractors standard.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 7 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

- a. Form of Acceptance: Change Order, executed by Owner.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- B. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 7 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures." Co-executed by Owner.
 - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 02 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect/Owner will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2.3 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2.3 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2.2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2.3 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's / Owners' decision will be final on whether a proposed product matches.

- a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
- 10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect/Owner will consider requests for substitution if received within the duration of the project.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - 2. Requested substitution does not require extensive revisions to the Contract Documents.
 - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 4. Substitution request is fully documented and properly submitted.
 - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 7. Requested substitution is compatible with other portions of the Work.
 - 8. Requested substitution has been coordinated with other portions of the Work.
 - 9. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

- A. Conditions: Architect/Owner will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

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END OF SECTION 016000

SECTION 017000 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.
- B. Related Sections:
 - 1. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 2. Section 017329 "Cutting and Patching" for correction of work.
 - 3. Section 014000 "Quality Requirements" for manufacturer representative qualifications.

1.2 ACTION SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements. Floor Slab Certification
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect/Owner when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect. Contractor to perform foundation form and elevation survey prior to the placement of concrete. Owner to review and approve prior to proceeding with the placement of concrete.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect/Owner.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 017329 "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017000

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes procedural requirements for cutting and patching.
- B. Related Sections:
 - 1. Section 078413 "Penetration Firestopping" for patching fire-rated construction.
- C. See Divisions 02 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 ACTION SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.3 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.4 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 5. Section 087100 "Door Hardware" for locks and key turnover.
- C. See individual Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 INSPECTION PROCEDURES

A. PRE-INSTALLATION INSPECTION

- 1. A pre-installation/inspection meeting with the manufacturer's representative is required for the following trades at a minimum:
 - a. Siding.
 - b. Pex & CPVC piping.
 - c. Window Manufacturer.
 - d. Building wrap.
 - e. Roofing.
 - f. Sherwin Williams.
 - g. Elevator.
- 2. A brief paragraph of meeting minutes signed by the manufacturer's representative should include notes indicating discussions regarding acceptable installation methods are being performed by the contractor and in accordance with manufacturer's warranty requirements.

3. This manufacturer's inspection and sign-off meeting minutes is required for release of final retainage.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Delete items below not applicable or revise to suit project.
2. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
3. Advise Owner of pending insurance changeover requirements.
4. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
5. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
6. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
7. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
8. Coordinate first subparagraph below with Section 087100 "Door Hardware". Revise if Owner makes final changeover or if key-control system manufacturer delivers keys directly to Owner.
9. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
10. Complete startup testing of systems.
11. Submit test/adjust/balance records.
12. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
13. Advise Owner of changeover in heat and other utilities.
14. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
15. Complete final cleaning requirements, including touchup painting.
16. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect/Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems according to Section 017900 "Demonstration and Training".
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Excess inspections: The Owner has contracted with the architect for a total of 6 onsite inspections. 5 inspections during construction and 1 final inspection. Any additional inspections required either during construction or at completion will be invoiced to the Owner as Additional work at the cost of travel expenses and the Architect's hourly rate. This additional amount will be deducted from the final payment to the General Contractor.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface. Mow/trim areas planted with grass.

- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, PTAC sleeves, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove dust and debris from interiors of PTAC units. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

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END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation manuals for systems, subsystems, and equipment.
 - 2. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.
- B. Related Sections:
 - 1. Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation
- C. See Divisions 02 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 ACTION SUBMITTALS

- A. Manual: Submit two copies of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.

4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Name and address of Architect.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.
- B. Descriptions: Include the following:
1. Product name and model number.
 2. Manufacturer's name.

3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:
- D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, and demonstration and training videotape if available, that detail essential maintenance procedures:
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds. Include copies of invoices to provide resources for the date of purchase and serial numbers.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

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END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections:
 - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
- C. See Divisions 02 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 ACTION SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal: Submit one set(s) of corrected Record Transparencies and one set(s) of marked-up Record Prints. Architect will initial and date each transparency and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return transparencies and prints for organizing into sets, printing, binding, and final submittal.
 - b. Final Submittal: Submit one set(s) of marked-up Record Prints, and the following:
 - 1. Record Transparencies: One set(s).

1.3 CLOSEOUT SUBMITTALS

- A. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- B. Record Product Data: Submit one copy of each Product Data submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 - 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.
 - 1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
 - 2. Refer instances of uncertainty to Architect for resolution.
 - 3. Owner will furnish Contractor one set of transparencies of the Contract Drawings for use in recording information.
 - 4. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Architect will make the Contract Drawings available to Contractor's print shop.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's/Owner's reference during normal working hours.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

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END OF SECTION 017839

SECTION 017843 - SPARE PARTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes spare parts and materials.
- B. Related Sections:
 - 1. Refer to individual sections for items listed herein, as well as other requirements.

PART 2 - PRODUCTS

2.1 EXTRA MATERIALS - GENERAL

- A. At the time of building acceptance, deliver to the Owner the following extra materials. Deliver in original unopened cartons or containers (except paint) with each item properly identified.

2.2 ACOUSTIC TILE CEILINGS

- A. Replacement stock amounting to one (1) full box (minimum 12 tiles) of each type.

2.3 RESILIENT FLOORING TILES

- A. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. Furnish not less than four (4) cases of the hallway tiles and two (2) cases of the vinyl planks as installed.

2.4 PAINTING AND SPECIAL COATINGS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage.
 - 1. Quantity: Furnish the Owner with one (1) gallon of each material and color applied in addition to any leftover amounts.
 - 2. All cans shall be labeled with Finish Index number.

2.5 WINDOWS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1. Window Screens: Six (6) window screens.

2.6 BATHROOM ACCESSORIES

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1. Shower Rod: Two (2) units.
2. Towel hook: Two (2) units.

2.7 LIGHTING

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1. Fixture type A: Two (2) fixtures.
2. Fixture type B: Two (2) 24" bulbs.
3. Fixture type C: Four (4) 48" bulbs.
4. Range Hood Appliance: Six (6) light bulbs.

2.8 ELECTRICAL

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1. Standard Outlet: Provide two (2) receptacles and trim plates.
2. GFI Outlet: Provide two (2) receptacles and trim plates.
3. Toggle Switch: Provide two (2) toggle switches.

2.9 SELF-CONTAINED AIR-CONDITIONING UNITS

- A. Filters: Four (4) sets of filters for each unit for PTAC, split A/C and Packaged HVAC units.

2.10 DOOR HARDWARE

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1. Guestroom Door Hardware: Provide two (2) complete sets of hardware.

PART 3 - EXECUTION

Not Used

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Project No. 31000541
August 16, 2023

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END OF SECTION 017843

SPARE PARTS

017843 - 4

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections:
 - 1. Section 014000 "Quality Requirements" for instructor qualifications.
- C. See Sections 02 through 33 for specific requirements for demonstration and training for products in those Sections.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- B. Demonstration and Training Videotapes: Submit two copies within seven days of end of each training module.

1.3 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance. Use manufacturer certified personnel for training is required when available.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
 - 2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
 - 3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
 - 4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
 - 5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
 - 6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
 - 7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
 - 8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish an instructor to describe Owner's operational philosophy.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.

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END OF SECTION 017900

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Sections
 - 1. Section 312000 for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Submit shop drawings for fabrication and placement of the following:
 - 1. Reinforcement: Comply with ACI SP-66. Include bar schedules, diagrams of bent bars, arrangement of concrete reinforcement, and splices.

1.3 INFORMATIONAL SUBMITTALS

- A. Design Mixtures: For each concrete mixture.
- B. Material test reports.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Codes and standards: Comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:
 - 1. ACI 301
 - 2. ACI 318
 - 3. CRSI Manual of standard Practice
- C. Testing Agency Services:

1. Employ, at contractor's expense, an independent testing agency acceptable to the Owner to perform specified tests and other services required for quality assurance.
 - a. Testing agency shall meet ASTM E 329 requirements.
- D. Source of Materials: Obtain materials of each type from the same source for the entire project.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars, deformed: ASTM A 615/A 615M, Grade 60 as shown on structural drawings
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type I.
- B. Normal-Weight Aggregates: ASTM C 33, graded, 1-inch nominal maximum coarse-aggregate size.
 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- C. Lightweight Aggregate: ASTM C 330, 1/2-inch nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M and potable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- G. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Normal Weight Concrete Footings and Interior Slabs:
 - 1. Minimum Compressive Strength: See Structural Drawings
 - 2. Comply with ACI 211.1 for normal weight concrete.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.

2.8 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Provide complete coverage below all areas of floor slab.
 - 2. Lap joints 6 inches and seal with manufacturers recommended tape.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce profile amplitude of 1/4 inch in 1 direction.
 - 1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
 - 2. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
- F. Concrete joints shall be installed in compliance with ACI 302.1R-04.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

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

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. General contract to coordinate inspections.
 1. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION 033000

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hydraulic-cement-based underlayment for use below interior floor coverings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Materials shall be delivered in their original, unopened packages, and protected from exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

1.6 SITE CONDITIONS

- A. Environmental Requirements: Before, during and after installation of underlayment, building interior shall be enclosed and maintained at a temperature above 50 degrees F (10 degrees C).

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Gyp-Crete 2000/3.2k" by Maxxon Corporation;
 - b. "Firm Fill" Gypsum concrete by Haker Industries, Inc.
 - c. or equal.
 3. Cement Binder: ASTM C 150, Portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
 4. Compressive Strength: Not less than 2000 psi at 28 days when tested according to ASTM C 109/C 109M.
 5. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.
- B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.
1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- C. Water: Potable and at a temperature of not more than 70 deg F.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare and clean substrate according to manufacturer's written instructions.
1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 2. Fill substrate voids to prevent underlayment from leaking.
- B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
1. Install underlayment reinforcement recommended in writing by manufacturer.
- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.
- D. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.

3.2 INSTALLATION

- A. Coordinate application of components to provide optimum underlayment-to-substrate and inter coat adhesion.
- B. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- C. Apply $\frac{3}{4}$ " underlayment to produce uniform, level surface.
 - 1. Apply a final layer without aggregate to produce surface.
 - 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Seal underlayment with manufacturer's overspray floor sealer per manufacturer's written instructions.
- F. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment, sealer and floor covering manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 CLEANING AND PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

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END OF SECTION 034516

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes brick, mortar and concrete masonry units.
- B. Related Sections include the following:
 - 1. Division 01 "General Requirements"
- C. Related Documents: Standards and references: Comply with applicable Standards and Specifications of the following organizations, except as specified otherwise in this Section:
 - 1. National Concrete Masonry Association
 - 2. Structural Clay Products Association.
 - 3. ASTM Specifications specified herein.

1.2 ACTION SUBMITTALS

- A. Product data: Submit manufacturer's product data for masonry accessories and mortar materials.
- B. Samples:
 - 1. Brick: Submit sample panels and manufacturer's chemical analysis and recommendations for cleaning.
 - 2. Sample panel: Using brick and mortars selected for this project, construct one sample panel, 4' x 4', at job site for Architect's approval.
 - a. Panels shall show full range of colors and type of joints and shall be representative of work for the project and show variations which can be expected in finished walls.
 - b. Approved sample panels shall be maintained for duration of project. Disapproved samples shall be destroyed.

1.3 INFORMATIONAL SUBMITTALS

- A. Certification of mortar materials:
 - 1. Stamp bags of materials showing that they meet requirements herein specified.

2. Submit mill test certificates covering materials shipped as furnished by Material Manufacturers.

B. Concrete Masonry:

1. Submit test reports by an independent Testing Laboratory, which indicate that proposed masonry units meet requirements of these Specifications.
2. Certificates: Submit letters of certification that fire-rated blocks are equivalent construction to Underwriters' Laboratories' requirements.

1.4 CLOSEOUT SUBMITTAL

- A. Submittals: Make submittals in accordance with Section 013300.

1.4 FIELD CONDITIONS

A. Scaffolding And Bracing:

1. Provide safe and secure scaffolding, staging and ladders that conform with Federal Laws and Regulations, State Laws and Local Codes.

B. Rejection Of Work:

1. Architect reserves the right to reject material, work in progress, or finished masonry work, due to failure to comply with requirements specified.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

- A. Portland Cement: ASTM C150, Type I or ASTM C175, Type IA air-entraining.
- B. Hydrated Lime: ASTM C207, Type S. No substitutes permitted, except as specified below.
1. Substitute: "Easy Spread" mortar plasticizer by American Colloid Co. Do not use with air-entraining cement.
- C. Aggregate: ASTM C144, except that it shall not contain more than ten percent material passing through a No. 100 sieve. Measure sand while it is damp and loose throughout batches.
- D. Water: Clean and free from oil, acid, alkali, organic matter, or other deleterious substances.
- E. Admixtures to mortar: Not permitted.

- F. Masonry Cement: ASTM C91, Type II nonstaining, and may be used in lieu of regular Type N mix in the proportion of one part masonry cement to 2-1/4 to 3 parts sand by volume.

1. Provide the above masonry cement, gray, except where colored cement is required to match existing.

2.2 MORTAR MIXES

- A. Proportions: ASTM C270-87a. Volumes of materials listed below may be varied slightly to assure workability.

1. Type N (750 psi): Use for general exterior and interior masonry. Mix proportions of Portland cement, hydrated lime and sand = 1:1/4:2 1/4 to 3.
 - a. Mix when using "easy spread" type N(750 PSI): 94 lb (one bag) Portland Cement, 7 lb "Easy Spread" 480 lb (6 cu ft) sand, 7 gal water.
2. Type M (2,500 psi): Use for below grade masonry. Mix proportions of Portland cement, hydrated lime and sand = 1:1/4:2.25 to 3.
3. Type S (1,800 psi): Use for exterior walls reinforced with vertical steel bars. Mix proportions of Portland cement, hydrated lime and sand = 1:1/2:2.25 to 3.
 - a. Mix when using "easy spread" type S (1,800 PSI): 188 lb (2 bags) Portland Cement, 7 lb "Easy Spread", 720 lb (9 cu ft) sand, 8 gal water.
4. Unexposed Mortar: Use gray color in unexposed areas.

- B. Grout for reinforced masonry and bond beams:

1. Mix Design: One part Portland cement and one-tenth part hydrated lime or lime putty 2-1/4 to 3 parts fine aggregate and one to two parts coarse aggregate, and provide a minimum compressive strength of 2000 psi.
2. Aggregates: ASTM C404. Fine aggregate - size 2, No. 4 through 100 sieves. Coarse Aggregate - size 8, 3/8 inch through No. 16 sieves.
3. Mixing: Combine and mix cement, lime, water and aggregate for a minimum of five minutes in a mechanical batch mixer. Mix grout to have a slump of 9 inches plus or minus 1 inch at time of placement. Do not use grout which has begun to set or if more than 2-1/2 hours has elapsed after initial mixing.

- C. Ready-mixed mortar: Cementitious materials, water and aggregate complying with requirements specified herein, combined with set-controlling admixtures to produce ready-mixed mortar complying with ASTM C1142; or an approved dry ready-mix with the addition of water and mixing performed on the job.

2.3 MASONRY ACCESSORIES

A. Horizontal Reinforcing:

4. Characteristics: 9 gage galvanized steel wire, with maximum truss spacing of 16 inches OC for truss type, and crossbar spacing of 16 inches OC maximum for perpendicular crossbar type. Reinforcing width shall be 2 inches less than wall thickness.
5. Manufacturers/Types:
 - a. A. A. Wire Products Company, "Blok-Truss" or "Blok-Lok"
 - b. Hohmann and Barnard, "Trus-Mesh" or "Twin-Mesh-Lock"
 - c. Or equal, approved by the Architect.
6. Corners: Provide preformed corners.

B. Flexible Anchors:

1. Manufacturer/Type:
 - a. A. A. Wire Products Company, "Flex-O-Lok."
2. Characteristics: 3/16 inch mill galvanized wire, see Drawings for size.
3. Anchor Plate and Wire Tie: Model BL-200. Secure to structure per manufacturer's recommendations.
4. Spacing: 16 inches OC.

C. Reinforcing Bars: Install prebent bars at corners of bond beams.

D. Through Wall Flashing:

1. Manufacturers/Types: self-sealing, self-healing, fully adhered, composite flexible flashing
 - a. Everlastic MF-40 by Williams Products, Inc.
 - b. Or equal. Approved by Architect.
2. Ends of Flashing: Provide end dams (flashing turned up).

E. Fillers:

1. Manufacturer/Types:
 - a. Williams Products, Inc., Troy, Michigan, "Everlastic" or Vinyl U, Vinyl V, Sponge Neoprene, or expanded Polyethylene.
 - b. Or equal, approved by the Architect.
2. Adhesives:
 - a. Williams Products, Inc., "Pressure Sensitive Adhesive 81".
 - b. Or equal, approved by the Architect.

F. Weep Holes:

1. Cellular Plastic Weep/Vent: One-piece flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, spaced 24 inches OC maximum, in color closest to mortar color.
2. Manufacturers:
 - a. Hohmann & Barnard, Inc.; Quadro-Vent
 - b. Advanced Building Products Inc.
 - c. Dayton Superior Corporation, Dur-O-Wal Division
 - d. Heckmann Building Products Inc
 - e. Wire-Bond.

2.4 CONCRETE MASONRY UNITS

- A. Moisture Content: In addition to requirements of ASTM C90 concrete masonry units shall be steam cured, then yard cured for two weeks to 30 days.
- B. Concrete Block:
 1. Block: ASTM C90.
 2. Type: I.
 3. Grade: N.
 4. Weight Classification:
 - a. Normal Weight
 5. Texture: To match Architect's drawings.
 - a. Smooth Face Block.
 - b. Split Face Block.
- C. Special Shapes:
 1. Bond beam block, jamb block, lintel block, sash block, and any other special shapes shall be provided as shown on Drawings.
 2. Precast Lintels: Provided of same material as adjacent block, reinforced to carry imposed load. Minimum length, 16 inches longer than opening width. Finish texture to match adjacent units.
- D. Fire-Rated Block:
 1. Fire-Ratings: Provide minimum 2 hour fire-ratings at 2 hour wall separating buildings where shown on plans.
 2. Block shall meet ASTM C145.
 3. Block manufacturer's certificate: Submit to Architect, letters of certification that Manufacturer's fire-rated block are equivalent construction to Underwriters' Laboratories' requirements.

2.5 CLAY OR SHALE BRICK

A. Comply with or exceed ASTM C216, but include the following modifications:

1. Size Variation: Tolerance on dimensions shall be either over or under but not both, and the total size variation shall be the tolerances in Table 5 of ASTM C216.
2. Structural Quality: Sound, strong and serviceable in all respects.
3. Compressive Strength: Minimum 8000 psi.
4. Total Moisture Absorption: Less than eight percent.
5. Saturation Coefficient: 0.78 or less.
6. Certification Option: Compressive strength, water absorption and saturation coefficient requirements may be waived if a 50-cycle freeze thaw test, taken within the past 18 months, showing Grade SW compliance, is submitted and approved by the Architect, and the Manufacturer of the brick certifies that the brick will perform satisfactorily on this project for the usage shown.
7. Cracks: Bricks shall be free of cracks or laminations; such brick shall be considered as cull brick.
8. Chips: Chips smaller than 1/4 inch in diameter will not be considered significant. Chips 1/4 inch to 1/2 inch on velour brick or semi smooth brick shall not exceed 5 percent of the shipment at the job site, and brick with chips larger than 1/2 inch will be considered cull brick. On rougher textures up to ten percent of the brick may show chips 1/4 inch to 1/2 inch thick.
9. Color Range and Texture shall be the same in all respects as the approved job sample. Job sample shall be the same in all respects as the manufacturer's sample panel except as approved otherwise by the Architect.

B. Face Brick: Comply with or exceed ASTM C216, including:

1. Grade: NW (Above Grade).
2. Type: FBS (Standard).
3. Deliver on pallets, steel banded and stack at the job site.
4. Manufacturer/Finish/Color: Glen-Gery Brick – Prince William Utility Brick. Alternate manufacturers as approved by the owner.
5. Color: As indicated on Drawings.

C. Sizes:

1. Utility Size: 3-5/8" x 3-5/8" x 115/8" inches

2.6 ACCESSORIES

A. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

B. Manufacturers:

1. Mortar Net Solutions - Mortar Net with Insect Barrier
2. Advanced Building Products Inc.

3. Heckmann Building Products, Inc.
4. Wire-Bond.

C. Configuration:

1. Strips, not less than **1-1/2 inches** thick and **10 inches** high, designed to catch mortar droppings and prevent weep holes from clogging with mortar.

PART 3 - EXECUTION

3.1 ERECTION - GENERAL REQUIREMENTS

- A. Condition of Surfaces: Examine surfaces, supporting structures, and conditions upon which masonry work is to be installed.
- B. Unsatisfactory Conditions: Installer shall be required to notify Contractor in writing. Do not proceed with work until conditions have been corrected.
- C. Coordination: Review erection procedures and coordinate with work under other Sections.
- D. Workmanship And Joints:
 1. Lay-up walls plumb and true, square and straight, and in proper bond.
 2. Courses shall be level and accurately spaced.
 3. Joints shall be uniform and level, true and straight. Maintain joint widths, except for minor variations required to maintain bond alignment.
 4. Vertical joints shall be aligned in bond.
 5. Head Joints: Butter ends of units with sufficient mortar to fill head joints. Do not slush head joints.
 6. Bed and Head Joints: Shove and work units into completely filled bed and head joints.
 7. Tool joints as work progresses.
 8. Cutting and fitting shall be neatly done with motor driven saw.
 9. Variation In Mortar Joint Thickness: Do not exceed indicated bed joint thickness by more than plus or minus 1/8 inch with maximum thickness of 1/2 inch. Do not exceed indicated head joint by more than plus or minus 1/8 inch.
- E. Construction Tolerances:
 1. Maximum variation from plumb in vertical lines and surfaces of columns, wall and arises:
 - a. 1/4 inch in 10 ft.
 - b. 3/8 inch in a story height not to exceed 20 ft.
 - c. 1/2 inch in 40 ft or more.
 2. Maximum variation from plumb for external corners, expansion joints and other conspicuous lines:

- a. 1/4 inch in any story or 20 ft maximum.
 - b. 1/2 inch in 40 ft or more.
3. Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
 - a. 1/4 inch in 20 ft.
 - b. 1/2 inch in 40 ft, or more.
4. Maximum variation from plan location of related portions of columns, walls and partitions:
 - a. 1/2 inch in 20 ft.
 - b. 3/4 inch in 40 ft or more.
5. Maximum variation in cross-sectional dimensions of thicknesses of walls from dimensions shown on drawings:
 - a. Minus 1/4 inch.
 - b. Plus 1/2 inch.

F. Mortar And Grout:

1. Retempering: Mortars that have stiffened because of evaporation of water shall be tempered by adding water as needed. Mortars shall be used within 2-1/2 hours after initial mixing.
2. Admixtures are not permitted, except as specified.
3. Surplus mortar shall be removed immediately, as work progresses.

G. Walls and Partitions: Do not carry more than 6 ft or one scaffold height in advance of adjacent wall.

H. Brick Veneer and Block Back-Up: Lay in the same sequence of operation.

I. Isolation of Masonry from Structural Steel: Wherever structural steel, including bar joists passes through a masonry wall the masonry shall be maintained clear of the steel by 1/2 to 3/4 inch. Steel shall be kept clear by wrapping with insulation materials or other approved methods. Wherever masonry construction encloses any portion of steel columns, the masonry shall be kept clear of the column by 1/4 inch minimum.

3.2 REINFORCING

A. Horizontal Reinforcing:

1. Spacing: 16 inches OC vertically, maximum. Provide additional courses or closer spacing where required on Drawings.
2. Lap end laps 8 inches minimum.
3. Break horizontal reinforcing at control and expansion joints.

B. Bond Beams:

1. Set horizontal reinforcing bars, fill cavity full of grout and thoroughly puddle. Screed grout smooth and flush with top of bond beam blocks.
 2. Do not continue reinforcing bars and grout thru expansion and control joints.
 3. Expansion Dowels and Sleeves: Set in control joints.
- C. Special Requirements: See Drawings for reinforcement of masonry, spacings, locations and bends. Comply with Building Code requirements for reinforced masonry.
- D. Vertical Reinforcing And Grouting:
1. Placement Of Steel Bars: Center within block cores, joints, or spaces between courses of masonry. Completely encase bars with grout. Regular mortar as encasement is not permitted.
 2. Reinforced Hollow Unit Masonry: Build to preserve unobstructed vertical continuity of cells to be filled. Walls and cross webs forming such cells shall be full-bedded in mortar to prevent leakage of grout. Head (or end) joints shall be solidly filled with mortar for a distance in from face of wall or unit not less than thickness of longitudinal face shells. Bond shall be provided by lapping units in successive vertical courses.
 3. Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than 3" x 3".
 4. Cleanout Openings: Provide at bottoms of cells, to be filled at each lift or pour of grout where such lift or pour of grout is in excess of 4 ft in height. Overhanging mortar or other obstruction or debris shall be removed from insides of such cell walls. Cleanouts shall be sealed before grouting, after inspection.
 5. Vertical Reinforcement: Hold in position at center of block cells at top, and wire tied at bottom and at intervals not exceeding 192 diameters of reinforcement.
 6. Cells Containing Reinforcement: Fill solidly with grout. Grout shall be poured in lifts of 4 ft. maximum height. Grout shall be consolidated at time of pouring by puddling or vibrating and then reconsolidated by again puddling later, before plasticity is lost.
 7. When grouting is stopped for one hour or longer, horizontal construction joints shall be formed by stopping pour of grout 1-1/2 inches below top of uppermost unit.
- E. Expansion And Control Joints:
1. Provide continuous vertical break in masonry.
 2. Wall reinforcement shall be cut on each side of joint, not run through.
 3. Fillers: Recess with space available for backer rod and sealant. Align fillers vertically to provide depth of sealant and backer rod.

3.3 BRICK REQUIREMENTS

A. Wetting Brick:

1. Wet down brick of clay or shale which have ASTM C67 initial rates of absorption or more than 30 gr/30 sq inches/minute.

B. Pattern Bond:

1. Running bond and Rowlock where shown on drawings.

C. Joint Types:

1. Concaved Surfaces: Cut mortar flush and tool slightly concave before initial set of mortar.

3.4 BLOCK REQUIREMENTS

A. Laying: Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells.

B. Webs: Cover full with mortar in starting courses on footings and foundation walls, in courses of piers, columns and pilasters and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

C. Pattern Bond: Running bond.

D. Joint Types:

1. Concaved Surface: Cut mortar flush and tool slightly concave, before initial set of mortar.

E. Wetting: Do not wet concrete masonry units under any circumstances.

3.5 BUILT-IN WORK

A. Coordination:

1. Consult other trades prior to installing built-in items. Verify items to be furnished under other Sections.
2. Shop drawings on built-in items shall be reviewed by Architect, before installation.
3. Related work: Provide for installation of work under other Sections to avoid cutting and patching after erection.

B. Installation - General:

1. Set And Build-In: Flashings, lintels, mechanical and electrical equipment, and other miscellaneous items.
2. Cut and patch for work under other Sections.

C. Weep Holes: Build into masonry veneer walls at 24 inches OC maximum.

D. Cavity Drainage Material: Place cavity drainage material in cavities to comply with manufacturer's instructions.

3.6 FIELD QUALITY CONTROL

- A. Quality Control Tests: Compressive tests will be required of construction mortar when directed by the Architect.
 - 1. Type of Tests: Compressive tests in accordance with ASTM C109.
 - 2. Number of Tests: One test for each 2,500 sq ft of wall.
 - 3. Costs of Tests: See Section 01400.
 - 4. Testing Laboratory Service: See Section 01400.

3.7 REPAIR, POINTING AND CLEANING

- A. Repair:
 - 1. Remove and replace masonry units which are loose, chipped, broken, stained, damaged, or do not match adjoining units.
 - 2. Provide new units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.
- B. Pointing:
 - 1. Point-up joints that are defective or that are not uniform and neat in appearance.
 - 2. Cut out defective mortar joints and fill solidly with mortar as specified. Tool as specified. Start work at tops of walls and work down.
 - 3. Tuck point mortar joints that shrink away from contacted surfaces.
- C. Cleaning:
 - 1. Brush off excess mortar as work progresses. Dry brush at end of each day's work.
 - 2. Final cleaning: After mortar is thoroughly set and cured, and damaged surfaces are repaired, clean walls as follows.
 - a. Dry clean to remove large particles of mortar.
 - b. Presoak wall by saturating with water and flush off loose mortar and dirt.
 - c. Scrub down wall with stiff fiber brush and a solution of one-half cup of trisodium phosphate and one-half cup of household detergent dissolved in one gal. of water.
 - d. Rinse walls by washing off cleaning solution, dirt and mortar crumbs using clean, pressurized water.
- D. Brick Masonry Cleaning:
 - 1. Manufacturer:
Process Solvent Company, Inc., "101 Lime Solvent"
 - 2. Application: Comply with Manufacturer's printed instructions and methods.
 - 3. Final wash down with clean water.

3.8 PROTECTION:

1. Materials and work: Protect from damage by rain, snow, inclement weather, wind, freezing temperatures, and other Trades.
2. Cover tops of brick veneer walls with tarps or reinforced plastic each day at end of work and when work is not in progress. Keep walls covered and protected until soldier course is installed.
3. Adjacent finished surfaces: Protect from damage by masonry work.
4. Temperature: No masonry erection shall be done with temperature at or below 32 degrees F., unless adequate protection is provided to heat and maintain temperature of materials and completed wall above freezing.
5. Heating materials: Heat materials to at least 40 degrees F. but not more than 160 degrees F. to produce mortar temperature of between 40 degrees F. and 120 degrees F. When the temperature of dry masonry units is below 20 degrees F., heat so that they are at or above 20 degrees F. at time of use.
6. Enclosures: Provide sufficient enclosures and heat to maintain enclosures above 32 degrees F. for 24 hours.
7. Frozen materials and work: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing. No additive antifreeze materials permitted in mortar work.

END OF SECTION 042000

SECTION 044313.16 - ADHERED STONE MASONRY VENEER

1. GENERAL

1.1 SUMMARY

A. Section Includes:

1. Masonry veneer system adhered to waterproofing and lath, over wood framing and sheathing. System includes the following types of veneers:
 - a. Manufactured stone masonry.

B. Related Sections include:

1. Section 072419 "Water Drainage Exterior Insulation and Finish System (EIFS)" for weather barriers.
2. Section 076200 "Sheet Metal Flashing and Trim" for flashing materials.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM); Philadelphia, PA. (215) 299-5420,
1. ASTM C 39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 2. ASTM C 140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 3. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
 4. ASTM C 150 - Standard Specification for Portland Cement.
 5. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
 6. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
 7. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 8. ASTM C 778 - Standard Specification for Standard Sand.
 9. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.
 10. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
 11. ASTM C 1032 - Standard Specification for Woven Wire Plaster Base.
 12. ASTM C 932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
 13. ASTM C 482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.

14. ASTM C 348 Standard test Method for Flexural Strength of Hydraulic-Cement Mortars.
 15. ASTM F 1667 – Standard Specification for Driven Fasteners, Nails, Spikes & Staples.
- B. American National Standards Institute (ANSI); New York, (212) 642-4900,
1. ANSI A118.4 Specification for Latex-Portland Cement Mortar.
- C. Building Code Compliance:
1. International Code Council (ICC)
- D. Masonry Veneer Manufacturers Association (MVMA)

1.4 ACTION SUBMITTALS

- A. Product Data: For each variety of masonry, masonry accessory, and manufactured product.
- B. Samples for Initial Selection: For colored pointing mortar and other items involving color selection.
- C. Samples for Verification:
1. For each masonry type indicated. Include at least four Samples in each set and show the full range of color and other visual characteristics in completed Work.
 2. For each color of mortar required

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
1. Product Data: For each type of product indicated.
 2. Shop Drawings: Indicate layout, show profiles and product components, including anchorage, accessories, finish colors, patterns, and textures.
 3. Qualification Data: Manufacturer's manufacturing and installing qualifications, safety and quality documents.
 4. Test Reports: Certified test reports showing compliance with specified performance requirements and physical properties.
 5. Samples: Board containing sample including mortar.
 6. Manufacturer's Instructions: Installation Procedures.
 7. Certificates: ICC-ES Report 2380.
 8. Minutes of pre-installation conference.
 9. Maintenance Data
 10. Warranty: Product and installation warranties.
- B. Material Test Reports:
1. Masonry Test Reports: For each masonry variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical

properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual experienced in installing adhered masonry veneer assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- B. ICC-ES Certification: Manufacturer's current ICC-ES report 2380, including AC- 51 testing data.
- C. Single Source Responsibility: Obtain primary manufactured stone veneer and trim from a single manufacturer with not less than twenty years of successful experience in manufacturing and five years of successful experience in installing principal materials described in this section. Manufacturer and Installer shall have completed at least ten projects of similar size and complexity. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.
- D. Manufacturer Qualifications:
 - 1. Has over 20 years experience in producing simulated masonry.
 - 2. Provides field service representative.
 - 3. Has ICC-ES certification.
 - 4. Has a 50 year product warranty.
 - 5. Is in good standing with the MVMA.
- E. Product Compatibility: Manufacturers of products and systems certify in writing that products are compatible.
 - 1. Pre-Installation Conference:
 - a. General contractor shall arrange a meeting not less than thirty days prior to starting work.
 - b. Attendance:
 - i. General Contractor
 - ii. Architect/Owner's Representative
 - iii. Manufacturer Representative
- F. Warranty: Single Source Warranty.
 - 1. Fifty (50) year product warranty.
 - 2. One (1) year installation warranty.
- G. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for each type of masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch

length of flashing left exposed to view (omit masonry above half of flashing).

- b. Include wood studs, sheathing, and flashing in exterior masonry-veneer wall mockup.
- 2. Protect accepted mockups from the elements with weather-resistant membrane.
- 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.
- 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.
- C. Delivery: Deliver materials in original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store materials to comply with manufacturer written instructions to prevent deterioration from moisture, temperature or other detrimental effects.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining masonry face.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed masonry.

- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- E. Environmental Site Conditions: Comply with Manufacturer's Installation Procedures for environmental conditions.

1.9 COORDINATION

- A. Advise installers of other work about specific requirements for placement of flashing and similar items to be built into masonry.

1.10 WARRANTY

- A. Special Warranty: Mortar manufacturer's standard form in which manufacturer agrees to repair or replace components of adhered manufactured masonry veneer that fail in materials, workmanship, or adhesion within specified warranty period.

1. Warranty Period:

- a. Product Warranty: 50 years from date of substantial completion.
- b. Installation: 1 year from date of substantial completion.

2.PRODUCTS

2.1 MANUFACTURED VENEER UNITS

A. General:

- 1. Compressive Strength: ASTM C 39, 1800 psi.
- 2. Thermal Resistance: ASTM C 177, R-factor, 0.392 per inch of thickness.
- 3. Freeze/Thaw: ASTM C 67, 50 cycles, no disintegration and less than 3 percent weight loss.
- 4. Fire Hazard Test, UL 723:
 - a. Flame spread: 0.
 - b. Smoke Development: 0.

B. Manufactured Stone:

- 1. Basis of Design: Eldorado Stone (As indicated on drawings).
- 2. Properties
 - a. Thickness: 1-1/8-2-1/2 inches

- b. Weight: maximum of 15 lbs/SF
 - c. Density to be determined under ASTM C 567
 - d. Compressive Strength: Minimum of 1,800 PSI when tested in accordance with ASTM C 192
 - e. Water absorption: less than 18% when tested in accordance with ASTM C-140 or UBC standard 15-5
 - f. Freeze-thaw: less than 3% mass loss when tested in accordance with ASTM C 67
 - g. Shear Bond Strength: minimum of 50 PSI when conducted in accordance with ASTM C 482
 - h. Thermal Resistance: $R \geq .865$ when tested at a thickness of 1.0 inch (25.4 mm) in accordance with ASTM C 518
 - i. Smoke and fuel contribution: UL listed 0/0
 - j. Flexural strength: tested in accordance with ASTM C 348, Section 4.4
 - k. Tensile strength: tested in accordance with ASTM C 190, Section 4.5
 - l. Weather resistance: Mix design proven by test results to be resistant to degradation by weather.
3. Architectural Trim
- a. Caps, Sills, and Miscellaneous Trim Pieces:
 - 1) Color and size: As indicated on drawings.
 - a) Provide sloped top surface and drip edge.

2.2 AIR AND WATER BARRIER – Two Layers. Refer to Section 072419.

2.3 REINFORCING (LATH):

- A. Corrosion resistant minimum 2.5 lbs per square yard expanded metal lath that complies with ASTM C 847, or, corrosion resistant minimum 18 gauge woven wire mesh that complies with ASTM C 1032. For open studs and non solid sheathing (e.g. rigid insulation board) use corrosion resistant minimum 3.4 lbs per square yard, 3/8" paper backed lath (paper backing shall meet the requirements of ASTM D226 to be considered a substitute for Weather Resistive Barrier). Any alternative lath material shall carry an evaluation report that rates the lath as an acceptable substitute to the above listed materials. Lap lath not less than 2 inches all around vertically and horizontally. Terminate lath a minimum of 2 inches on the foundation and/or flange of the weep screed or as directed by project specifications and or local building codes. Metal lath can be installed with the small cups pointing upward to better capture mortar scratch coat. barrier not less than 6 inches at the vertical joints. In the case of applications with two layers, start with two horizontal layers at the bottom of exterior wall or structure.

2.4 FASTENERS

- A. Galvanized steel fasteners (nails, staples or screws), for wood stud applications (open, rigid sheathing, rigid foam insulation) should penetrate the stud a minimum of $\frac{3}{4}$ inch. Spacing of these fasteners should be a maximum of 6" vertical and should be 16" horizontal (on the studs). These fasteners should be a minimum of 1 $\frac{1}{2}$ inches long, 11 gage

nails having a 7/16 inch head or 7/8 inch long, 16 gage staples. Corrosion resistant screws should have a 7/16 inch head and should penetrate the metal stud a minimum of 3/8 inch. Refer to governing building code for information on specific fastener penetration depth.

In the case of rigid sheathing, care should be taken to avoid excessive fasteners applied between wall framing. In the case of exterior gypsum sheathing (e.g. DensGlass), fasteners should only be applied into wall framing unless additional fasteners are approved by the design professional.

2.5 WEEP SCREED:

- A. Foundation Weep Screed shall be corrosion resistant and a minimum 0.019- inch (No. 26 galvanized sheet gauge, fabricated plastic or vinyl material) with a minimum vertical attachment of 3 ½ inches. Weep screed should have holes with a minimum diameter of 3/16 inch spaced at a maximum of 33 inches on center. Install Foundation Weep Screed per manufacturer's instructions and integrate with WRB and metal lath. Weep screed shall have a minimum of 3 ½ inches attachment flange at or below the foundation plate line on exterior walls in accordance with ASTM C926. The exterior lath shall cover and terminate on the attachment flange of the weep screed. Weep holes should not be covered during installation.

2.6 CLEARANCES:

- A. Stone should be held a minimum of 4 inches above finished grade or per local code and building practices. Stone shall be held at a clearance above hard surfaces a minimum of 2 inches or as per local code and building practices.

2.7 MORTAR MATERIALS

- A. Source Limitations for Mortar Materials: Obtain mortar from a single manufacturer. To be mixed with potable water clean and free from injurious amounts of oils, acids, alkalis, salts, organic minerals or other deleterious substances.
- B. Manufacturer: Subject to compliance with requirements, provide products by:
 - 1. Laticrete International, Inc: MVIS – Masonry Veneer Installation System.
- C. Masonry Veneer Mortar: Polymer-modified portland cement mortar recommended by the mortar manufacturer for the application indicated.
 - 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 2. Provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

- D. Masonry Pointing Mortar: Where indicated, provide mortar manufacturer's recommended masonry pointing mortar in color selected by Architect from manufacturer's standard.
- E. Water: Potable.

2.8 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
 - 2. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
- B. Solder and Sealants for Sheet Metal Flashings:
 - 1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. Elastomeric Sealant: ASTM C 920, chemically curing sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

3.EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive adhered manufactured masonry veneer, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of adhered veneer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 MANUFACTURED VENEER UNITS

- A. Comply with manufacturer's written instructions and recommendations for the adhered stone veneer system used.

3.3 ADHERED MASONRY VENEER INSTALLATION

- A. Comply with mortar manufacturer's written instructions, for adhered masonry veneer system specified.

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- B. Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.
- D. Measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.
- E. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 POINTING

- A. Prepare joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.
- B. Point joints by placing and compacting pointing mortar in layers of not more than 3/8 inch deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Joint Profile: Concave.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace masonry of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged units. Units may be repaired if methods and results are approved by Architect.
 - 2. Defective joints.
 - 3. Masonry not matching approved samples and mockups.
 - 4. Masonry not complying with other requirements indicated.
- B. Replace in a manner that results in masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

- C. In-Progress Cleaning: Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.

END OF SECTION 044313.16

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes structural steel.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Mill test reports.
- C. Source quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- C. Comply with applicable provisions of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W, M, and S-Shapes: ASTM992, $F_y=50$ ksi (min).
- B. Channels, Angles, Plate and Bar: ASTM A 36, $F_y=36$ ksi (min).
- C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.

- D. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325N, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.
 - a. Finish: Plain.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.4 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

2.5 SHOP CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

2.6 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces to be field welded.
 - 2. Surfaces to receive sprayed fire-resistive materials.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry

film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 ERECTION

- A. Examination: Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedment's, with steel erector present, for compliance with requirements.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.2 FIELD CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design " for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 051200

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Miscellaneous steel framing and supports.
2. Prefabricated building columns.
3. Shelf angles.
4. Loose bearing and leveling plates.
5. Steel weld plates and angles.
6. Structural-steel door frames.
7. Miscellaneous steel trim.
8. Metal ladders (provided by elevator manufacturer).
9. Metal bollards.
10. Pipe guards.
11. Elevator sump cover.
12. Laundry trench grate.
13. Loose steel lintels.
14. Gate assembly.

B. Related Sections

1. Section 033000 "Cast-in-Place Concrete"
2. Section 051200 "Structural Steel Framing"
3. Section 099113 "Exterior Painting" for gates, bollards and connectors.
4. Section 099123 "Interior Painting" for handrails, sump covers, and trench grates.

1.2 ACTION SUBMITTALS

- A. Product Data for prefabricated building columns, metal nosings and tread, and grout.
- B. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Templates: For anchors and bolts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- B. Ferrous Metals:
 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 2. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
 3. Steel Tubing: ASTM A 500, cold-formed steel tubing.
 4. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
 5. Slotted Channel Framing: Cold-formed metal channels complying with MFMA-3, 1-5/8 by 1-5/8 inches. Channels made from galvanized steel complying with ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.079-inch nominal thickness.
 6. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
- C. Nonferrous Metals:
 1. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.
 2. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.
 3. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

- A. General: Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Cast-in-Place Anchors in Concrete: Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79.

- B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Available Products:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
 - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 - g. Themec Company, Inc.; Themec-Zinc 90-97.
- C. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for regalvanizing welds in steel.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- E. Concrete Materials and Properties: Comply with requirements in Section 03300 for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.5 FABRICATION

- A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
 - 1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
 - 2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
 - 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 - 4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - 5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 24 inches o.c.
- B. Miscellaneous Framing and Supports: Provide steel framing and supports not specified in other Sections as needed to complete the work. Fabricate units from steel shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Loose Steel Lintels: Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

- D. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts.
- E. Miscellaneous Steel Trim: Fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Exterior Miscellaneous Steel Trim: Hot Dipped Galvanized..
- F. Metal Ladders: Comply with ANSI A14.3, unless otherwise indicated.
 - 1. Elevator Pit Ladders: Comply with ASME A17.1.
 - 2. Steel Ladder Construction: Flat bar side rails, with 3/4-inch- diameter steel bar rungs fitted in centerline of side rails, plug-welded, and ground smooth on outer rail faces.
- G. Metal Bollards: Fabricate from Schedule 40 steel pipe 1/4-inch wall-thickness rectangular and/or round steel tubing.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.
- B. Steel and Iron Finishes:
 - 1. Hot-dip galvanize items as indicated to comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.
 - 2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed metal fabrications:
 - a. Exteriors (SSPC Zone 1B) and Items Indicated to be Hot Dipped Galvanized. All exterior steel fabrications and steel subject to direct water contact or elevated humidity levels shall be hot dipped galvanized.
 - b. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
 - 3. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Perform cutting, drilling, and fitting required for installing metal fabrications.
 - 1. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
 - 2. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
 - 3. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
 - 4. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack solidly with Nonshrink, nonmetallic grout.
- C. Bollards:
 - 1. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
 - 2. Fill bollards solidly with concrete, mounding top surface to shed water.

3.2 CLEANING

- A. Touch up surfaces and finishes after erection.
 - 1. Painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting.
 - 2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood framing.
2. Wood supports.
3. Wood blocking.
4. Wood cants.
5. Wood nailers.
6. Wood furring.
7. Wood grounds.
8. Wood sheathing.
9. Wood subflooring.
10. Plywood backing panels.

B. Related Sections

1. Section 072500 "Weather Barriers" for exterior weather barrier installed with exterior sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product indicated.

1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.

C. Research/Evaluation Reports: For the following:

1. Treated wood.
2. Engineered wood products.
3. Foam-plastic sheathing.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive stained or natural finish, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Provide dressed lumber, S4S, unless otherwise indicated.
 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
- B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Wood Structural Panels:
1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
 2. Oriented Strand Board: DOC PS 2.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
- B. Kiln-dry material after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

- C. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.4 DIMENSION LUMBER

- A. General: Of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Non-Load-Bearing Interior Partitions: Standard, Stud, or No. 3 grade and any of the following species:
 - 1. Mixed southern pine; SPIB.
 - 2. Eastern softwoods; NELMA.
 - 3. Northern species; NLGA.
 - 4. Western woods; WCLIB or WWPA.
- C. Framing Other Than Non-Load-Bearing Partitions: See Structural Drawings:

2.5 TIMBER AND MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber for support or attachment of other construction, including the following:
 - 1. Rooftop equipment bases and support curbs.
 - 2. Blocking.
 - 3. Cants.
 - 4. Nailers.
 - 5. Furring.
 - 6. Grounds.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine, No. 2 grade; SPIB.
 - 2. Eastern softwoods, No. 2 Common grade; NELMA.
 - 3. Northern species, No. 2 Common grade; NLGA.

4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.6 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Composite of wood veneers with grain primarily parallel to member lengths, manufactured with exterior-type adhesive complying with ASTM D 2559. Allowable design values determined according to ASTM D 5456.
 1. Available Manufacturers:
 - a. Boise Cascade Corporation.
 - b. Georgia-Pacific Corporation.
 - c. Louisiana-Pacific Corporation.
 - d. Pacific Woodtech Corp.
 - e. Truss Joist MacMillan.
 - f. Union Camp Corp.; Building Products Division.
 - g. Willamette Industries, Inc.
 2. Extreme Fiber Stress in Bending, Edgewise: See structural drawings for 12-inch nominal - depth members.
 3. Modulus of Elasticity, Edgewise: See structural drawings.
- B. Rim Boards: Performance-rated product complying with APA PRR-401.
 1. Material: Mat-formed panel's all-veneer panels composite panel's glulam's or structural composite lumber.
 2. Thickness and Grade: 1-1/8-inch rim board OR 1-1/8-inch rim board plus.
 3. Trademark: Factory mark with APA trademark indicating thickness, grade, and compliance with APA standard.

2.7 SHEATHING

- A. Plywood Wall Sheathing See structural drawings for sheathing.
- B. Oriented-Strand-Board Wall Sheathing: See structural drawings for sheathing.
- C. Fiberboard Wall Sheathing: AHA A194.1, Type IV, Class 1 (regular density) cellulosic fiberboard sheathing with square edges, 1/2 inch thick.
- D. Plywood Roof Sheathing: See structural drawings for sheathing.
- E. Oriented-Strand-Board Roof Sheathing: See structural drawings for sheathing.

2.8 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Subflooring: See structural drawings for sheathing single-floor panels or sheathing.

2.9 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.10 MISCELLANEOUS MATERIALS

- A. Fasteners:
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - 2. Power-Driven Fasteners: CABO NER-272.
 - 3. Bolts: Steel bolts complying with ASTM F1554, Grade 36; with ASTM A 563 hex nuts and, where indicated, flat washers.
- B. Metal Framing Anchors: Made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Available Manufacturers:
 - a. Mitek, Inc.
 - b. Simpson Strong-Tie Company, Inc
 - 2. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
 - 3. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
- D. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 OR ASTM D 3498 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

3.2 INSTALLATION

- A. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Per structural drawings.
- B. Blocking: Comply with blocking requirements per plans for adequate support of wall hung items, including but not limited to cabinets, accessories, specialties, fixtures, equipment and devices.
- C. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- D. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- E. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- F. Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
- G. Fastening Methods:
 - 1. Subflooring: Glue and nail to wood framing. Reference structural drawings for nail/screw/glue requirements.
 - 2. Sheathing: Nail to wood framing.
 - 3. Plywood Backing Panels: Nail or screw to supports.

END OF SECTION 061000

SECTION 061733 - WOOD I JOISTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Prefabricated plywood web joists.

B. Related Sections:

1. Division 01 - General Requirements.
2. Section 014523 - Testing and Inspection.
3. Section 061000 - Rough Carpentry.
4. Section 061736 - Metal Web Wood Joists.

1.2 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating joist locations, sizes, camber, spacing, species, stress grades and attachment details.
- B. Evaluation Reports: Submit research or evaluation reports stating compliance to CBC.

1.3 QUALITY ASSURANCE

- A. Comply with following as a minimum requirement: Prefabricated plywood web joists shall comply with requirements of ICC Evaluation Service, Inc. report No. PFC-5803, current editions.
- B. Fabrication and installation of wood chord metal joists shall comply with requirements of CBC Chapter 23.
- C. Provide special inspections per CBC Chapter 17A.
- D. Each member shall be stamped with an identifying mark. Manufacturer shall provide a verified report identifying members by mark and including pertinent data such as certification of flange material and species, type of glue, and other information as may be required.
- E. Plywood web joist fabrication shall be inspected as part of manufacturer's approved quality assurance program. Inspection shall be performed in accordance with Section 01 4523 - Testing and Inspection.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store plywood web joists above grade on platforms, skids, or other required supports.
- B. Protect joists from moisture with polyethylene film or waterproof paper.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. TrusJoist, A Weyerhaeuser Business.
- B. Standard Structures, Inc.
- C. Louisiana-Pacific Corporation.
- D. Georgia-Pacific Corporation.
- E. Equal.

2.2 MATERIALS

- A. Wood Chord: Solid-sawn lumber, laminated veneer lumber (LVL), laminated strand lumber (LSL) or machine-stress-rated (MSR) structural lumber. Allowable unit stresses for chord members shall be as set forth in applicable California Building Code and as noted in the ICC reports. Lumber grade identification shall be as indicated on Drawings.
- B. Web shall be plywood or oriented strand board.
- C. Accessories: Supply miscellaneous accessories including bracing, blocking, stiffeners, bearing clips, and any other required accessories required by joist manufacturer to complete joist installation.
- D. Adhesives: Adhesives must meet requirements for exterior type complying with ASTM D2559.

2.3 FABRICATION

- A. Fabricate joists in accordance with referenced standards.
- B. TJI Joists: Plywood web type members, structural grade plywood Micro-Lam or machine stress rated lumber chord flanges assembled with waterproof glues; plywood webs of APA Structural 1 Grade installed with face grain running in vertical direction of members and butt jointed for a continuous web member; web pressure formed and

tightly fitted into a groove routed on centerline of wide face of flange members to form a pressure glue joint at that junction.

1. Flanges: Joists shall be factory fabricated with micro-lam billets utilizing waterproof glues and having machine stress rating of $F_b=2,100$ psi, $E=1,800,000$ psi. Moisture content at time of fabrication shall be between 7 and 19 percent of a surface dry basis. Joints shall be pre-qualified, finger joints.
2. Webs: Plywood complying with PS 1, C-C Structural 1, grade marked by an ICC-approved agency or oriented strand board OSB complying with APA E446. Moisture content at time of fabrication shall be between 7 and 16 percent. Difference in average moisture content between panels glued to each other in any member shall not exceed 5 percent. Plywood containing core gaps at ends shall not be furnished. Install plywood web with face veneers oriented vertically, and butt jointed with adhesive to form a continuous member. Top and bottom edges of webs shall be specially prepared and pressure fitted into a machined groove in center of wide face of flange members so as to form a tight glued junction. Provide web bearing stiffeners as indicated.
3. Adhesives: Exterior type, phenol, resorcinol or phenol-resorcinol. Adhesive shall be mixed and handled in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.1 GENERAL

- A. Joists shall be of sizes and spacing indicated. Top and bottom chord and web members shall be of sizes and stress-grade lumber indicated or specified.

3.2 INSTALLATION

- A. Joints shall be installed in accordance with Drawings and Shop Drawings.
- B. Temporary construction loads, which cause stresses beyond design limits, shall not be applied to joists.
- C. Installation bracing, in addition to specified bridging, bracing shall be provided as required to keep joists straight and plumb until sheathing material has been installed.

3.3 CLEANUP

- A. Remove debris, rubbish, and waste material and legally dispose of off Project site.

3.4 PROTECTION

BRR Architecture, Inc.
Project No. 31000541
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WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

A. Protect Work of this section until Substantial Completion.

END OF SECTION 061733

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Wood roof trusses.
 - 2. Wood girder trusses.
 - 3. Truss accessories.
- B. See Section 061000 "Rough Carpentry" for supplementary framing and permanent bracing.

1.2 ACTION SUBMITTALS

- A. Product Data: For metal-plate connectors, metal framing anchors, bolts, and fasteners indicated.
- B. Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice details; type, size, material, finish, design values, orientation, and location of metal connector plates; and bearing details.
 - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Metal-plate manufacturer.
 - 2. Fabricator.
- B. Research/Evaluation Reports: For the following:
 - 1. Metal-plate connectors.
 - 2. Metal framing anchors.

1.4 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.

1. Manufacturer's responsibilities include preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that involves inspection by SPIB, Timber Products Inspection, TPI, or other independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
- C. Comply with TP1 1, "National Design Standard for Metal Plate Connected Wood Truss Construction," and TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
- D. Wood Structural Design Standard: Comply with applicable requirements in AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads indicated without exceeding TPI 1 deflection limits.

2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
- B. Grade and Species: Any species for truss chord and web members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

2.3 METAL PRODUCTS

- A. Metal Connector Plates: Fabricate connector plates to comply with TPI 1 from hot-dip galvanized steel sheet complying with ASTM A 653/A 653M, G60 coating designation; Designation SS, Grade 33, and not less than 0.036 inch thick.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpine Engineered Products, Inc.
 - b. CompuTrus, Inc.
 - c. Eagle Metal Products.
 - d. Jager Industries, Inc.
 - e. Mitek Industries, Inc.

- f. Robbins Manufacturing Company.
 - g. TEE-LOK Corporation.
 - h. Truswal Systems Corporation.
- B. Fasteners: Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - 1. Nails, Wire, Brads, and Staples: FS FF-N-105.
 - 2. Power-Driven Fasteners: CABO NER-272.
 - 3. Wood Screws: ASME B18.6.1.
 - 4. Lag Bolts: ASME B18.2.1.
 - 5. Bolts: Steel bolts complying with ASTM F-1554, Grade 36; with ASTM A 563 hex nuts and, where indicated, flat washers.
- C. Metal Framing Anchors: Provide framing anchors made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpine Engineered Products, Inc.
 - b. Cleveland Steel Specialty Co.
 - c. Harlen Metal Products, Inc.
 - d. KC Metals Products, Inc.
 - e. Silver Metal Products, Inc.
 - f. Simpson Strong-Tie Company, Inc.
 - g. Southeastern Metals Manufacturing Co., Inc.
 - h. United Steel Products Company, Inc.
 - 2. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.4 FABRICATION

- A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install and brace trusses according to TPI recommendations and as indicated. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

- B. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.
- C. Securely connect each truss ply required for forming built-up girder trusses. Anchor trusses to girder trusses as indicated.
- D. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install and fasten strong back bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- E. Install wood trusses within installation tolerances in TPI 1.
- F. Do not cut or remove truss members.
- G. Return wood trusses that are damaged or do not meet requirements to fabricator and replace with trusses that do meet requirements.

END OF SECTION 061753

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Standing and running trim.
 - 2. Frames.
- B. Related Section
 - 1. Section 123530 "Residential Casework" for additional woodwork not specified in this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of factory-fabricated product and process indicated.
- B. Samples: For the following:
 - 1. Each type of finish required.
 - 2. Each type of paneling required.
 - 3. Each type of siding required.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee Board of Review.
- B. Softwood Plywood: Comply with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."
- C. Hardwood Plywood: HPVA HP-1.
- D. Preservative Treatment: Comply with NWWDA I.S. 4 for exterior finish carpentry to receive water-repellent preservative treatment.
- E. Fire-Retardant Treatment: Where indicated, use materials impregnated with fire-retardant chemicals per AWPA C20; exterior type or interior Type A as required.

2.2 STANDING AND RUNNING TRIM

- A. Exterior Standing and Running Trim: Finished lumber and moldings.
 - 1. Species and Grade: As indicated on drawings.
- B. Interior Standing and Running Trim: Finished lumber and moldings.
 - 1. Species and Grade or Cut: As indicated on drawings.
 - 2. Mohawk Group
 - a. Davis Solid 22 Butterscotch.
 - b. Product Type: Commercial Hardwood.
 - c. Thickness: $\frac{3}{4}$ ".
 - d. Finish: Enhanced Urethane with Aluminum Oxide.
 - e. Size: 6" wide x Random Lengths.
- C. Shelving: 3/4-inch particleboard shelving with radiused and filled front edge.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails of stainless steel hot-dip galvanized steel noncorroding aluminum stainless steel, hot-dip galvanized steel, or noncorroding aluminum.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours.
- B. Prime and back prime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Division 09 Section "Painting."

3.2 INSTALLATION

- A. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts.
- B. Standing and Running Trim: Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.
- C. Blocking: Comply with blocking requirements per plans and manufacturers shop drawings for adequate support of wall hung items, including but not limited to cabinets, accessories, specialties, fixtures, equipment and devices.

- D. Siding: Install siding and flashing according to manufacturer's written recommendations. Do not allow nails to penetrate more than one thickness of siding, unless otherwise recommended by siding manufacturer. Seal joints at inside and outside corners and at trim locations.
- E. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

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END OF SECTION 062023

SECTION 066120 - POLYMER COUNTERTOPS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast Polymer
 - a. Vanity Tops

B. Related Sections include the following:

1. Section 061000 "Rough Carpentry"
2. Section 062023 "Interior Finish Carpentry"
3. Division 22 for Plumbing Fixtures

C. Related Documents include the following:

1. Federal Specifications (FS) Publications:
 - a. FS MMM-A-130 - Adhesive, Contact
2. Architectural Woodwork Institute (AWI) Publications:
 - a. "Architectural Woodwork Quality Standards"
3. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)
4. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

1.2 ACTION SUBMITTALS

A. Submit "Letter of Conformance" in accordance with Section 013300 indicating specified items selected for use in project with the following supporting data.

1. Submit Shop Drawings and product data. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.
 - a. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.3 QUALITY ASSURANCE

A. Allowable Tolerances:

1. Variation in component size: +/- 1/8 inch.
2. Location of openings: +/- 1/8 inch from indicated location.

B. Perform work to (custom) quality in accordance with "Quality Standards" of the Architectural Woodwork Institute (AWI).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cast polymer materials until painting and similar operations that could damage cast polymer have been completed in installation areas. If cast polymer materials must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cast polymer materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cast polymer materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cast polymer materials work by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Cast polymer materials:

1. Provide one (1) year Warranty against manufacturing defects.

PART 2 - PRODUCTS

2.1 CAST POLYMER

A. Guest Room Countertops, Bath Vanity, Splashes

1. Manufacturer: Dal Tile
 - a. Product Code: Frost White – Quartz, polished
 - b. Vendor Contact: Refer to vendor List

B. Public Space Countertops, Splashes

1. Manufacturer: Dal Tile
 - a. Product Code: Simply White – Dal One Quartz, polished
 - b. Vendor Contact: Refer to vendor list

C. Fire Hazard Ratings:

1. Classified in accordance local codes and ordinances, ASTM E84 and the following:
 - a. Class C III
 - b. Flame Spread: Class A: 0 - 25
 - c. Smoke Developed: 0-450

D. Vanity Countertops:

1. Homogeneous cast polymer countertops. Thickness, sizes and profiles as shown on Drawings.
 - a. Provide matching backsplash, side splash, and aprons, and other accessories as shown on Drawings in same material, color and finish as countertops. Apron shall be prepared to receive facial tissue dispenser as detailed on the Drawings.

2.2 INSTALLATION MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- B. Sink/Lavatory Mounting Hardware: Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of under mount sinks/lavatories.
- C. Adhesive and Sealant (Installer to verify products are approved by Cast polymer materials Manufacturer):

1. Approved Manufacturers:
 - a. "OSI SF400"; OSI Sealants, Inc. (800-999-8920)
 1. VOC Content: <50 g/L
 - b. "PL Premium 'Polyurethane' Adhesive"; OSI Sealants, Inc. (800-999-8920)
 1. VOC Content: <50 g/L
 - c. "LN-902 Liquid Nails", Liquid Nails, Macco Division of ICI Paints, (800-634-0015)
 - a. VOC Content: <20 g/L
 - d. "DAP 27404", DAP, Inc. (888-327-8477)
 1. VOC Content: <12.1 g/L
 - e. Or as recommended by cast polymer manufacturer.

2.3 FABRICATION

A. General:

1. Shop assembled cast polymer materials for delivery to site in units easily handled and to permit passage through building openings.
2. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.
 - a. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.
3. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.
4. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.
5. Provide for mounting of soap dishes, grab rails, etc., as indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.2 PREPARATION

- A. Condition cast polymer materials to average prevailing humidity conditions in installation areas before installation.

3.3 INSTALLATION

- A. All countertops shall be installed as shown on Drawings and as specified by
- B. Install components plumb, level and rigid, scribed to adjacent finishes, in
- C. Countertops:
 - 1. Quality Standard: Comply with AWI Section 400 requirements for countertops.
 - 2. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 3. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 4. Provide backsplashes, side splashes, and aprons as indicated on the Drawings. Adhere to tops using manufacturer's standard color matched silicone sealant.

3.4 ADJUSTING AND CLEANING

- A. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained and damaged components.
- B. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work which cannot be repaired to Owner's Representative's

END OF SECTION 066120

SECTION 066400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Fiberglass reinforced polyester (FRP) panel system for adhesive mounting.
2. Moldings, adhesive, and joint sealants.

B. Related Sections include:

1. Section 102600 "Wall Protection"

C. Related Documents include the following:

1. ANSI/AHA A135.5 - Prefinished Hardboard Paneling; 1995.
2. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1998.

1.2 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets on product to be used, including: preparation instructions and recommendations. Storage and handling requirements and recommendations.
- B. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Instructions: Deliver to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.5 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Marlite, (800) 377-1221, info@marlite.com
- B. Crane Composites, (800) 435-0080
Jeff Tolle
JTolle@CraneComposites.com

2.2 PANEL SYSTEM

- A. Panels: Fiberglass reinforced polyester (FRP) panels, USDA approved for incidental food contact.
 - 1. Thickness: 0.090 inch (2.3 mm).
 - 2. Size: Rest Room: 48 inches by 96 inches.
 - 3. Guestrooms: See elevations.
 - 4. Surface Burning Characteristics: ASTM E 84 (Class A & Class C).
- B. Panel Trim: Extruded PVC, in manufacturer's standard color to match FRP.
 - 1. Outside corners, inside corners, edge trim, and division molding.
 - 2. Base Molding: Design that simplifies installation and helps seal wall panel system, with factory made corners and splices.
- C. Sealant: Manufacturer's recommended sealant in color to match FRP.
- D. Guestroom FRP backsplash at kitchen:
 - 1. Marlite
 - 2. Product: Symmetrix FRP, Horizontal Subway Tile
 - 3. Color: White with White Grout Lines, SS100-G63
 - 4. Substitutions: Not permitted.
 - 5. Surface Burning Characteristics: ASTM-E84 (Class C)
- E. Public Spaces-- Where shown on plans:
 - 1. Marlite
 - 2. Product: Symmetrix FRP, Horizontal Subway Tile
 - 3. Color: White with White Grout Lines, SS100-G63
 - 4. Substitutions: Not permitted

5. Surface Burning Characteristics: ASTM-E84 (Class A in Lobby, Corridors & Elevator Lobbies, Class C in Guest Laundry)
- F. Back of House FRP (Staff Laundry):
 1. Crane Composites/Kemlite (800-435-0080)
Glasbord w/Surfaseal Class C (PIF)
Thickness: 0.040 Inch
Surface Texture: Gently pebbled, high gloss
Color: 85 White
 2. Substitutions: Not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Gypsum Board to be prepared according to Specification elsewhere. Do not begin installation until substrates have been properly prepared.

3.2 PREPARATION

- A. Take panels out of cartons and allow to acclimatize to room conditions for at least 48 hours prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation.
- D. Protect existing surfaces from damage due to installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use the adhesives recommended by the panel manufacturer.
- C. Install continuous bead of silicone sealant in each joint and trim groove and between trim and adjacent construction, maintaining 1/8 inch (3 mm) expansion space.
- D. Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.
- E. Install Guestroom FRP without joints. Match length of FRP to kitchen countertop and trim to join upper cabinet edges.

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END OF SECTION - 066400

PLASTIC PANELING

066400 - 4

SECTION 071416 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cold fluid-applied latex-rubber waterproofing.

1.2 PREINSTALLATION MEETING

- A. Conduct preinstallation meeting at project site.

1.3 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products.

1.6 STORAGE

- A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life. Protect stored materials from direct sunlight.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, and agreeing to repair or replace waterproofing that does not comply with requirements or that does not remain watertight for a period of five years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Airless Spray – Rub-R-Wall Waterproofing Rubber Polymer corporation, Akron Ohio 44313.

2.2 WATERPROOFING MATERIALS

- A. Cold Fluid-Applied Waterproofing: Comply with ASTM C 836.
- B. Primer: Manufacturer's standard, factory-formulated polyurethane or epoxy primer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Locations: Exterior sides of elevator pit.
- B. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.
 - 1. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

- D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.
- F. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and manufacturer's written instructions.
 - 1. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat when recommended by waterproofing manufacturer.
- G. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

3.2 INSTALLATION

- A. Apply waterproofing according to ASTM C 898 and manufacturer's written instructions.
 - 1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils and a minimum dry film thickness of 50 mils at any point.

3.3 CURING, PROTECTING, AND CLEANING

- A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
 - 1. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

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END OF SECTION 071416

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Perimeter insulation under slabs-on-grade.
 - 2. Concealed building insulation.
 - 3. Loose-fill building insulation.
 - 4. Vapor retarders.
 - 5. Sound attenuation insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Research/Evaluation Reports: For foam-plastic insulation.

1.4 QUALITY ASSURANCE

- A. Retain ASTM test method below based on product and kind of fire-resistance characteristic specified for each product in Part 2. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics and other methods indicated with product, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60 lb/cu. ft., with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.
1. Available Manufacturers:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.
 - c. Owens Corning.
 - d. Pactiv Building Products Division.
- B. Molded-Polystyrene Board Insulation: ASTM C 578, Type I, 0.90 lb/cu. ft., with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.
1. Available Manufacturers:
 - a. DiversiFoam Products.
 - b. Manufacturers with a third-party certification program satisfying model building code mandatory requirements for foam plastics.

2.3 GLASS-FIBER BLANKET INSULATION

- A. Available Manufacturers:
1. CertainTeed Corporation.
 2. Guardian Fiberglass, Inc.
 3. Johns Manville.
 4. Knauf Fiber Glass.
 5. Owens Corning.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- C. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); - kraft vapor-retarder membrane on 1 face.
- D. Where glass-fiber blanket insulation is indicated on the drawings, provide the following:
1. Exterior walls: Faced, R-19.
 2. Ceiling Joists at Roof: Filled with non-combustible insulation; R-49.

3. Interior walls shall have unfaced acoustical insulation, R-11.
4. Floor/Ceiling cavities shall have unfaced acoustical insulation.

2.4 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BLANKET INSULATION

A. Available Manufacturers:

1. Fibrex Insulations Inc.
2. Owens Corning.
3. Thermafiber.

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.

D. Where slag-wool-fiber/rock-wool-fiber blanket insulation is indicated on the drawings, provide the following:

1. Exterior walls: Faced, R-19.
2. Ceiling Joists at Roof: Filled with non-combustible insulation; R-49.
3. Interior walls shall have unfaced acoustical insulation, R-11.
4. Floor/Ceiling cavities shall have unfaced acoustical insulation.

2.5 LOOSE-FILL INSULATION – (OPTIONAL FOR ATTIC USE ONLY)

A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C 739, chemically treated for flame-resistance, processing, and handling characteristics.

B. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application or Type II for poured application; with maximum flame-spread and smoke-developed indexes of 5.

2.6 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

B. Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm.

1. Available Products:

- a. Raven Industries Inc.; DURA-SKRIM 6WW.
 - b. Reef Industries, Inc.; Griffolyn T-65.
- C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- D. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

2.7 AUXILIARY INSULATING MATERIALS

- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.8 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate or Angle formed from perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square, welded to projecting copper-coated steel spindle 0.105 inch in diameter and of length capable of holding insulation of thickness indicated securely in position with 1-1/2-inch- square or diameter self-locking washers complying with the following requirements:
 - 1. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel sheet, with beveled edge for increased stiffness.
- B. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 2 inches between face of insulation and substrate to which anchor is attached.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF PERIMETER INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.
- D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Exterior walls to have Faced Glass Batt insulation.
- C. Interior walls and floor/ceiling cavities to have unfaced Glass Batt acoustical insulation.
- D. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are placed. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

- E. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- F. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
 - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - 5. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
 - b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- G. Place loose-fill insulation into spaces indicated, either by pouring or by machine blowing, to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
 - 1. For cellulosic-fiber loose-fill insulation, comply with the Cellulose Insulation Manufacturer's Association's Special Report #3, "Standard Practice for Installing Cellulose Insulation".
- H. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.4 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Install min 3" thick, unfaced or faced glass or slag-wool-fiber/rock-wool-fiber blanket insulation in ceiling cavity.

3.5 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

- B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- C. Before installing vapor retarder, apply urethane sealant to flanges of wood framing including runner tracks, wood studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- D. Firmly attach vapor retarders to wood framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

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August 16, 2023

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END OF SECTION 072100

SECTION 072419 – WATER DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes EIFS-clad drainage wall assemblies that are field applied over substrate.
- B. Related Sections include the following:
 - 1. Section 079200 "Joint Sealants" for sealing joints in EIFS with elastomeric joint sealants and for perimeter joints between system and other materials.

1.2 ACTION SUBMITTALS

- A. Product Data: For each EIFS component, trim and accessory.
- B. Samples: For each exposed product and for each color and texture specified, 8 inches square in size.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For insulation and joint sealant, from the manufacturer.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic and other causes.
 - 1. Stack insulation board flat and off the ground.
 - 2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.5 FIELD CONDITIONS

- A. Weather Limitation: Maintain ambient temperatures above 40 deg F for a minimum of 24 hours before, during and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried and cured according to manufacturers' written instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 MAUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Parex USA, Inc.
 - 2. BASF Wall Systems
 - 3. Dryvit Systems, Inc.
 - 4. Master Wall Inc.
 - 5. Omega Products International, Inc.
 - 6. Sto Corp.
- B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with EIFS components.

2.2 PERFORMANCE REQUIREMENTS

- A. EIFS Performance: Comply with ASTM E 2568 and ICC-ES AC219 and with the following:
 - 1. Weathertightness: Resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior.
 - 2. Structural Performance: EIFS assembly and components shall comply with ICC-ES AC219 when tested according to ASTM E 2568.
 - 3. Wind Loads: Uniform pressure as indicated on the drawings.
 - 4. Bond Integrity: Free from bond failure within EIFS components or between EIFS and substrates, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

2.3 EIFS MATERIALS

- A. Air & Water Barrier: Single component seamless monolithic elastomeric coating. Apply to entire building envelope other than the roof.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Parex: Weatherseal Spray & Roll On.
 - b. Laticrete: MVIS Air & Water Barrier.
 - c. Mapei: Mapelastic AquaDefense.
 - d. Merkrete: Hydro Guard 2000.
- B. Drainage Plane: Provide the following method of discharging water that has penetrated the EIFS finish, as recommended by the EIFS manufacturer:
1. Insulation adhesive specifically formulated to be applied to back side of insulation in a manner that creates open vertical channels.
 2. Channeled Board Insulation: EIFS manufacturer's standard factory-fabricated profile with linear, vertical-drainage channels, slots, or waves on the back side of board.
- C. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with air barrier coatings with VOC content of 50 g/L or less.
- D. Molded, Rigid Cellular Polystyrene Board Insulation: Comply with ASTM C 578, Type I, and EIFS manufacturer's requirements for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks.
 2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E 84.
 3. Dimensions: Provide insulation boards of not more than 24 by 48 inches thick or in other thicknesses indicated, but not more than 4 inches thick or less than the thickness allowed by ASTM C 1397.
 4. Foam Build-Outs: Provide with profiles and dimensions indicated on drawings.
- E. Reinforcing Mesh: Balanced alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. according to ASTM E 2098 and the following:
1. Reinforcing Mesh for EIFS, General: Not less than weight required to meet impact-performance level specified in "Performance Requirements" article.
- F. Base-Coat Materials: EIFS manufacturer's standard mixture complying with one of the following:
1. Factory-blended dry formulation of Portland cement, dry polymer admixture, and inert fillers to which only water is added at project site.
 2. Factory-mixed noncementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.
- G. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

- H. Finish-Coat Materials: EIFS manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following:
 - 1. Factory-mixed formulation of polymer-emulsion binder, colorful mineral pigments, sound stone particles, and filler.
 - 2. Colors: As indicated on drawings.
 - 3. Texture: Uniform "pebble-type" texture, selected by Architect from Manufacturer's full range.
- I. Water: Potable.
- J. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard cell class for use intended, and ASTM C 1063.
 - 1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 - 2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 - 3. Weep Screed/Track: Prefabricated, one-piece type for attachment behind insulation with perforated face leg extended to form drip and weep holes in track bottom, of depth required to suit thickness of coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at the terminations of EIFS with drainage.
 - 4. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, conditions with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Begin coating application only after surfaces are dry.
 - 2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.
- C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.3 EIFS INSTALLATION, GENERAL

- A. Comply with ASTM C 1397, ASTM E 2511, and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 AIR & WATER BARRIER INSTALLATION

- A. Comply with EIFS manufacturer's written instructions for system specified.

3.5 TRIM INSTALLATION

- A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints and elsewhere as indicated. Coordinate with installation of insulation.
 - 1. Weep Screed/Track: Use at bottom termination edges, at window and door heads of water-drainage EIFS unless otherwise indicated.
 - 2. Expansion Joint: Use where indicated on Drawings.
 - 3. Casing Bead: Use at other locations.

3.6 INSULATION INSTALLATION

- A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C 1397 and the following:
 - 1. Use one of the following adhesive attachment methods as required by manufacturer's system:
 - a. Apply adhesive to insulation by notched-trowel method, with notches oriented vertically to produce drainage channels that remain functional after the insulation is adhered to substrate.
 - b. Apply adhesive to insulation by notched-trowel method in a manner that results in coating the entire surface of drainage mat with adhesive once insulation is adhered to drainage mat.

- c. Apply adhesive to ridges on back of channeled insulation by notched-trowel method in a manner that results in full adhesive contact over the entire surface of ridges, leaving channels free of adhesive once insulation is adhered to substrate.
2. Press and slide insulation into place. Apply pressure over the entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
3. Allow adhered insulation to remain undisturbed for not less than 24 hours, before beginning rasping and sanding insulation or applying base coat and reinforcing mesh.
4. Apply insulation over substrates in courses with long edges of boards oriented horizontally.
5. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.
6. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches wide or 6 inches high. Offset joints not less than 6 inches from corners of window and door openings and not less than 4 inches from aesthetic reveals.
 - a. Adhesive Attachment: Offset joints of insulation not less than 6 inches from horizontal and 4 inches from vertical joints in sheathing.
7. Apply channeled insulation with drainage channels aligned vertically.
8. Interlock ends at internal and external corners.
9. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
10. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
11. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch. Prevent airborne dispersal and immediately collect insulation raspings or sandings.
12. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch.
13. Install foam build-outs.
14. Interrupt insulation for expansion joints where indicated.
15. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.
16. After installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches over front and back face unless otherwise indicated on Drawings.
17. Treat exposed edges of insulation as follows:

- a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
 - b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
 - c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
18. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and water-resistive barrier.
- B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
 1. At expansion joints in substrates behind EIFS.
 2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
 3. Where wall height or building shape changes.
 4. Where EIFS manufacturer requires joints in long continuous elevations.

3.7 BASE-COAT INSTALLATION

- A. Base Coat: Apply to exposed surfaces of insulation and foam build-outs in minimum thickness recommended in writing by EIFS manufacturer, but not less than 1/16-inch dry-coat thickness.
- B. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.
- C. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings, extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- wide, strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.
 1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches wide.
 2. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.
- D. Foam Build-Outs: Fully embed reinforcing mesh in base coat.

3.8 FINISH-COAT INSTALLATION

- A. Primer: Apply over dry base coat according to EIFS manufacturer's written instructions.

- B. Finish Coat: Apply over dry primed base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

3.9 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION 072419

SECTION 074646 – FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Fiber-cement trim and soffit.
- B. Related sections include the following:
 - 1. Section 072419 "Water Drainage Exterior Insulation and Finish System (EIFS)" for exterior weather barrier installed with exterior sheathing.
 - 2. Section 017700 "Closeout Procedures" for manufacturer meeting.

1.2 PREINSTALLATION MEETING

- A. Required Preinstallation meeting with manufacturer.
 - 1. A preinstallation inspection meeting with manufacturer's representatives is required for this work.
 - 2. Review project conditions (manufacturer and installer).
 - 3. Manufacturer training on installation guidelines.
 - 4. Manufacturer review of completed installation.
 - 5. Manufacturer signature and sign-off required as part of closeout requirements.
 - 6. Meeting notes regarding recommendations and discussions.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: Full-size units of each type of soffit and trim in each color, texture, and pattern required.

1.4 INFORMATIONAL SUBMITTALS

- A. Research/Evaluation Reports: For each type of siding required.

PART 2 - PRODUCTS

2.1 TRIM

- A. Fiber-Cement Trim: Trim made from fiber-cement board that complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM

E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following:
 - a. James Hardie Inc.: HardieTrim Boards 5/4. (preferred product)
 - b. Certainteed, Inc.: Certainteed Trim Boards 5/4. (alternate product)
2. Finish: Smooth Texture
3. Factory Priming: Manufacturer's standard acrylic primer and as indicated on drawings.

2.4 SOFFIT

- A. Fiber-Cement Soffit: Panels with smooth texture, perforated, made from fiber-cement board that complies with ASTM C 1186, Type A, Grade II; is classified as non-combustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.

2.5 ACCESSORIES

- A. Siding accessories: Provide starter strips, edge trim, corner cap, joint covers, and other items as recommended by siding manufacturer for building configuration.
 1. Provide accessories made from the same material as siding, unless otherwise indicated.
 2. Provide accessories matching color and texture of siding, unless otherwise indicated.
- B. Fasteners: Use aluminum, hot-dip galvanized or stainless-steel fasteners.
 1. Where fasteners will be exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate installation of exterior weather barrier over all exterior sheathing. Install per manufacturer's instructions. Flash and detail around all exterior openings per manufacturer's latest recommendations and details. Provide all associated accessories and components to complete a weather tight exterior.
- B. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.
- C. Comply with siding manufacturer's written installation instructions unless more stringent requirements apply.

- D. Butt siding together per manufacturer's written instructions. Space butt joints tight and provide joint covers.
- E. Patch/fill all exposed nail holes flush with the surface.

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END OF SECTION 074646

FIBER-CEMENT SIDING

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SECTION 075423 - THERMOPLASTIC POLYOLEFIN PROTECTED MEMBRANE ROOFING (TPO)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Adhered membrane roofing system.
 - 2. Roof insulation.
- B. Related sections include the following:
 - 1. Section 072100 "Thermal Insulation" for insulation beneath the roof deck.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
 - 3. Section 079200 "Joint Sealants"
 - 4. Division 22 Section "Plumbing Specialties" for roof drains.
- C. Related documents include the following:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
 - 2. Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.2 PREINSTALLATION MEETING

- A. Conduct conference at Project site. Comply with requirements in Section 013100. Review methods and procedures related to roofing system including, but not limited to, the following:
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranties: Special warranties specified in this Section.
- B. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for membrane roofing system identical to that used for this Project.
- C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain components for membrane roofing system approved by roofing membrane manufacturer.
- E. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
 - 1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, walkway products and other components of membrane roofing system.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.
 1. See structural drawings for Design requirements.
 2. The main roof should be designed to provide an FM approval Class 1-90 roofing system with appropriate perimeter and comer enhancements per FM Global Data Sheet 1-29
 3. The lower level roof should be designed to provide an FM approval Class 1-60 roofing system with appropriate perimeter and comer enhancements.
 4. All roof elevation changes/parapets intersection should be evaluated and confirmed to include snow drip per FM Global Data sheet 1-54 in design load calculations.

2.3 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE (Fully Adhered)

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:
 1. Manufacturers:
 - a. Carlisle SynTec Incorporated.
 - b. Firestone Building Products Company.
 - c. GAF Materials Corporation.
 - d. GenFlex Roofing Systems.
 - e. Johns Manville International, Inc.
 - f. Sarnafil Inc.
 - g. Versico Inc.
 2. Thickness: 60 mils (1.5 mm), nominal.
 3. Exposed Face Color: White.
 4. Physical Properties:
 - a. Breaking Strength: 225 lbf (1 kN); ASTM D 751, grab method.
 - b. Elongation at Break: 15 percent; ASTM D 751.
 - c. Tearing Strength: 55 lbf (245 N) minimum; ASTM D 751, Procedure B.

- d. Brittleness Point: Minus 22 deg F (30 deg C).
- e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- (75-mm-) diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F (40 deg C) and an ozone level of 100 pphm (100 mPa); ASTM D 1149.
- f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F (116 deg C); ASTM D 573.
- g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F (70 deg C); ASTM D 471.
- h. Linear Dimension Change: Plus or minus 2 percent; ASTM D 1204.

2.4 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
 - 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
- D. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.5 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
 - 1. Manufacturers:
 - a. AlliedSignal Inc.; Commercial Roofing Systems.
 - b. Apache Products Company.
 - c. Atlas Roofing Corporation.
 - d. Carlisle SynTec Incorporated.
 - e. Celotex Corporation.
 - f. Firestone Building Products Company.
 - g. GAF Materials Corporation.
 - h. GenFlex Roofing Systems.
 - i. Johns Manville International, Inc.

- B. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

- B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
- C. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches (50 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- F. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - 1. Set each layer of insulation in a cold fluid-applied adhesive.

3.4 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- E. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
- F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.

3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Flash penetrations and field-formed inside and outside corners with sheet flashing.

C. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Manufactured reglets.
 - 2. Formed roof drainage system.
 - 3. Formed low-slope roof flashing and trim.
 - 4. Formed steep-slope roof flashing and trim.
 - 5. Formed wall flashing and trim.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Show layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim.
- C. Samples: For each type of sheet metal flashing and trim.

1.3 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality, mill phosphatized for field painting.
- B. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.
- C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 - 1. Nails for Copper Sheet: Copper, hardware bronze, or Series 300 stainless steel, 0.109 inch minimum and not less than 7/8 inch long, barbed with large head.
 - 2. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
 - 3. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 - 4. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

2.4 REGLETS

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counter flashing pieces, and compatible with flashing indicated.

1. Available Manufacturers:

- a. Cheney Flashing Company, Inc.
- b. Fry Reglet Corporation.
- c. Heckmann Building Products Inc.
- d. Hickman, W. P. Company.
- e. Keystone Flashing Company, Inc.
- f. Sandell Manufacturing Company, Inc.

2. Material: Galvanized steel, 0.0217 inch thick.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- C. Sealed Joints: Form non expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Optional aluminum or steel.
1. Gutter Size: 6 inches.
 2. Accessories: Valley baffles.
 3. Fabricate Gutters and accessories from the following material:
 - a) Aluminum: 0.040 inch thick.
 - b) Prepainted, Metallic-Coated Steel: 0.0276 inch thick.
- B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors. Optional aluminum or steel.
1. Downspout Size: 5 by 4 inches.
 2. Fabricate downspouts from the following material:
 - a) Aluminum: 0.024 inch thick.
 - b) Prepainted, Metallic-Coated Steel: 0.0217 inch thick.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following material:
1. Galvanized Steel: 0.0217 inch thick.
- B. Drip Edges: Fabricate from the following material:
1. Galvanized Steel: 0.0217 inch thick.
- C. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following material:
1. Galvanized Steel: 0.0217 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high end dams. Fabricate from the following material:
1. Galvanized Steel: 0.0217 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric or butyl sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric or butyl sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
 - 1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
- H. Seal joints with elastomeric or butyl sealant as required for watertight construction.

3.2 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric or butyl sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between. Coordinate locations to align with grade level trench drains. DOWNSPOUTS SHALL BE PLUMB.

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.
- D. Counter flashing: Coordinate installation of counter flashing with installation of base flashing. Insert counter flashing in reglets or receivers and fit tightly to base flashing. Secure in a waterproof manner. Extend counter flashing 6 inches over base flashing. Lap counter flashing joints a minimum of 6 inches and bed with elastomeric or butyl sealant.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
 - 1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
 - 2. Seal with elastomeric or butyl sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Reglets: Installation of reglets is specified in Division 03 Section "Cast-in-Place Concrete."

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- C. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

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END OF SECTION 076200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
- B. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated on Drawings.
- B. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application on Drawings.
 - 1. A/D Fire Protection Systems Inc.
 - 2. Grace, W. R. & Co. - Conn.
 - 3. Hilti, Inc.
 - 4. Johns Manville.
 - 5. Nelson Firestop Products.
 - 6. NUCO Inc.
 - 7. RectorSeal Corporation (The).
 - 8. Specified Technologies Inc.
 - 9. 3M; Fire Protection Products Division.
 - 10. Tremco; Sealant/Weatherproofing Division.
 - 11. USG Corporation.

2.2 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

2.3 FIRESTOPPING

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. Include the following information on labels:
1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.

3.2 FIELD QUALITY CONTROL

- A. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fire-resistive joint systems for the following:
 - 1. Floor-to-floor joints.
 - 2. Floor-to-wall joints.
 - 3. Head-of-wall joints.
 - 4. Wall-to-wall joints.
 - 5. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: For each fire-resistive joint system.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control test reports.
- C. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service.
- D. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

- D. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- E. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, fire-resistive joint systems that may be incorporated into the Work include, but are not limited to those systems as indicated on the drawings.
- B. Products: Subject to compliance with requirements, provide one of the fire-resistive joint systems indicated for each application as indicated on the drawings.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.
- B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities and L-ratings indicated as determined by UL 2079.
 - 1. Load-bearing capabilities as determined by evaluation during the time of test.
- C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive Joint System Schedule at the end of Part 3, as determined by NFPA 285 and UL 2079.
 - 1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.
 - 2. OPL-Listed, Perimeter Fire-Barrier Systems: F-ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.
- D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

2.3 FIRE-RESISTIVE JOINT SYSTEMS

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 FIELD QUALITY CONTROL

- A. Inspecting Agency: Local building inspector.
- B. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.
- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

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END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 2. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 3. Interior joints in horizontal traffic surfaces.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.3 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 or manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

1.4 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

2.3 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: Match adjacent materials.

2.4 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food; provide products that comply with 21 CFR 177.2600.
- C. Single-Component Nonsag Polysulfide Sealant: Products:
 - 1. Pacific Polymers, Inc.; Elastoseal 230 Type I (Gun Grade).
 - 2. Ric Systems Inc.; PSI-7000.
 - 3. Type and Grade: S (single component) and NS (nonsag).
 - 4. Class: 25.
 - 5. Use Related to Exposure: NT (nontraffic).

D. Single-Component Neutral-Curing Silicone Sealant: Products:

1. White Lightning WL09212 Silicone Ultra (981-0052).
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

E. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant: Products:

1. Optional: White Lightning Kit & Bath Ultra Latex Sealant w/EcoGuard Series WL0002510 White (139-3370); WL0002610 Clear (139-3388); WL0002710 Bisque (139-3396).
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

F. Single-Component Nonsag Urethane Sealant: Products:

1. Stampede-1 Polyurethane (Assorted Colors).
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25 minimum.
4. Use Related to Exposure: NT (nontraffic).

G. Single-Component Pourable Urethane Sealant: Products:

1. Stampede 1SL Self-Leveling Polyurethane Limestone
2. Type and Grade: S (single component) and P (pourable).
3. Class: 25.
4. Use Related to Exposure: T (traffic).

2.5 LATEX JOINT SEALANTS

A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF. Products:

1. Sherwin-Williams Siliconized Acrylic Latex 1100A Powerhouse Colors

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90. Products:

1. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
2. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.7 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- G. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior perimeter joints between sheathing or sidings and frames of doors windows and louvers. Other exterior joints in vertical and horizontal nontraffic surfaces. Joint Sealant: Single-component nonsag polysulfide sealant, Single-component neutral-curing silicone sealant, or Single-component nonsag urethane sealant.
- B. Joint-Sealant Application: Interior perimeter joints of exterior openings. Vertical joints on exposed surfaces of interior partitions. Perimeter joints between interior wall surfaces and frames of interior doors and windows. Joint Sealant: Latex sealant.
- C. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters. Joint Sealant: Single-component mildew-resistant neutral-curing silicone sealant.

END OF SECTION 079200

SECTION 081103 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes steel doors and frames.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated. Include door designation, type, level and model, material description, label compliance, fire-resistance ratings, and finishes.
- B. Door Schedule. Use same reference designations indicated on Drawings.

1.3 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

1.4 WARRANTY

- A. Furnish manufacturer's standard warranty against deficiencies in materials or fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements for frames, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis of Design: The design for doors is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by other manufacturers, subject to compliance with minimum requirements noted in this Specification and the specifications of the Basis-of-Design product.

C. Manufacturers:

1. Timely Industries; Pacoima, CA (213)875-0124 (preferred product)
2. Redi Frame

D. All materials can be procured from the following WoodSprings Suites preferred vendors:

American Direct Procurement
11000 Lakeview Avenue
Lenexa, KS 66219
(913) 677-5588
Attn: Jerry Pennington
Email: JerryP@AmericanDirectCo.com

Paragon Distribution, LLC
1841-A West Oak Pkwy
Marietta, GA 30062
(770)-795-9564
Attn: Nick Batrouney
Email: Nick@discoverparagon.com

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness for exterior doors.

2.3 DOORS

- A. Exterior Doors: Complying with ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level indicated. See Basis of Design door specified above.

2.4 FRAMES

- A. General: ANSI A250.8; conceal fastenings, unless otherwise indicated.
- B. Frame Steel Sheet Thickness:
 1. 16 gauge (0.053 inch minimum) for hollow metal welded frame interior doors (up to 45 minute label rating), unless otherwise indicated.

2. 18 or 20 gauge (0.040 inch minimum) for Timely or Redi-Frame interior doors, depending on the throat size.
 3. 14 gauge (0.067-inch minimum) for exterior steel doors.
- C. Door Silencers: Three silencers on single-door frames and two silencers on double-door frames.
- D. Supports and Anchors: Not less than 0.042-inch- thick zinc-coated steel sheet.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Zinc-coat items that are to be built into exterior walls according to ASTM A 153/A 153M, Class C or D as applicable.
- F. All pre-painted frames will have either Timely T8 steel casing with miter guard or Redi Frame standard 1 1/2" steel casing with casing corner piece, to insure tight miters.

2.5 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant.
- B. Exterior Doors: Fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
- C. Interior Door Faces: Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from cold-rolled steel sheet.
- D. Core Construction: Manufacturer's impregnated kraft honeycomb core fully laminated to steel face sheets, complying with SDI standards. Insulation cores are not acceptable.
- E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.
- F. Clearances for Fire-Rated Doors: As required by NFPA 80.
- G. Door-Edge Profile: Beveled edge.
- H. Tolerances: Comply with SDI 117.
- I. Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
- J. Frame Construction:
1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints. Provide temporary spreader bars.

- K. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- L. Locate hardware as indicated or, if not indicated, according to ANSI A250.8.
- M. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- thick steel sheet.
 - 1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 - 2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
- N. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.6 FINISHES

- A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A224.1 or A250.10 for acceptance criteria.
- B. Prefinished metal door frames shall match Timely Door "Browntone"

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Wall Anchors: Provide at least three anchors per jamb.
 - 2. Gypsum Board Partitions: For in-place partitions, install knock-down, drywall slip-on frames.
 - 3. Fire-Rated Frames: Install according to NFPA 80.
- B. Door Installation: Comply with ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
 - 1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
 - 2. Smoke Control Doors: Install to comply with NFPA 105.
- C. After installation, remove protective wrappings from doors and frames and touch up prime coat with compatible air-drying primer.

END OF SECTION 081103

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes solid- and hollow-core doors as follows:
 - 1. Doors with hardboard faces.
 - 2. Factory fitting wood doors to frames and factory machining for hardware.
- B. Related Sections include the following:
 - 1. Section 062023 "Finish Carpentry" for wood door frames.
 - 2. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details; location and extent of hardware blocking; mortises, holes, and cutouts; factory finishing; fire ratings; and other pertinent data.
- C. Samples: For each face material and finish.

1.3 QUALITY ASSURANCE

- A. Quality Standard: Comply with NWWDA I.S.1-A, "Architectural Wood Flush Doors."
- B. Fire-Rated Wood Doors: Doors that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated.

1.4 WARRANTY

- A. Furnish manufacturer's standard warranty against deficiencies in materials or fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Masonite.
2. Lynden Door.
3. Doormerica

B. All materials can be procured from the following WoodSpring Suites preferred vendor:

American Direct Procurement
11000 Lakeview Avenue
Lenexa, KS 66219
(913) 677-5588
Attn: Jerry Pennington
Email: JerryP@AmericanDirectCo.com

Paragon Distribution, LLC
1841-A West Oak Pkwy
Marietta, GA 30062
(770)-795-9564
Attn: Nick Batrouney
Email: Nick@discoverparagon.com

2.2 DOOR CONSTRUCTION

- A. Adhesives: Do not use adhesives containing urea formaldehyde.
- B. Particleboard: Do not use particleboard made with binder containing urea-formaldehyde resin.
- C. Doors for Opaque Finish:
1. Grade: Custom.
 2. Faces for Interior Doors: Hardboard with embossed wood grain texture.
- D. Interior Hardboard-Faced Solid-Core Doors:
1. Core: Particleboard or either glued or non glued block or structural composite lumber.
- E. Fire-Rated Doors:
1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
 2. Edge Construction: Manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance.
- F. Hollow-Core Doors:
1. Core: Institutional hollow core.

- G. Blocking: For hollow-core doors, provide blocking as needed to eliminate through-bolting hardware.
- H. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.
- I. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated.

2.3 FABRICATION

- A. Fabricate doors in sizes indicated for Project-site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- C. Factory machine doors for hardware that is not surface applied.
 - 1. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Louvers: Factory install louvers in prepared openings.
- E. Exterior Doors: Flash top of outswinging doors (with manufacturer's standard metal flashing).

2.4 FINISHES

- A. Prefinished wood doors to match Wilsonart 7966 5th Avenue Elm.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

- B. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Comply with NFPA 80 for fire-rated doors.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fire-rated access doors and frames.
- B. Related Section:
 - 1. Section 087100 "Door Hardware" for mortise or rim cylinder locks and master keying.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of access door indicated.
- B. Coordination Drawings: Drawn to scale and coordinating access door and frame installation with ceiling support, ceiling-mounted items, and concealed Work above ceiling.
- C. Samples: For each exposed finish.
- D. Schedule: Door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 and that are labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction per test method indicated.
 - 1. Vertical Access Doors: NFPA 252 or UL 10B. One Hour Fire Rated
 - 2. Horizontal Access Doors and Frames: ASTM E 119, UBC Standard 7.1, or UL 263.
- B. Size and Location Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule.

1.4 WARRANTY

- A. Furnish manufacturer's standard warranty against deficiencies in materials or fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. Hot-Dip Galvanized Steel: Coat to comply with ASTM A 123/A 123M for steel and iron products and ASTM A 153/A 153M for steel and iron hardware.
- B. Steel Sheet:
 - 1. Hot-Rolled: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled.
 - 2. Cold-Rolled: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
 - a. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.
 - 3. Electrolytic Zinc Coated: ASTM A 591/A 591M, Commercial Steel (CS), with Class C coating and phosphate treatment to prepare surface for painting.
 - 4. Metallic Coated: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness.
- C. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy 5005-H15.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.
- F. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.
- G. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum panels indicated.
- H. Plaster Bead: Casing bead formed from 0.0299-inch zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.
- I. Paint:
 - 1. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide sound foundation for field-applied topcoats despite prolonged exposure.

2. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
3. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.2 ACCESS DOORS AND FRAMES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Acudor Products, Inc.
 2. Bar-Co, Inc. Div.; Alfab, Inc.
 3. Cendrex, Inc.
 4. Cesco Products.
 5. Elmdor/Stoneman; Div. of Acorn Engineering Co.
 6. Jensen Industries.
 7. J. L. Industries, Inc.
 8. Karp Associates, Inc.
 9. Larsen's Manufacturing Company.
 10. MIFAB Manufacturing, Inc. 22"X30" MPFR –DW WITH DRYWALL BEAD (Basis of Design)
 11. Milcor Limited Partnership. Nystrom Building Products Co.
 12. Precision Plumbing Products, Inc.
 13. Williams Bros. Corporation of America (The).
- C. Flush, Insulated, Fire-Rated Access Doors and Trimless Frames:
 1. Material: Prime-painted steel sheet.
 2. Surface Type: Gypsum board.
 3. Locations: Ceilings.
 4. Fire-Resistance Rating: 1 hour.
 5. Temperature-Rise Rating: 250 deg F at the end of 30 minutes.
 6. Door: Flush panel with core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
 7. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead.
 8. Hinges: Continuous piano hinge.
 9. Automatic Closer: Spring type.
 10. Latch: Self-latching bolt lock with knurled knob.

2.3 FABRICATION

- A. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For recessed panel doors, provide access sleeves for each locking device.
Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install access doors with trimless frames flush with adjacent finish surfaces or recessed to receive finish material.
- D. Adjust doors and hardware after installation for proper operation.

END OF SECTION 083113

SECTION 083326 - WOOD OVERHEAD COILING DOORS

PART 1- GENERAL

1.1 SUMMARY

A. Section includes:

1. Wood overhead coiling doors.

B. Related Sections:

1. Section 087100 for finish hardware and key cylinders for locks.

C. Design Requirements:

1. Door mounting: Outside mount, with coil mounted on face of wall, and guide rails mounted on face of wall at jambs.
2. Door operation: Manual push-up (lift or pull) operation not exceeding 25 lbs.

1.2 ACTION SUBMITTALS

- A. Shop Drawings: Indicate opening sizes, jamb, sill, and head conditions

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver doors until proper protection can be provided, and until needed for installation.
- B. Store products in manufacturer's unopened packaging until ready for installation.

1.6 FIELD CONDITIONS

- A. Maintain temperature and humidity within manufacturer's recommended limits.

1.7 WARRANTIES

- A. Provide manufacturer's standard limited warranty against manufacturing defects.

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Woodfold Mfg., Inc. (www.woodfold.com).
- B. Living Doors, Inc.
Email: LivingDoors@aol.com
Toll Free: (800) 233-1530
Ph: (631) 924-5393 Fax: (631) 924-5590
Owner: John-Paul Plante
22A Scouting Blvd., Unit 3
Medford, NY 11763
- C. Substitutions: Overhead Door Model #665 Series.

2.2 COMPONENTS

- A. Curtain:
 - 1. Slats: Solid hardwood profiles with long edges rabbeted to interlock to form sight-proof curtain.
 - 2. Bottom rail: Solid wood profile matching grain and species of slat.
 - 3. Wood species: Oak.
 - 4. Interlocking hardware: Manufacturer's standard, concealed within slat and bottom rail profile.
- B. Guides: Manufacturer's standard guides for indicated counter door mounting and operation.
- C. Latching Hardware:
 - 1. Deadbolt with key lock, mortised into curtain bottom rail on coil side of counter door.
 - 2. Furnish two keys per lock.
 - 3. Metal hardware to be satin chrome US26D.
- D. Hood: Plywood with veneer on sight-exposed face matching species of curtain material, or solid wood of same species as curtain material; concealed fastener construction to facilitate hood removal for servicing counter door.

2.3 FINISHES

- A. Finish as indicated per plans.

PART 3- EXECUTION

3.1 INSTALLATION

- A. Install door assembly and operating equipment in accordance with manufacturer's instructions.
- B. Anchor to adjacent construction without distortion or stress.
- C. Fit and align door assembly including hardware, level and plumb, to provide smooth operation.
- D. Lubricate bearings and sliding parts; adjust doors to operate easily, free or warp, twist,

3.2 FIELD QUALITY CONTROL

- A. Adjust doors for smooth operation throughout full operating range.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain doors. Refer to Section 017700 "Closeout Procedures."

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

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END OF SECTION 083326

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Exterior aluminum-framed storefronts.
 - a. Glazing is retained mechanically with gaskets on four sides.
2. Exterior manual-swing aluminum doors.
3. Exterior aluminum door frames.

B. Related Sections:

1. Section 072100 "Thermal Insulation"
2. Section 079200 "Joint Sealants"
3. Section 087100 "Door Hardware"
4. Section 088000 "Glazing"

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples: For each exposed finish.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Field quality-control test and inspection reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Acceptable to manufacturer and capable of preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.
- C. Preconstruction Sealant Testing: For structural-sealant-glazed systems, perform sealant manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by aluminum-framed systems.
 - 1. Determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers.
- D. Structural-Sealant Glazing: Comply with recommendations in ASTM C 1401, "Guide for Structural Sealant Glazing."

1.5 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage through fixed glazing and framing areas.
 - f. Failure of operating components to function properly.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Arch Aluminum & Glass Co., Inc.
 - 2. CMI Architectural Products, Inc.
 - 3. Commercial Architectural Products, Inc.
 - 4. EFCO Corporation.
 - 5. Kawneer.
 - 6. Pittco Architectural Metals, Inc.
 - 7. Tubelite Inc.

8. United States Aluminum.
9. Vistawall Architectural Products.
10. YKK AP America Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 1. Structural loads.
 2. Thermal movements.
 3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 4. Dimensional tolerances of building frame and other adjacent construction.
 5. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Glazing-to-glazing contact.
 - e. Noise or vibration created by wind and thermal and structural movements.
 - f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Sealant failure.
 - h. Failure of operating units to function properly.
- B. Structural-Sealant Joints: Designed to produce tensile or shear stress in structural-sealant joints of less than 20 psi.
- C. Structural Loads:
 1. Wind Loads: As indicated on Structural Drawings.
- D. Deflection of Framing Members Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
- E. Structural-Test Performance: Systems tested according to ASTM E 330 as follows:
 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity but not less than 10 seconds.

- F. Temperature Change (Range): Systems accommodate 120 deg F, ambient; 180 deg F, material surfaces.
- G. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of systems of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft..
- H. Water Penetration under Static Pressure: Systems do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
- I. Condensation Resistance: Fixed glazing and framing areas of systems have condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.
- J. Average Thermal Conductance: Fixed glazing and framing areas of systems have average U-factor of not more than 0.41 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
- B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard 2 x 4 extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Framing members are composite assemblies of two separate extruded-aluminum components permanently bonded by an elastomeric material of low thermal conductance.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Reinforce members as required to receive fastener threads.
 - 2. Do not use exposed fasteners except for hardware applications and then use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.
- F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.5 GLAZING SYSTEMS

- A. Glazing: As specified in Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type and as follows:
 - 1. Structural Sealant: ASTM C 1184, neutral-curing silicone formulation compatible with system components with which it comes in contact.
 - a. Color: As selected by Architect from manufacturer's full range of colors.
 - 2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other system components with which it comes in contact.
 - a. Color: Matching structural sealant.

2.6 DOORS

- A. Doors: Manufacturer's standard "5-1/2-inch wide stile" glazed doors, for manual swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 2. Door Design: Wide stile; 5-1/2-inch nominal width.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
 3. Glazing Stops and Gaskets: Beveled, Snap-On, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
- B. Door Hardware: As specified in Section 087100 "Door Hardware."

2.7 DOOR HARDWARE

- A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.
- B. Scheduled Door Hardware: Provide door hardware according to the Door Schedule shown on drawings.
- C. Cylinders: As specified in Section 087100 "Door Hardware."
- D. Cylinder Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE".
- E. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- F. Weather Stripping: Manufacturer's standard replaceable components.
 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- G. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- H. Silencers: BHMA A156.16, Grade 1. Provide 3 at each strike jamb.

2.8 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 "Joint Sealants."

2.9 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from interior.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device (dutchman) to retain glazing in place while structural sealant cures.
- F. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Doors: Reinforce doors as required for installing hardware.
 - 1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms. Not included in door schedule.

- H. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

- A. Baked on finish.
 - 1. Color: Clear Anodized.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Fit joints to produce hairline joints free of burrs and distortion.
 - 2. Rigidly secure nonmovement joints.
 - 3. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 4. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" and to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, without warp or rack.
- F. Install glazing as specified in Section 088000 "Glazing."
 - 1. Structural-Sealant Glazing:
 - a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

- b. Install weatherseal sealant according to Division 07 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- G. Entrances: Install to produce smooth operation and tight fit at contact points.
 - 1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
 - 2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install insulation materials as specified in Section 072100 "Thermal Insulation."
- I. Install perimeter joint sealants as specified in Section 079200 "Joint Sealants" and to produce weathertight installation.
- J. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.2 FIELD QUALITY CONTROL

- A. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.3 DOOR HARDWARE SCHEDULE

See door schedule on drawings.

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END OF SECTION 084113

SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vinyl windows.
 - 1. Single slider units.
- B. Related Documents include:
 - 1. AAMA/NWWDA 101/I.S. 2-97 - Voluntary Standard for Aluminum and Poly Vinyl Chloride (PVC) Prime Windows and Glass Doors.
 - 2. NFRC 100 - Thermal Properties; National Fenestration Rating Council.
 - 3. ASTM D 3656 - Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Fiber Yarn.
 - 4. ASTM D 3678 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Interior Profile Extrusions.
 - 5. ASTM D 4028 - Standard Specification for Solar Screening Woven from Vinyl-Coated Fiber Glass Yarn.
 - 6. ASTM E 774 - Standard Specification for Sealed Insulating Glass.

1.2 ACTION SUBMITTALS

- A. Product Data: Manufacturer's standard details and catalog data demonstrating compliance with referenced standards; include manufacturer's standard installation instructions.
- B. Drawings: Manufacturer's product drawings showing details of fabrication, hardware, weatherstripping, fasteners, screens, glazing, accessories, and related items.
- C. Verification Samples: Operating sample of each window type specified illustrating fabrication, hardware, glazing, screen, and finish.

1.3 INFORMATIONAL SUBMITTALS

- A. Test Reports: For each window type specified, furnish test reports from accredited independent testing laboratory certifying that identical or larger window units meet requirements specified for air infiltration, water penetration and structural performance by AAMA/NWWDA 101/I.S. 2-97, for thermal performance by NFRC-97, and for seal integrity of insulating glass units by IGCC. Test reports to test standards other than those listed will not be accepted. Include structural analysis data indicating structural test pressures and design pressures from basic wind speeds indicated and deflection limitations of glass framing systems, signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 CLOSEOUT SUBMITTALS

- A. Warranty documents, properly executed

1.5 DELIVERY, STORAGE AND HANDLING

- A. Follow manufacturer's instructions for delivery, storage, and on-site handling.
- B. All units to be install with AAMA, NFRC and manufacturer's warranty labels intact for review.

1.6 WARRANTY

- A. Furnish manufacturer's standard warranty against deficiencies in materials or fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Anderson Silverline vinyl windows Series 2800 (White)(Preferred)
 - 2. Alenco
 - 3. All Seasons Windows & Door Mfg.
 - 4. Alside Window Systems
 - 5. Certainteed
 - 6. Jeld Wen
 - 7. Milgard Windows
 - 8. Superseal Manufacturing Company
 - 9. Weather Shield Mfg., Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Acceptable Products to meet or exceed grading measures of AAMA/NWWDA 101/I.S. 2-97 Tests:
 - 1. Water Resistance Test: 30×0.15 = minimum 4.5 pounds per sq.ft.
 - 2. Structural Load Test: Meet or exceed all local expected wind loads.
 - 3. Air Infiltration Test: maximum 0.24 cu.ft./minute/ per sq.ft. of sash at 25 mph.
- B. Acceptable Products to meet or exceed Thermal performance of NFRC 100-97: U-Value 0.34 maximum.

- C. Acceptable Products to meet or exceed Solar Heat Gain Coefficient of NFRC 200-97: 0.27 maximum.

2.3 WINDOW UNITS

- A. Review Drawings for sizes, locations, and ganging of same units and different units.
- B. Plans call for SL (single) slider units: All windows in Project shall be from one manufacturer. Each window type on Project shall be from common factory production run. Variation in appearance, hardware, cross-section and assembly will be cause for rejection.
- C. Glazing: Sealed insulating glass unit, nominal 3/4 inch unit thickness, with DSB glass. Conform to ASTM E 774, Level CBA. Clear sealed insulating glass shall be "U" value (0.54), Low "E" (E=0.04) glass (inside of outside pane #2 surface).
- D. Frame: PVC extrusions, fusion-welded construction at corners, joined with screws into integral screw ports; multi-chambered weep system with wind-blocking covers. Frame color to be White. Overall jamb width of 3-1/16 inches, 2 inches thick.
- E. Sash: PVC extrusions, fusion-welded narrow-line construction, mitered corners, lift-out operation of operable sash units, with nylon-encased metal dual-roller system, full-interlocking meeting rails, full sash capture at jamb, cam-type locks with keepers. Sash color to be White.
- F. Insect screening: Roll-formed or extruded aluminum channel frames, with 18"x14" or 18"x16" fiberglass mesh secured with continuous vinyl gasket, removable for screen replacement. Screen to be compliant with ASTM D3656.
- G. STC Rating = 28 (Min).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify openings are in correct location and of correct size, in accordance with approved shop drawings and manufacturer's installation instructions.
- B. Do not begin installation before unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. A pre-installation inspection meeting with the manufacturer's representative is required for this work. See Section 017700 "Closeout Procedures" for requirements. Install products specified in this section square, plumb and level, in accordance with approved shop drawings and manufacturer's installation instructions. Provide flashing per window manufacturer's specifications, building wrap specifications, and plans/specifications.

Coordinate with architect when conflicts occur between differences in design or manufacturer's recommendations.

- B. Adjust operating hardware for correct operation in accordance with manufacturer's installation instructions.

3.3 CLEANING

- A. Clean interior and exterior surfaces free of labels (after review of same has occurred), mortar, plaster, paint, joint sealers, and other foreign matter to prevent damage to weatherstripping, and to prevent interference with operation of hardware.

3.4 PROTECTION

- A. Protect screens and operating parts from dirt and damage caused by subsequent construction activities. Replace units damaged by subsequent construction activities.

END OF SECTION 085313

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Commercial door hardware.
 - 2. Cylinders for doors specified in other Sections.
 - 3. Electrified door hardware.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include details of electrified door hardware and wiring diagrams.
- C. Samples: For each exposed finish.
- D. Door Hardware Schedule: Organized into door hardware sets indicating type, style, function, size, label, hand, manufacturer, fasteners, location, and finish of each door hardware item. Include description of each electrified door hardware function, including sequence of operation.
- E. Templates: Submit template information for finish hardware to suppliers of aluminum entrances, hollow metal and wood doors for production after hardware schedule approval.
- F. Keying Schedule: Detail Owner's final keying instructions for locks, per WoodSpring Suites construction bulletin.

1.3 CLOSEOUT SUBMITTALS

- A. Product certificates.

1.4 QUALITY ASSURANCE

- A. Supplier Qualifications: Person who is or employs a qualified DHI Architectural Hardware Consultant.
- B. Source Limitations: Refer to Door Hardware Schedule.
- C. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying schedule.

- D. Templates: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware.

1.5 DELIVERY, STORAGE AND HANDLING.

- A. Marking and Packaging: Hardware delivered in original packaging and marked by architectural door opening number according to approve hardware schedule to identify correct location.
- B. Delivery: Hardware supplier will deliver finish hardware to job site in a timely manner per job completion schedule. Inventory and verify all hardware per approved door hardware schedule. Supply any material not accounted for.
- C. Storage: Store hardware in a locked on-site location to ensure protection of material and finish. Hardware to be stored on shelves off floor & grouped by hardware type in clean, dry & secure area.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within warranty period.
 - 1. Warranty Period for Electromagnetic and Delayed Egress Locks: Five years from date of Substantial Completion.
 - 2. Warranty Period for Exit Devices: Three years from date of Substantial Completion.
 - 3. Warranty Period for Lock sets: Lifetime from date of Substantial Completion.
 - 4. Warranty Period for Door Accessories: One year from date of Substantial Completion.
 - 5. Warranty Period for Closers: Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product: Subject to compliance with requirements, provide the product named for each door hardware item indicated in Door Hardware Sets.
 - 1. For this project the following products only will be considered. Specified items listed in sets. Equals are as follows:
 - a. Butts Pivots Hager (EC, ECBB, RC)
 - b. Closers Hager (5400 Series, 5300 Series)
 - c. Locks (Common) Hager (2500 Series)
 - d. Locksets (Guestrooms) Onity (HT RFID), Kaba (Ilco 790 RFID or Saflok RT RFID)

- e. Panics Hager (4700 Series)
- f. Stops Hager (236) or
- g. Push-pull, Kicks Hager (214)
- h. Weather Stripping Hager (891, 726)
- i. Door Sweeps Hager (770)
- j. Thresholds Hager (412)
- k. Mag. Locks/controls Hager (380)
- l. Card Readers Onity, Kaba
- m. Viewers/Door Guard Hager (130)
- n. Exterior closers @ LCN – NO SUBSTITUTION
set #3 and 4
- o. Continuous Hinges Roton – NO SUBSTITUTION
- p. Overhead Stops Glynn-Johnson – NO SUBSTITUTION

- B. Provide RFID Electronic lock and key system from either Onity (Contact Mark Lewitt 864-621-1546) or Kaba (Contact Jules Dana 817-421-4270)

PRODUCT SPECIFICATIONS

Manufacturer/Supplier: ONITY

Lock Model: HT RFID

Finish: Satin Chrome 626

Front Desk System: OnPoint RFID

Manufacturer/Supplier: KABA ILCO

Lock Model: ILCO 790 RFID

Finish: Satin Chrome

Front Desk System: Next Gen FDU

Manufacturer/Supplier: KABA SAFLOK

Lock Model: SAFLOK RT RFID

Finish: Satin Chrome

Front Desk System: SAFLOK 6000

2.2 KEYING

- A. All keying shall be accomplished per Owner Requirements per the below Project Keying Legend.

Project Keying Legend				Grand Master A Mechanical AA Housekeeping AB Electrical Elevator AC		
Door ID	Opening Location	HW Set	Lock Information (Manufacturer/Part Description)	Type	Master Keying	Stamped Key ID
135A	Exterior from Vestibule	001	HA \ 3902 US26D (3902)	Double Keyed Cylinder	NONE	NONE
135B & 146	Vestibule/Lobby to Corridor	005	HA \ 3902 US26D (3902)	RFID	NONE	NONE

139	Corridor to Restroom	007	HA \ 2553 US26D WTN (2553)	Entry Lock	AB	B139
140	Exterior from Mechanical	002	HA \ 2580 US26D WTN (2580)	Storeroom Lock	AA	A140
141	Staff Laundry from Dryer	15	HA \ 2553 US26D WTN (2553)	Entry Lock	AA	A141
137B	AHU Access	015A	HA \ 2553 US26D WTN (2553)	Entry Lock	AA	1372
142B	Guest Laundry from AHU	015A	HA \ 2553 US26D WTN (2553)	Entry Lock	AA	A1422
142C	Guest Laundry from Closet	15	HA \ 2553 US26D WTN (2553)	Entry Lock	AA	A1421
143B	Staff Laundry from FCU-1	15	HA \ 2553 US26D WTN (2553)	Entry Lock	AA	A143
144	Exterior from Storage	2	HA \ 2580 US26D WTN (2580)	Storeroom Lock	AA	A144
145A	Exterior from Electrical	2	HA \ 2580 US26D WTN (2580)	Storeroom Lock	AC	C1451
240B	Mechanical Platform from Supplemental Utility	8	HA \ 2580 US26D WTN (2580)	Storeroom Lock	AA	A240

- B. All lock cylinders are to be grand master keyed. All locks and cylinders shall be supplied with a visual key control system. All keys shall be stamped per key schedule.
1. Furnish two (2) change keys for each lockset and a total of six (6) master keys, (6) grand master keys, (10) construction keys.
- C. All locks to be construction keyed, employing "lost ball" method. All permanent grand master and master keys and permanent day keys will be turned over to the owner prior to substantial completion.
- D. Provide and comply with ANSI 7.1.4.27 (hazard warnings).
- E. Provide and comply with ANSI a117.1,4.13 (handicap access).

2.3 DOOR HARDWARE

- A. Scheduled Door Hardware: Provide door hardware according to Door Hardware Sets at the end of Part 3. Manufacturers' names are abbreviated.
- B. All materials can be procured from the following WoodSpring Suites preferred vendors:

American Direct Procurement
11000 Lakeview Avenue
Lenexa, KS 66219
(913) 677-5588
Attn: Jerry Pennington
Email: JerryP@AmericanDirectCo.com

Paragon Distribution, LLC
1841-A West Oak Pkwy
Marietta, GA 30062
(770)-795-9564
Attn: Nick Batrouney
Email: Nick@discoverparagon.com

2.4 FABRICATION

- A. Base Metals: Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials if different from specified standard.
- B. Fasteners: Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated. Provide steel machine or wood screws or steel through bolts for fire-rated applications.
- C. Spacers or Sex Bolts: For through bolting of hollow metal doors.
- D. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."
- E. Finishes: Comply with BHMA A156.18.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- B. Steel Door and Frame Preparation: Comply with DHI A115 series. Drill and tap doors and frames for surface-applied hardware according to SDI 107.
- C. Wood Door Preparation: Comply with DHI A115-W series.
- D. Mounting Heights: Comply with the following requirements, unless otherwise indicated:
 - 1. DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
 - 3. DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- E. Adjust and reinforce attachment substrates as necessary for proper installation and operation. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 - .1. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
 - 2. Thresholds: Set thresholds for exterior in full bed of sealant. Complying with other requirements specified in Division 07 Section "Joint Sealants."
- F. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with accessibility requirements.
 - 1. Door Closers: Adjust sweep period so that from an open position of 70 degrees, the door will take at least three seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

3.2 DOOR HARDWARE SETS:

See HARDWARE SCHEDULE that follows this Section.

END OF SECTION 087100

HARDWARE SCHEDULE BY OPENING TYPE

Qty	Mfr.	Hardware Set Description
Hardware Set #001		
1		ALD X ALF EXTERIOR-VESTIBULE - #135A
		DOUBLE TUMBLER LOCKSET
2		CLOSERS
1	PEMKO	200SAT THRESHOLD
		ALL OTHER HARDWARE BY ALUMINUM DOOR SUPPLIER
Hardware Set #002		
		3/6-6/8 HMD X HMF EXT-MECH - #140, EXT-STOR #144, EXT-ELECT #145A
1	ROTON	780-224HD - ALUM
1	FALCON	W581PD6 DANE 2 3/4" US26D KD ASA STOREROOM
1	DOM	SC81 REG W/PA ALUM CLOSER
1	PEMKO	303AV 42" X 80" WEATHER-STRIP
3	ROCKWOOD	307D METAL DOOR SILENCERS
1	PEMKO	3452AV 42" SWEEP
1	PEMKO	171A X 42" THRESHOLD
Hardware Set #003		
		3/0-6/8 HMD X HMF EXTERIOR-STAIRS - #150A, 152A
1	ROTON	780-224HD ALUM
1	LCN	4040XP - Rw/PA ALUM
1	PEMKO	303AV 36" X 80" WEATHER-STRIP
3	ROCKWOOD	307D METAL DOOR SILENCERS
1	PEMKO	3452AV 36" SWEEP
1	PEMKO	171A X 36" THRESHOLD
1	ONITY	KHA3T-RS2-626-B
1	ROCKWOOD	BLACK LEXAN 34" X 34" KICKPLATE
		□ Add 24" black kickplate at 1 st floor ext to stair doors
1	GLYNN JOHN	104S OVERHEAD STOP
1	HAGER	3817-ESCUTCHEON-WTN LEVER 32D LEVER PULL
Hardware Set #004		
		ALD X ALF EXTERIOR-HALL - #136
1	ONITY	KHA3T-SA4-626-B
1		CLOSURE
1	PEMKO	2006AT THRESHOLD
		ALL OTHER HARDWARE BY ALUMINUM DOOR SUPPLIER

Hardware Set #005		ALD X ALF VESTIBULE, LOBBY-CORRIDOR - #135B, 146
		ALL OTHER HARDWARE BY ALUMINUM DOOR SUPPLIER
1	ONITY	KHA3T-AP1-626-B
2		CLOSURES
Hardware Set #007		3/0-6/8 WD X TMF CORR-RESTROOM - #139
3	IVES	5BB1 4.5 X 4.5 US26D STD WT
1	FALCON	SC91 REG W/PA ALUM CLOSER
1	FALCON	W511PD6 DANE 2 3/4" US26D OFFICE
1	ROCKWOOD	409 US26D WALL STOP
1	PEMKO	S88D X 204" GASKET DARK BROWN
Hardware Set #008		3/0-6/8 HMD X TMF CORR TO UTILITY - 240A, 240B, 340, 440
3	IVES	5BB1 4.5 X 4.5 US26D STD WT
1	FALCON	SC91 REG W/PA ALUM CLOSER
1	ROCKWOOD	409 US26D WALL STOP
1	PEMKO	S88D X 204" GASKET DARK BROWN
1	FALCON	W581PD6 DANE US26D
1	ROCKWOOD	BLACK LEXAN 24" X 34" KICKPLATE
		Kickplates and Onity locks not needed at 240B Door 3/0-3/0.
1	ONITY	KHH3-L-626
1	HAGER	412S MIL 36" SADDLE THRESHOLD
1	HAGER	770S-MIL 36" DOOR BOTTOM SWEEP
		Threshold and door sweep are only required at door 240B.
Hardware Set #009		3/0-6/8 HMD X TMF CORRIDOR-STAIRS - #150B, 152B, 250, 252, 350, 352, 450, 452
3	IVES	5BB1 4.5 X 4.5 US26D
1	FALCON	F-24-R-L-BE RIM SP28 36"
1	DOM	SC81 REG W/PA ALUM CLOSER
1	ROCKWOOD	409 US26D WALL STOP
1	PEMKO	S88D X 204" GASKET DARK BROWN
1	ROCKWOOD	BLACK LEXAN 34" X 34" KICKPLATE
1	NGP	513 SADDLE THRESHOLD 5" X 1/4" – MILL ALUM

Hardware Set #010		3/0-6/8 WD X TMF TRAINING, STAFF LDY - 143C 148A
2	IVES	3SP1 4.5 X 4.5 US26D SPRING HINGE
1	IVES	5BB1 4.5 X 4.5 US26D STD WT
1	ROCKWOOD	409 US26D WALL STOP
1	PEMKO	S88D X 204" GASKET DARK BROWN
1	ONITY	KHH3-L-626
Hardware Set #011		3/6-6/8 HMD X TMF CORR-STAFF LDY - #143A
3	IVES	5BB1 4.5 X 4.5 US26D STD WT
1	FALCON	SC91 REG W/PA ALUM CLOSER
1	ROCKWOOD	409 US26D WALL STOP
1	PEMKO	S88D X 216" GASKET DARK BROWN
1	ROCKWOOD	BLACK LEXAN 34" X 40" KICKPLATE
1	ONITY	KHH3-L-626
Hardware Set #012		3/0-6/8 WD X TMF CORR-GUEST LDY #142A, FITNESS #147
1	FALCON	SC91 REG W/PA ALUM CLOSER
3	IVES	5BB1 4.5 X 4.5 US26D STD WT
1	ROCKWOOD	409 US26D WALL STOP
1	PEMKO	S88D X 204" GASKET DARK BROWN
1	ROCKWOOD	BLACK LEXAN 34" X 34" KICKPLATE
1	ONITY	KHH3-L-626
Hardware Set #013		3/0-6/8 WD X TMF CORR-SUITES – Door "A"
3	IVES	5BB1 4.5 X 4.5 US26D STD WT
1	FALCON	SC91 REG W/PA ALUM CLOSER
1	ROCKWOOD	474 US26D DOOR STOP
1	PEMKO	S88D X 204" GASKET DARK BROWN
1	ROCKWOOD	620 CHROME DOOR VIEWER
1	PEMKO	US26D PRIVACY DOOR LATCH (No substitutions)
1	ROCKWOOD	603 SHIM DOOR GUARD SHIM
1		CARD READER
1	PEMKO	18062CNB X 36"

Hardware Set #014		3/0-6/8 WD X TMF CORR-SUITES-HDCAP – Door “A”
3	IVES	5BB1 4.5 X 4.5 US26D STD WT
1	FALCON	SC91 REG W/PA ALUM CLOSER
1	ROCKWOOD	409 US26D WALL STOP
1	HAGER	S88D X 204" GASKET DARK BROWN
2	ROCKWOOD	620 CHROME DOOR VIEWER
2	PEMKO	US26D PRIVACY DOOR LATCH (No substitutions)
2	ROCKWOOD	603 SHIM DOOR GUARD SHIM
1	PEMKO	18062CNB X 36"
1		CARD READER
Hardware Set #015/15A		2/0-6/8 or 2/6-6/8 HMD X TMF - #137B, 141, 142B, 142C, 143B, 154
3	IVES	5PB1 4.5 X 4.5 US26D STD WT PLAIN BEARING
1	FALCON	W511PD6 DANE 2 3/4" US26D KD ASA ENTRANCE
1	ROCKWOOD	409 US26D WALL STOP
Hardware Set #016		3/0-6/8 WD X TMF SUITES-BATHROOM – Door “B”
3	IVES	EC1100 4.5 X 4.5 US26D
1	FALCON	W301S DANE 2 3/8" US26D ASA PRIVACY
1	ROCKWOOD	474 US26D DOOR STOP
3		DOOR SILENCERS SUPPLIED BY FRAME SUPPLIER
Hardware Set #021		3/6-7/0 HMD X TMF ELEVATOR DOOR - #241, 341, 441
3	IVES	5BB1 4.5 X 4.5 US26D
1	SARGENT	99L-F-BE US26D DUMMY KNOB
1	FALCON	19-R-EO SP28 4FT
1	FALCON	DOOR SILENCERS SUPPLIED BY FRAME SUPPLIER
1	RIXON	FM998 689 WALL MAGNET
1	PEMKO	S773D – GASKET DARK BROWN
		WALL MAGNET TO BE TIED INTO FIRE ALARM SYSTEM

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications:

1. Interior windows.
2. Glazed entrances.
3. Storefront framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

1.3 QUALITY ASSURANCE

A. Sealant Compatibility and Adhesion Testing: Use sealant manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

B. Fire-Rated Assemblies: Where glazing products are used in fire-rated assemblies, comply with requirements of specific assembly specified in other sections of these Specifications.

1. Door Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
2. Window Assemblies: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

C. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

D. Glazing Publications: Comply with recommendations of the following, unless more stringent requirements are indicated.

1. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines."

E. Insulating-Glass Certification Program: Permanently marked with certification label of Insulating Glass Certification Council, Associated Laboratories, Inc or National Accreditation and Management Institute.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by manufacturer, in which manufacturer agrees to furnish replacements for units that deteriorate from normal use by developing defects attributable to the manufacturing process, f.o.b. the nearest shipping point to Project site, within warranty period.
1. Coated Glass:
 - a. Defects: Peeling, cracking, and other indications of degradation of metallic coating.
 - b. Warranty Period: 10 years from date of Substantial Completion.
 2. Laminated Glass:
 - a. Deterioration: Edge separation, delamination that materially obstructs vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - b. Warranty Period: Five years from date of Substantial Completion.
 3. Insulating Glass:
 - a. Deterioration: Failure of hermetic seal resulting in obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - b. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other articles including schedules where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Product: Subject to compliance with requirements, provide the product specified.
 4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 5. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses, nominally, of lites in exterior walls is .25" thick.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from a maximum change (range) of 120 deg F, in ambient and surface temperatures, respectively, acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- wide interspace.
 - 4. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F.
 - 5. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
 - 6. Solar Optical Properties: NFRC 300.

2.3 GLASS MATERIALS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class 1, kind FT where indicated on drawings
- C. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
2. Sealing System: Dual seal with manufacturer's standard primary and secondary sealants.
3. Spacer: Manufacturer's standard.
4. Corner Construction: Manufacturer's standard.
5. Overall Unit Thickness and Thickness of Each Lite: As indicated on the drawings.
6. Interspace Content: Argon.

2.4 FIRE-RATED GLAZING PRODUCTS

- A. Laminated Ceramic Glazing Material: Proprietary product in the form of two lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch nominal thickness; polished on both surfaces; weighing 4 lb/sq. ft.; and as follows:
 1. Fire-Protection Rating: As indicated for assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Polished on both surfaces, transparent.
 3. Product: "FireLite Plus" manufactured by Nippon Electric Glass Co., Ltd. and distributed by Technical Glass Products.
- B. Laminated Glass with Intumescent Interlayers: Proprietary product in the form of multiple lites of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Kind FT (fully tempered) float glass laminated with intumescent interlayers; and as follows:
 1. Fire-Protection Rating: As indicated for assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Product: "PyroStop" distributed by Technical Glass Products.
- C. Gel-Filled, Dual-Glazed Units: Proprietary product in the form of two lites of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Kind FT (fully tempered) float glass; with a perimeter metal spacer separating lites and dual-edge seal enclosing a cavity completely filled with clear, fully transparent, heat-absorbing gel; and as follows:
 1. Fire-Protection Rating: As indicated for assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Product: "SuperLite II" by SAFTI Div., O'Keeffe's Inc.
- D. Gel-Filled, Triple-Glazed Units: Proprietary product in the form of two outer lites and one inner lite of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1

(clear), Kind FT (fully tempered) float glass; each outer lite 6 mm thick; with a perimeter metal spacer separating lites and dual-edge seals, enclosing two cavities each completely filled with clear, fully transparent, water-base, heat-absorbing gel; and a 50.9-mm overall thickness.

1. Fire-Protection Rating: As indicated for assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Product: "Pyrovue Commercial" by Advanced Glass Systems Corp.

2.5 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Colors of Exposed Sealants: As selected from manufacturer's standards.
- B. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 GLAZING GASKETS

- A. Compression Gaskets: Molded or extruded gaskets of type and material indicated below and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene dense compression gaskets complying with ASTM C 846.
 - 2. Silicone dense compression gaskets complying with ASTM C 1115.
 - 3. Neoprene soft compression gaskets complying with ASTM C 509, Type II, black.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.9 MIRRORS:

- A. 1/4" clear flat glass with copper electroplated back over heavy silver film. Not less than .0002".
- B. Twin: Ground flat
- C. Edges: Seamed.
- D. Paint mirror back surface: With e coats of mirror backing paint.
- E. Anchorage: Concealed (no rosettes).

2.10 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
 - 1. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
 - 2. Protect glass edges from damage during handling and installation. Remove glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance from Project site and legally dispose of off Project site.
 - 3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by sealant compatibility and adhesion testing.
 - 4. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 - 5. Provide spacers for glass lites where the length plus width is larger than 50 inches unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances.

3.2 PROTECTION:

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter.
- C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged, including natural causes, accidents, and vandalism, during construction period.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

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END OF SECTION 088000

SECTION 089119 – FIXED LOUVERS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes exterior wall louvers.

1.2 WARRANTY

- A. Furnish manufacturer's standard warranty against deficiencies in materials or fabrication.

PART 2 – PRODUCTS

2.1. MANUFACTURERS

- A. Wall Louvers

- 1. Ruskin

2.2. WALL LOUVERS

- A. Wall Louvers: 6" deep extruded aluminum (.125" thickness) frame with stationary fixed 45 degree weatherproof drainable blades at approximately 5" centers. Factory assembled components/sections. Minimum 54% free area design. Architecturally styled with hidden mullions. Wall Flange. Bird screen. Factory prime coat for field painting.
- A. Model: Ruskin model ELF6375DXH

PART 3 – EXECUTION

3.1. INSTALLATION

- A. Install per manufacturer's instructions.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

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Lee's Summit, MO 64086

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END OF SECTION 089119

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Glass-mat gypsum sheathing board.
2. Weather-resistant barrier.
3. Interior gypsum wallboard
4. Tile backing panels
5. Interior gypsum board ceiling.

B. Related Sections include the following:

1. Section 076200 "Sheet Metal Flashing and Trim" for flashing installed with gypsum sheathing.
2. Section 079200 "Joint Sealants" for sealants applied with gypsum sheathing.

1.2 DEFINITIONS

Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 for definitions of terms for gypsum sheathing board construction not defined in this Section or in other referenced standards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Building Wrap: For air/moisture-infiltration protection, include data substantiating compliance with building code in effect for Project.

B. Samples: For each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

- B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- C. Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Install mockups for the following applications:
 - a. Surfaces with texture finishes.
 - b. Surfaces indicated to receive non textured paint finishes.
 - c. Surfaces indicated to receive textured paint finishes.
 - 2. Simulate finished lighting conditions for review of mockups.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Above ceiling Observation: Before Contractor installs gypsum board ceiling, Architect/Owner will conduct and above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 - 1. Notify Architect (7) seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 - 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control air tubing.
 - f. Installation of ceiling support framing.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Stack sheathing flat on leveled supports off the ground, under cover, and fully protected from weather.

1.6 COORDINATION

- A. Glass-Mat Gypsum Sheathing Board:
 - 1. Do not leave exposed to weather for more than 180 days.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Product: Subject to compliance with requirements, provide the product specified.

2.2 GYPSUM SHEATHING

- A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.
1. Product: Subject to compliance with requirements, provide one of the following "Dens-Glass Gold" by G-P Gypsum Corporation or "Glas Roc" by BPB America Inc.
 2. Type and Thickness: See structural drawings.
 3. Size: See structural drawings.

2.3 WEATHER-RESISTANT BARRIER

- A. Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; and UV stabilized.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. DuPont (E. I. du Pont de Nemours and Company); Tyvek Commercial Wrap.
 - b. Raven Industries, Inc.; Rufco-Wrap.
 - c. Reemay, Inc.; Typar House Wrap.
 - d. Simplex Products.
 - e. Tenneco Building Products; Amowrap House wrap.
 3. Material: Manufacturer's standard.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Glass-Mat Gypsum Sheathing Board: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and

other materials, recommended by sheathing manufacturer for application indicated, and complying with requirements for elastomeric sealants specified in Section 079200.

B. Glass-Mat Gypsum Sheathing Board:

1. Silicone Emulsion Sealant: ASTM C 834, compatible with sheathing tape and sheathing, recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
2. Glass-Fiber Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

2.5 ACCESSORY MATERIALS

A. Fasteners: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, attach sheathing with steel drill screws complying with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing with drill screws complying with ASTM C 954.

2.6 PANEL PRODUCTS

A. Panel Size, General: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Regular Type: In thickness indicated and with long edges tapered.
2. Type X: In thickness indicated and with long edges tapered.

C. Water and Fire Resistant Gypsum Board: ASTM C 1396, Type X

1. Thickness: As indicated.
2. Length, Long Edges, Cut: Maximum permissible lengths, edges tapered, ends square cut.
3. Core: Non-combustible fire-resistant and mold resistant core.
4. Mold Resistance: Score of 10 in accordance with ASTM D3273/3274.
5. Provide one of the following:
 - a. M-Bloc Mold Resistant Type C by American Gypsum.
 - b. Gold Bond Brand XP Fire-Shield C Gypsum Board, by National Gypsum.
 - c. Sheetrock Mold Tough Firecode Type X Gypsum Panel, by USG.
 - d. ToughRock Fireguard X Mold-Guard Gypsum Board by Georgia Pacific.
 - e. M2Tech Type X Gypsum Board or Diamondback Glasroc Tile Backer Type X by CertainTeed.

- D. Acoustically Enhanced Gypsum Board: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. National Gypsum Company; Sound Break.
 - b. Serious Energy, Inc.; Quiet Rock.
2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.

- E. Exterior Gypsum Panels for Ceilings and Soffits:

1. Exterior Gypsum Soffit Board: ASTM C 931/C 931M, with core type and in thickness indicated and with manufacturer's standard edges.
2. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with core type and in thickness indicated.
 - a. Product: G-P Gypsum Corp; Dens-Glass Gold.

- F. Interior Gypsum Panels for Ceilings: ASTM C635

1. Basis of Design: USG Drywall Suspension System, Flat Ceilings
2. Materials:
 - a. USG Drywall Suspension Systems – Commercial quality, cold-rolled steel, hot dipped galvanized finish
 - b. Wire:
 - 1) Hanger wire: (12 ga) (8 ga) galvanized
 - 2) Tie Wire: 18 ga, galvanized
 - c. Metal Lath: 3.4 #/ S. Y. self-furring diamond mesh lath, galvanized
 - d. Screws – Self-taping truss-head lathing screws
 - e. Casing and Corner beads as required

- G. Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M, with core type and in thickness indicated.
2. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with core type and in thickness indicated.
 - a. Product: G-P Gypsum Corp.; Dens-Shield Tile Backer.
3. Cementitious Backer Units: ANSI A118.9, in thickness indicated.

2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Corner bead: Use at outside corners, unless otherwise indicated.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use where indicated.
6. Expansion (Control) Joint: Use where indicated.
7. Curved-Edge Corner bead: With notched or flexible flanges; use at curved openings.

B. Exterior Trim: ASTM C 1047, hot-dip galvanized steel sheet or rolled zinc.

1. Corner bead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening. Use where indicated.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Products:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. MM Systems Corporation.
 - d. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use USG "spatter" medium "orange peel" texture finish applied directly to gypsum board for walls and ceilings.
- D. Joint Compound for Exterior Applications:
1. Exterior Gypsum Soffit Board: Use setting-type taping and setting-type, sandable topping compounds.
 2. Glass-Mat Gypsum Sheathing Board: As recommended by manufacturer.
- E. Joint Compound for Tile Backing Panels:
1. Water-Resistant Gypsum Backing Board: Use setting-type taping and setting-type, sandable topping compounds.
 2. Glass-Mat, Water-Resistant Backing Panel: As recommended by manufacturer.
 3. Cementitious Backer Units: As recommended by manufacturer.

2.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
1. Laminating Adhesive: Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Available Products:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
1. Available Products:
 - a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
 - b. Pecora Corp.; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.

D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to wood framing members.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

E. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit wood stud size.

F. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and manufacturer's written instructions.
- B. Cut boards at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
 1. Install boards with a 3/8-inch setback where non-load-bearing construction abuts structural elements.
 2. Install boards with a 1/4-inch setback where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- C. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
- D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
- E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
- F. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges, and stagger

end joints of adjacent board's not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- G. Vertical Installation: Install board vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud.
1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.2 WEATHER-RESISTANT BARRIER INSTALLATION

- A. Cover sheathing with weather-resistant barrier as follows:
1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with corrosion-resistant staples.
- C. Building Wrap: Comply with manufacturer's written installation instructions.

3.3 SHEATHING JOINT-AND-PENETRATION TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written recommendations.
1. Apply elastomeric sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.4 PANEL PRODUCT INSTALLATION

- A. Prior to beginning any installation which will close up walls or floors verify that the latent moisture content of the wood framing members and wood panel products does not exceed 18%.
- B. Gypsum Board: Comply with ASTM C 840 and GA-216.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.
 - 2. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.
 - 3. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 4. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 5. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 6. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
 - 7. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws with screws; fasten face layers with adhesive and supplementary fasteners.
- C. Exterior Ceilings and Soffits: Apply exterior gypsum panel's perpendicular to supports, with end joints staggered and located over supports.
 - 1. Fasten with corrosion-resistant screws.
- D. Interior Ceilings: Install per system manufacturer's written instructions, applicable drawings, ASTM C636 and applicable codes.
- E. Tile Backing Panels:
 - 1. Water-Resistant Gypsum Backing Board: Install with 1/4-inch gap where panels abut other construction or penetrations.
 - 2. Glass-Mat, Water-Resistant Backing Panel: Install with 1/4-inch gap where panels abut other construction or penetrations.
 - 3. Cementitious Backer Unit Application: ANSI A108.11.

3.5 FINISHING

- A. Installing Trim Accessories: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Finishing Gypsum Board Panels: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
 - 1. Prefill open joints and damaged surface areas.
 - 2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
 - 3. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
 - 4. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- C. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 - 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
 - 3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges where indicated. Provide USG "spatter" medium with "knockdown" texture applied directly to the gypsum board on walls and ceilings.

3.6 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns. Mockup may be area to be incorporated into the work.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

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END OF SECTION 092900

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- C. Samples: For each acoustical panel, for each exposed suspension system member, for each exposed molding and trim, and for each color and texture required.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Research/evaluation reports.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of quantity installed, but not fewer than one full box.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 GENERAL

- A. Acoustical Panel Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
 1. Anchors in Concrete: Expansion anchors fabricated from corrosion-resistant materials, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 1. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- E. Seismic struts and seismic clips.
- F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

2.3 ACOUSTICAL PANELS

A. Products:

1. CertainTeed – “Baroque” Hytone – Bet 157 trim edge.
2. USG – “Radar” Item 2110.

B. Classification: Non-fire-resistance-rated panels.

C. Color: White.

D. Edge Detail: Square.

E. Thickness: 5/8 inch.

F. Size: 24 by 24 inches.

2.4 METAL SUSPENSION SYSTEM

A. Products:

1. Celotex “Classic Stab Ceiling System” 15/16” Trim Edge.
2. USG DX.

B. Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and Cisca's "Ceiling Systems Handbook."
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders.
- C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices.

1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
 2. Do not attach hangers to steel deck tabs or to steel roof deck.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate with concealed fasteners at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

END OF SECTION 095113

SECTION 096519 - RESILIENT FLOOR TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Solid vinyl floor tile.
2. Rubber floor tile.
3. Laminated vinyl tile (LVT).
4. Rubber stair treads.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: Full-size units of each color and pattern of resilient floor tile required.

1.3 FIELD CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 LAMINATED VINYL TILE

- A. Laminated vinyl tile (LVT)

1. LVT-1: See Plans for Locations.
2. LVT-2: See Plans for Locations.

All materials can be procured from the following WoodSpring Suites preferred vendor:

2.2 TOPSET BASE:

- A. Vinyl cove base with toe.
 1. See Plans
- B. Roppe
 1. Tub Mold: Roppe White tub mold.

2.3 TRANSITION STRIP

- A. Shaw 2" Rubber door transition 147VS Color: 40 Clay

2.4 RESILIENT THERMOSET RUBBER STAIR TREADS

- A. Endura Rubber Stair Treads, Risers, and Stringers:
 1. Endura Round Raised Disk Pattern Solid Color Rubber Stair Treads and landings 2, 3 & 4 with visually-impaired 2" (5.08cm) wide contrasting color abrasive grit strip.
 - a. Color: Brown
 2. Risers and Stringers (Skirting)
 - a. Color: Black
- B. Manufacturer:

Burke Flooring
2250 South Tenth Street
San Jose, CA 95112
Phone: (800) 447-8442
(352) 357-4119
Fax: (352) 357-9660

2.5 INSTALLATION MATERIALS

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

- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Asphalt Tile Adhesives: 50 g/L.
 - b. Cove Base Adhesives: 50 g/L.
 - c. Rubber Floor Adhesives: 60 g/L.
- C. Transition strips-See carpet specifications. Provide in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products. Use manufacturer's pre-installation site review to confirm acceptable preparation.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install tiles per manufacturer's requirements.

- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis.
- C. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. LVT-1&2: Lay planks perpendicular to the corridor wall in a random staggered pattern. Adjust layout so that all cut edges occur at the room perimeter with no ending length of plank is less than the width of the plank.
- D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- E. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- J. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
- K. Install topset base around complete perimeter of room including around cabinetry.
- L. Install guestroom entry transition strip to allow door brush sweep to contact upon closing.

- M. Prior to beginning any installation verify that latent moisture content of concrete and/or cementitious subgrade materials does not exceed adhesive manufacturer's recommendation.

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END OF SECTION 096519

SECTION 096813 - TILE CARPET

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes carpet tiles and vinyl base.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include the following:
 - 1. Seam locations.
 - 2. Pattern type, repeat, location, direction, and starting point.
 - 3. Pile direction.
 - 4. Transition, and other accessory strips.
 - 5. Transition details to other flooring materials.
- C. Samples: For each carpet and exposed accessory and for each color and pattern required.
- D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

1.3 CLOSEOUT SUBMITTALS

- A Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 FIELD CONDITIONS

- A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."
- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet tile before installing these items.

1.7 WARRANTY

- A. Carpet Warranty: Manufacturer's standard form in which manufacturer agrees to replace carpet that does not comply with requirements or that fails within 10 years from date of Substantial Completion. Warranty does not include deterioration or failure of carpet from unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Carpet tiles:

See plans. Refer to FF&E Manual for manufacturer and model information.

2.2 PRODUCTS

- 1. Provide the following:
 - 1. See Plans

2.3 ACCESSORIES

A. Topset Base: .

1. See Plans

B. Transition Strip:

1. Shaw 2" Rubber Guestroom/Corridor door transition: 147VS. Color: 40 Clay

C. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. Bind or seal cut edges as recommended by carpet manufacturer.
- B. Install pattern parallel to walls and borders.
- C. Install topset base around complete perimeter of room including around cabinetry.
- D. Install transition strips at all locations where the carpet meets a different floor finish material.

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END OF SECTION

TILE CARPET

096813 - 4

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 PREINSTALLATION MEETING

- A. A pre-installation meeting with manufacturer's representative is required for this work. See Section 017700 "Closeout Procedures" for requirements. This inspection meeting needs to take place for exterior and interior painting applications.

1.2 SUMMARY

- A. Section includes surface preparation and field painting of exposed exterior items and surfaces.

1.3 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For each type of finish-coat material indicated.

1.4 QUALITY ASSURANCE

- A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5.
 - 1. Wall Surfaces: Provide samples on at least 100 sq. ft.
 - 2. Small Areas and Items: Architect will designate items or areas required.
 - 3. Final approval of colors will be from benchmark samples.

1.5 FIELD CONDITIONS

- A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
- B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

- D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
- B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Sherwin Williams Co. (SW)

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
 - 1. Flat Paints and Coatings: VOC not more than 50 g/L.
 - 2. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
 - 3. Anticorrosive Coatings: VOC not more than 250 g/L.
 - 4. Varnishes and Sanding Sealers: VOC not more than 350 g/L.
 - 5. Stains: VOC not more than 250 g/L.
 - 6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - 7. Restricted Components: Paints and coatings shall not contain acrolein; acrylonitrile; antimony; benzene; butyl benzyl phthalate; cadmium; di (2-ethylhexyl) phthalate; di-n-butyl phthalate; di-n-octyl phthalate; 1,2-dichlorobenzene; diethyl phthalate; dimethyl phthalate; ethylbenzene; formaldehyde; hexavalent chromium; isophorone; lead; mercury; methyl ethyl ketone; methyl isobutyl ketone; methylene chloride; naphthalene; toluene (methylbenzene); 1,1,1-trichloroethane; or vinyl chloride.
- D. Colors: As indicated by manufacturer's designations.

2.3 PREPARATORY COATS

- A. Concrete Unit Masonry Block Filler: High-performance latex block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
- B. Exterior Primer: Exterior alkyd or latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
 - 1. Ferrous-Metal and Aluminum Substrates: Rust-inhibitive metal primer.
 - 2. Zinc-Coated Metal Substrates: Galvanized metal primer.
 - 3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.4 EXTERIOR FINISH COATS – NO SUBSTITUTIONS

- A. Exterior Ferrous Metal, and hollow metal doors and frames furnished with shop coat: One coat rust-inhibitive metal primer, and one coat semi-gloss acrylic metal primer, and one coat of semi-gloss acrylic:
 - 1. SW: Pro Industrial Zero VOC.
 - 2. Color: Refer to the color schedule as shown on drawings.
- B. Exterior Ferrous metal not furnished with shop coat: One coat rust-inhibitive:
 - 1. SW: Pro Industrial Zero VOC.
 - 2. Color: Match surrounding surface colors.
- C. Exterior Galvanized Metal: Prepare by solvent washing and then etching. One coat of acrylic primer/finish and one coat of exterior satin acrylic latex:
 - 1. SW: Duration/K33 series.
 - 2. Color: Match surrounding surface colors.
- D. Exterior wood trim, and all exposed wood: One (1) coat of primer and one (1) coat of exterior acrylic satin latex.
 - 1. Primer: Exterior Acrylic Wood Primer: All sides and edges shall be painted with primer before installation.
 - 2. SW: Duration/K33 series.
 - 3. Color: Refer to the Color Schedule shown on drawings.
- E. Exterior Vents and Grills and piping shall be painted to match adjoining building color. All roof penetrations shall be painted to blend with the roof color.
- F. Exterior Downspouts: Refer to the color schedule as shown on drawings.
- G. Exterior side of doors to be painted to match interior side of doors; refer to the color schedule as shown on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

3.2 PREPARATION

- A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 - 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

- a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

C. Material Preparation:

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

3.3 APPLICATION

- A. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convactor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 4. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- B. Sand lightly between each succeeding enamel or varnish coat.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Omit primer over metal surfaces that have been shop primed and touchup painted.
 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

- E. Minimum Coating Thickness: Apply paint materials no thinner than manufacturers recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- F. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- H. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
- K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

3.4 CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 PREINSTALLATION MEETING

- A. A pre-installation meeting with manufacturer's representative is required for this work. See Section 017700 "Closeout Procedures" for requirements. This inspection meeting needs to take place for interior and exterior painting applications.

1.2 SUMMARY

- A. Section includes surface preparation and field painting of interior items and surfaces.

1.3 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For each type of finish-coat material indicated.

1.4 QUALITY ASSURANCE

- A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5.
 - 1. Wall Surfaces: Provide samples on at least 100 sq. ft.
 - 2. Small Areas and Items: Architect will designate items or areas required.
 - 3. Final approval of colors will be from benchmark samples.

1.5 FIELD CONDITIONS

- A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
- B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- D. Do not when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
- B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Sherwin-Williams Co. (SW); Ryan Brown, 303-886-2257, ryan.e.brown@sherwin.com

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
 - 1. Flat Paints and Coatings: VOC not more than 50 g/L.
 - 2. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
 - 3. Anticorrosive Coatings: VOC not more than 250 g/L.
 - 4. Varnishes and Sanding Sealers: VOC not more than 350 g/L.
 - 5. Stains: VOC not more than 250 g/L.
 - 6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - 7. Restricted Components: Paints and coatings shall not contain acrolein; acrylonitrile; antimony; benzene; butyl benzyl phthalate; cadmium; di (2-ethylhexyl) phthalate; di-n-butyl phthalate; di-n-octyl phthalate; 1,2-dichlorobenzene; diethyl phthalate; dimethyl phthalate; ethylbenzene; formaldehyde; hexavalent chromium; isophorone; lead; mercury; methyl ethyl ketone; methyl isobutyl ketone; methylene chloride; naphthalene; toluene (methylbenzene); 1,1,1-trichloroethane; or vinyl chloride.
- D. Colors: As indicated by manufacturer's designations.

2.3 PREPARATORY COATS

- A. Concrete Unit Masonry Block Filler: High-performance latex block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
- B. Interior Primer: Interior latex-based or alkyd primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
 - 1. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer.
 - 2. Zinc-Coated Metal Substrates: Galvanized metal primer.
 - 3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.4 INTERIOR FINISH COATS – NO SUBSTITUTIONS

- A. Interior Metals (Interior Semi-Gloss Latex Enamel). Prefinished or primed and /or unprimed metals shall receive one coat rust-inhibitive metal primer and two coats of interior Semi-Gloss Latex Enamel.
 - 1. Sherwin-Williams; Proclassic Waterborne/B31 series.
- B. Interior Gypsum Board Ceilings (Interior Latex Vinyl Acrylic Eggshell). Texture per gypsum assembly's specifications USG "Knockdown" texture. All ceilings (textured and non-textured): Two (2) coats: Interior: latex Vinyl Acrylic Eggshell.
 - 1. Sherwin-Williams – ProMar 200/B20W200 Series.
- C. Interior Gypsum Board Walls (Interior Latex Vinyl Acrylic Eggshell) @ bath and laundry. Texture per gypsum assembly's specifications USG "Knockdown" texture. All areas to receive two (2) coats of Latex as follows:
 - 1. Sherwin-Williams – ProMar 200 Zero Series.
- D. Interior Gypsum Board Walls (Interior Latex Vinyl Acrylic Eggshell) @ headboard. All areas to receive two (2) coats of Latex as follows:
 - 1. Sherwin-Williams – ProMar 200 Zero Series Deep Base.
- E. Interior Gypsum Board Walls (Interior Latex Vinyl Acrylic Eggshell) @ office accent wall. All areas to receive two (2) coats of Latex as follows:
 - 1. Sherwin-Williams – ProMar 200 Zero Series Deep Base.
- F. Interior Metal Doors and Frames (Interior Semi-Gloss Latex Enamel). Do not paint over fire labels. All areas to receive two (2) coats of Latex as follows:
 - 1. Sherwin-Williams – ProClassic Waterborne/B31 Series.

- G. Metal Railings at Interior Stairwells (Interior Semi-Gloss Latex Enamel). Prefinished or primed and /or unprimed metals shall receive one coat rust-inhibitive metal primer and two coats.

- 1. Sherwin-Williams – ProClassic Waterborne/B31 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

3.2 PREPARATION

- A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.

- d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 - 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
 - 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- C. Material Preparation:
- 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

3.3 APPLICATION

- A. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convactor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
- 1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 - 3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 4.. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
- B. Sand lightly between each succeeding enamel or varnish coat.

- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. Omit primer over metal surfaces that have been shop primed and touchup painted.
 - 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- E. Minimum Coating Thickness: Apply paint materials no thinner than manufacturers recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- F. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- H. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
- K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

3.4 CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

- C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

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August 16, 2023

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END OF SECTION 099123

SECTION 102600 – WALL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Corner guards.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: For each type of wall protection showing locations and extent.

1.3 CLOSEOUT SUBMITTAL

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
- B. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.1 CORNER GUARDS

- A. All materials can be procured from the following WoodSpring Suites preferred Vendors.
1. Koroseal
Kim Willner
kwillner@koroseal.com
 2. InPro Corporation
Todd Thoma
tthoma@inprocorp.com
- B. Public Spaces: Koroseal – Korogard “Relaxed Gray” (5A) P1 Dune Leno Weave Finish.
- C. Public Spaces: InPro 500 “Gala” 0380 Chair Rail.

- D. Guestrooms: InPro Color #0103 White Sand.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3.2 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

3.3 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Public-use washroom accessories.
 - 2. Private-use bathroom accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule:
 - 1. Identify locations using room designations indicated on Drawings.
 - 2. Identify products using designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 SCHEDULE OF ACCESSORIES

- A. See Suggested Vendors List in Section 011000, Interior Materials Lists on Drawings, and Basis of Design items on Drawings.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Direct: Sonny Welty sonnyw@americandirectco.com 913-563-5807
 - 2. Paragon: Cameron Web cameronw@discoverparagon.com 770-795-9564 x319

2.2 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cabinet mounted fire extinguishers.
- B. Related Sections:
 - 1. Section 104416 "Fire Extinguishers".

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Fire-Protection Cabinets: Include door hardware, cabinet type, trim style, panel style, and details of installation.
 - 2. Show location of knockouts for hose valves.
- B. Samples: For each exposed cabinet finish.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Apply decals on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Basis-of-Design Product: The design for each product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 FIRE-PROTECTION CABINET

- A. Basis-of-Design Product: J.L Industries (Model #1827FX) or a comparable product by one of the following:
- B. Available Manufacturers:
 - 1. Fire End & Croker Corporation.
 - 2. General Accessory Mfg. Co.
 - 3. JL Industries, Inc.
 - 4. Kidde Fyrnetics.
 - 5. Larsen's Manufacturing Company.
 - 6. Modern Metal Products; Div. of Technico.
 - 7. Moon American.
 - 8. Potter Roemer; Div. of Smith Industries, Inc.
 - 9. Watrous; Div. of American Specialties, Inc.
- C. Cabinet Type: Suitable for fire extinguisher.
- D. Cabinet Construction: Nonrated.
- E. Cabinet Material: Enameled-steel or Aluminum or Stainless-steel sheet.
- F. Semirecessed Cabinet: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, rounded edge trim with 2-1/2" backband.
- G. Cabinet Trim Material: Aluminum sheet.
- H. Door Material: Aluminum sheet.
- I. Door Style: Double strength full glass.
- J. Door Glazing: Tempered float glass (clear) Tempered float glass.

K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

L. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, with plated or baked-enamel finish.

M. Finishes:

1. Aluminum: Class I, clear anodic coating complying with AAMA 611.

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth.

1. Construct fire-rated cabinets with double walls fabricated from ~~0.0428-inch~~ thick, cold-rolled steel sheet lined with minimum ~~5/8-inch~~ thick, fire-barrier material. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum ~~1/2 inch~~ thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi recessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.
- C. Prepare recesses for semi recessed fire-protection cabinets as required by type and size of cabinet and trim style.
- D. Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

- E. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi recessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- F. Identification: Apply decals at locations indicated.
- G. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- H. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes
 - 1. Portable fire extinguishers.
 - 2. Mounting brackets for fire extinguishers.
- B. Related Sections:
 - 1. Section 104413 "Fire Protection Cabinets".

1.2 ACTION SUBMITTALS

- A. Product Data: For Fire Extinguishers: Include rating and classification.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Basis-of-Design Product: The design for each product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 PORTABLE FIRE EXTINGUISHERS

- A. Available Manufacturers:
1. Amerex Corporation.
 2. Ansul Incorporated.
 3. Badger Fire Protection.
 4. Buckeye Fire Equipment Company.
 5. Fire End & Croker Corporation.
 6. General Fire Extinguisher Corporation.
 7. JL Industries, Inc.
 8. Kidde Fyrnetics.
 9. Larsen's Manufacturing Company.
 10. Modern Metal Products; Div. of Technico.
 11. Moon American.
 12. Potter Roemer; Div. of Smith Industries, Inc.
 13. Watrous; Div. of American Specialties, Inc.
- B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated -A:B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Available Manufacturers:
1. Amerex Corporation.
 2. Ansul Incorporated.
 3. Badger Fire Protection.
 4. Buckeye Fire Equipment Company.
 5. Fire End & Croker Corporation.

6. General Fire Extinguisher Corporation.
 7. JL Industries, Inc.
 8. Larsen's Manufacturing Company.
 9. Potter Roemer; Div. of Smith Industries, Inc.
- B. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
1. Color: Red.
- C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.
- B. Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
- D. Identification: Apply decals at locations indicated.

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END OF SECTION 104416

SECTION 107313 – PREFABRICATED METAL CANOPIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roll formed aluminum overhead hanger rod style canopies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, and finishes for canopies.

B. Shop Drawings:

1. Include plans, elevations, sections, mounting heights, and attachment details.
2. Detail fabrication and assembly of canopies.
3. Show locations for blocking, reinforcement, and supplementary structural support.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Fabricator's responsibilities include fabricating and installing canopies and providing professional engineering services needed to assume engineering responsibility.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.4 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of canopies in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Where canopy installation is indicated to fit to other work, verify dimensions of other work by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for fenestration operation throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 WARRANTY

- A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of canopies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including framework.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Canopy Warranty Period: Five years from date of Substantial Completion.
 - a. Color Warranty (Kynar Finish): Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Mapes Architectural Canopies, 7748 North 56th Street, Lincoln NE, Ph. 888-273-1132, email: canopy@mapes.com
- B. Substitutions: As approved by Architect.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design canopies.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 CANOPY FRAMES (HANGER ROD SUPPORTED)

A. Product: Mapes Super Lumishade

1. Hanger Rod Supported canopies

B. Materials:

1. Decking shall consist of an interlocking roll-formed 2 1/2 W style pan (minimum .032 aluminum).
2. Intermediate framing members shall be extruded aluminum, alloy 6063-T6, in profile and thickness as shown on the Drawings.
3. Hanger rods and attachment hardware shall be powder coated to match canopy.
4. Fascia shall be standard 8" size.
5. Aluminum Finish: (2) Two coat Kynar Finish. Color shall be as indicated on the Drawings.

C. Anchors, Fasteners, Fittings, Hardware, and Installation Accessories: Complying with performance requirements indicated and suitable for exposure conditions, supporting structure, anchoring substrates, and installation methods indicated. Corrosion-resistant or noncorrodible units; weather-resistant, compatible, non-staining materials. Provide as required for canopy assembly, mounting, and secure attachment. Number as needed to comply with performance requirements and to maintain uniform appearance; evenly spaced. Where exposed to view, provide finish and color to match canopy.

1. Lag Bolts: ASME B18.2.1..
2. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
3. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing according to ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - a. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
4. Adhesive-Bonded Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing according to ASTM E 1512 conducted by a qualified independent testing and inspecting agency.

- a. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 CANOPY FABRICATION

- A. Frames: Preassemble canopy frames in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
 - 1. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - 2. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
 - 3. Weld corners and connections continuously. Obtain fusion without undercut or overlap. Remove welding flux immediately. At exposed corners and connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 4. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications in place and to properly transfer loads.
 - 5. All connections shall be mechanically assembled utilizing 3/16" fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
 - 6. Decking shall be designed with interlocking extruded aluminum members with mechanical fasteners field applied to provide structural integrity for the completed assembly.
 - 7. Concealed drainage. Water shall drain from covered surfaces thru 2"x2" drainage holes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, lighting, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

- A. General: Install canopies at locations and in position indicated, securely connected to supports, free of rack, and in proper relation to adjacent construction. Use mounting methods of types described and in strict compliance with Shop Drawings and fabricator's written instructions by an approved installer.
- B. Install canopies after other finishing operations, including joint sealing and painting, have been completed.
- C. Weld frame connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 - 1. Field Welding: Comply with the following requirements:
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. Remove welding flux immediately.
 - d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing canopies to structural support and for properly transferring load to in-place construction.
- E. Corrosion Protection: Coat concealed surfaces of aluminum that come in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- F. Coordinate canopy installation with flashing and joint-sealant installation so these materials are installed in sequence and in a manner that prevents exterior moisture from passing through completed exterior wall and roof assemblies.

3.3 CLEANING AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean field welds, connections, and abraded areas. Paint uncoated and abraded areas with same or compatible material as used for shop-applied finish painting.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

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WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

- B. Galvanized Surfaces: Clean field welds, connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 113100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Cooking equipment including cooktops and microwave ovens.
2. Non-Ventilation range hoods.
3. Refrigerator/freezers.
4. Clothes washers and dryers.
5. Commercial washer and dryer.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed finish.
- C. Appliance Schedule: Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Gas-Burning Appliances: Comply with ANSI Z21 Series standards.
- D. Residential Appliances: Comply with NAECA standards.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

1. Electric Range: Three-year limited warranty for surface-burner elements.
2. Microwave Oven: Five-year limited warranty for defects in the magnetron tube.
3. Refrigerator/Freezer: Five-year limited warranty for in-home service on the sealed refrigeration system.
4. Clothes Washer: 10-year limited warranty for the inner wash basket and outer tub, and five-year limited warranty for the balance suspension system and drive transmission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. See Suggested Vendors List in Section 011000.
- B. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Basis-of-Design Product: The design for each residential appliance is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 COOKING APPLIANCES

- A. Cooktop: Electric.
 1. Basis-of-Design Product.
 - a. Kenyon International; Cooktop Model 41692 (black). Mount in countertop with controls facing front of cabinet.
- B. Microwave Oven :
 1. Basis-of-Design Product:
 - a. Microwave with Hood:
 1. Whirlpool WMH31017HW (White) – all standard units
 - b. Microwave - ADA
 2. Whirlpool WMC30516HW (White) counter top model– all accessible units.

C. Exhaust Hood : NON-VENTING

1. Basis-of-Design Product:
 - a. Whirlpool UXT4030ADW (White)

2.3 REFRIGERATION APPLIANCES

A. Refrigerator/Freezer:

1. Basis-of-Design Product:
 - a. Refrigerator
 1. Whirlpool WRT134TFDW (White) – all standard units
 - b. Refrigerator - ADA
 1. Whirlpool WRT112CZJW (White) – all accessible units

2.4 CLEANING APPLIANCES

- A. Note: Owner may provide via equipment lease with coin machine. Verify with owner. General Contractor to coordinate fusing on service disconnect (both).

B. Coin Operated Residential Clothes Washer:

1. Basis-of-Design Product:
 - a. Speed Queen Quantum Washer Top Load SWNLY2HP_112TW01
 - b. Speed Queen Quantum Washer Front Load (ADA) SFNNFJP_112TW01

C. Coin Operated Residential Clothes Dryer:

1. Basis-of-Design Product:
 - a. Speed Queen Commercial Stack Dryer SSGBCAGW111TW01.

D. Programmable Commercial Clothes Washer:

1. Basis-of-Design Product:
 - a. Contact Mac-Gray Intelligent Laundry Systems – Josh Krancer (781) 376-6410, (800) 298-1022.
 - b. See drawing for door swing on unit.
 - c. Products:
 1. Maytag: MXR65PNATS, Programmable Commercial Washer.
 2. Speed Queen: SC60 – Alternate.

E. Commercial Clothes Dryer:

1. Basis-of-Design Product:

- a. Contact Mac-Gray Intelligent Laundry Systems – Josh Krancer (781) 376-6410, (800) 298-1022.
- b. See drawing for door swing on unit. Coordinate with supplier.
- c. Maytag: MDG75PNHVW, 75 lb. Commercial Dryer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.
- D. Coin Boxes: All coin boxes shall be set for operation by a master key.

END OF SECTION 113100

SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Kitchen cabinets.
2. Vanity cabinets.
3. Plastic-laminate countertops and backsplashes.
4. Window Sills.
5. Registration cabinets and shelf.
6. Quartz countertops and backsplashes.

B. Related Sections:

1. Section 066400 "Plastic Paneling" for requirements for Kitchen backsplash.

1.2 ACTION SUBMITTALS

- A. Product Data: For cabinets, countertop material, and cabinet hardware.
- B. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, methods of joining countertops, and cutouts for plumbing fixtures.
- C. Samples: For each type of material exposed to view.

1.3 QUALITY ASSURANCE

- A. Quality Standards: Unless otherwise indicated, comply with the following standards.
- B. Cabinets: KCMA A161.1, Including the required 5 tests for structural integrity.
- C. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semi exposed location.
- D. Plastic-Laminate Countertops: KCMA A161.2.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Contact Information

1. Dubois Wood Products

- a. Jerry Egloff: (812) 683-3613 x122 (office), jegloff@duboiswood.com

2.2 GUESTROOM KITCHEN AND BATH CABINETS

A. Manufacturer:

1. Dubois Wood Products, Huntingburg, IN

- a. Face Frame: Oak
- b. Style: Oakdale
- c. Finish: Wilsonart Laminate 8201K-12 Grey Elm

B. Cabinet, doors, shelves and end panels: Soft Grain Finish.

C. Adjustable melamine shelves.

D. Fully adjustable pocket-type hinges.

E. Drawers: Continuous European style metal guides, with HPL bottoms.

F. Base Cabinet bottoms: HPL

G. Frames: Solid wood.

H. Kitchen and Vanity Countertops:

- 1. Suites: post formed plastic laminate. Wilsonart 4857-60 "Shadow Zephyr." Matte finish
- 2. Suites (Upgrade): Daltile Frost White Polished.

I. Window Sills

- 1. Suites & Signature: post formed plastic laminate. Formica 933-58 "Mission White"

J. Cabinet Heights:

- 1. Typical studio or suite: see plans
- 2. Accessible studio or suite: see plans

- K. Provide glued in 1"x6"x30" (nom.) blocking under cabinets to receive exhaust hood and microwave. Do not allow to extend below cabinet face frame and be visible.

2.3 PUBLIC SPACE CABINETS

A. Manufacturer:

1. Dubois Wood Products, Huntingburg, IN

- a. Face Frame: Oak
- b. Style: Oakdale
- c. Finish: Wilsonart Laminate 5023-19 Nightfall

B. Cabinet, doors, shelves and end panels: Leno Weave Finish.

C. Adjustable melamine shelves.

D. Fully adjustable pocket-type hinges.

E. Drawers: Continuous European style metal guides, with HPL bottoms.

F. Base Cabinet bottoms: HPL

G. Frames: Solid wood.

H. Registration and Coffee Bar Countertops:

1. Daltile One Quartz NQ76 Simply White, Polished, 2 cm thick.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit openings and are aligned. Complete installation of hardware and accessories as indicated.
- C. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

- E. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c., with toggle bolts through metal backing behind gypsum board.
- F. Fasten plastic-laminate countertops by screwing through corner blocks of base units into underside of countertop. Form seams using splines to align adjacent surfaces, and secure with glue and concealed clamping devices designed for this purpose.
- G. Fasten solid-surfacing-material countertops by screwing through corner blocks of base units into underside of countertop. Align adjacent surfaces, and form seams to comply with manufacturer's written instructions using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- H. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- I. Provide caulk at all cabinet, countertop and backsplash locations where meets installation surfaces. Caulking must be level or slightly coved at joint. Utilize backer rod where joint exceeds 1/4". Tool and finish joints. Leave no visible gaps horizontal or vertical.
- J. Provide white brake metal or wood to enclose rear of range hoods at ADA units. Exhaust hoods in ADA rooms to be pushed out so ports are exposed.

END OF SECTION 123530

SECTION 142100 - ELECTRIC TRACTION ELEVATORS

PART 1- GENERAL

1.1 PREINSTALLATION MEETING

- A. Convene pre-installation meeting before start of installation of elevators.
- B. Require attendance of parties directly affecting work of this section, including Contractor, Architect, and elevator manufacturer/installer.
- C. Review examination, installation, field quality control, adjusting, cleaning, protection, and coordination with other work.

1.2 SUMMARY

- A. Section includes: Electric traction passenger elevators.
- B. Related Sections:
 - 1. Section 013300 "Submittal Procedures"
 - 2. Section 033000 "Cast-in-Place Concrete" for Elevator pits
 - 3. Section 051200 "Structural Steel Framing" for support steel, divider beams, and hoist beams by Contractor
 - 4. Section 055000 "Metal Fabrication" for ladders
 - 5. Section 096519 "Resilient Floor Tile" for finished flooring in elevator cars
 - 6. Section 099123 "Interior Painting" for field painting of elevator entrances over primer
 - 7. Division 23 for heating, cooling, and ventilation of machine room and machinery space
 - 8. Division 26 for light outlets, convenience outlets, light switches, and conduits. Switchboards, Panel boards, and Control Centers (Switchboards and Panel boards): Disconnect switches. Lighting: Light fixtures
 - 9. Division 28 for Heat, smoke, and products of combustion sensing devices. Telephone and Intercommunication Equipment (Voice Communications): Telephone outlets and elevator telephones
- C. Related Documents:
 - 1. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People
 - 2. ADAAG, Americans with Disabilities Act Accessibility Guidelines
 - 3. ANSI/NFPA 70, National Electrical Code
 - 4. ANSI/NFPA 80, Fire Doors and Windows
 - 5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators
 - 6. ANSI/UL 10B, Fire Tests of Door Assemblies
 - 7. ISO 9001-2000 - Quality management Systems – Requirements
 - 8. Model Building Codes

9. All other local applicable codes

1.3 DESIGN REQUIREMENTS

- A. Arrange elevator components in control closet or machinery space so equipment can be removed for repairs or replaced with minimal disturbance to other equipment and components.
- B. Where permitted by code, provide all elevator equipment including controls, drives, transformers, and rescue features within the elevator hoistway.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer/installer's product data, including:
 1. Descriptive brochures or detail drawings of car and hall fixtures, cab ceilings, and product features.
 2. Power Information: Horsepower, starting current, running current, machine and control heat release, and electrical requirements.
- B. Shop Drawings: Submit manufacturer/installer's shop drawings, including plans, elevations, sections, and details, indicating location of equipment, loads, dimensions, tolerances, materials, components, fabrication, fasteners, hardware, finish, options, accessories, and other information to render totally functional elevators.
- C. Samples: Submit manufacturer/installer's samples of standard colors and finishes of finish materials

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Manual: Submit manufacturer/installer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; renewal parts catalogs; and electrical wiring diagrams.
- B. Warranty: Submit manufacturer/installer's standard warranty.

1.6 QUALITY ASSURANCE

- A. Manufacturer/Installer's Qualifications: Specialize in manufacturing and installing elevator equipment, with a minimum of 10 years successful experience.
- B. Regulatory Requirements:
 1. Elevator design, clearances, construction, workmanship, materials, and installation, unless specified otherwise, shall be in accordance with ANSI/ASME A17.1, handicap accessibility, Americans with Disabilities Act, and other codes having legal jurisdiction.

2. ANSI/ASME A17.1 shall govern, except where codes having legal jurisdiction include more rigid requirements or conflict with ANSI/ASME A17.1.
3. Elevator shall follow design and manufacturing procedures certified in accordance with ISO 9001:2000 to meet product and service requirements for quality assurance for new products.
4. Where product is in variance to the published ANSI/ASME A17.1 model code, provide a 3rd party AECO certification demonstrating equivalent function, safety, and performance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer/installer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer/installer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer/installer's instructions.
- C. Handling: Protect materials during handling and installation to prevent damage.

1.8 FIELD CONDITIONS

- A. Temporary Electrical Power:
 1. General Contractor will arrange for temporary 220 VAC, single-phase, 60 Hz, GFCI-protected electricity to be available for installation of elevator components.
 2. Comply with Section 015100 - Temporary Utilities.
- B. Installation of the Elevator
 1. General Contractor will provide permanent three-phase power prior to installation start.
 2. General Contractor will provide clear, rollable access to a 20' x 10' secure and dry storage area prior to delivery.
 3. General Contractor will provide a clean, dry, and complete hoistway along with temporary installation platform and all required OSHA-compliant barricades prior to delivery.
- C. Temporary Use of Elevator:
 1. General Contractor will negotiate with manufacturer/installer for temporary use of elevator, if required.
 2. Temporary use of elevator shall be in accordance with terms and conditions of manufacturer/installer's temporary acceptance form.

1.9 COORDINATION

- A. Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays.

1.10 WARRANTY

- A. Manufacturer/installer shall guarantee materials and workmanship of equipment installed under these specifications and make good, defects not due to ordinary wear or to improper use, which may develop within 1 year after completion of installation or acceptance thereof by beneficial use, whichever is earlier.

1.11 MAINTENANCE SERVICE

- A. Elevator maintenance service shall be performed by elevator manufacturer/installer.
- B. Elevators shall receive regular maintenance on each unit for period of 12 months after completion of work specified herein or acceptance thereof by beneficial use, whichever is earlier.
- C. Trained employees shall make periodic examinations and perform work including necessary adjusting, greasing, oiling, and replacing parts to keep elevators in operation, except parts that require replacement because of accidents, vandalism, misuse, or negligence by parties other than manufacturer/installer.
- D. Manufacturer/installer shall perform all Work, except emergency minor adjustment call-back service, during regular working hours. Manufacturer/installer shall provide emergency minor adjustment call-back service, during regular working hours.
- E. Should Owner request that examinations, cleaning, lubrication, adjustments, repairs, replacements, or emergency minor adjustment call-back service, unless specified herein, be performed on other than manufacturer/installer's regular working hours of regular working days, manufacturer/installer shall absorb straight-time labor charges and Owner will compensate manufacturer/installer for overtime premium, travel time, and expense at normal billing rates.
- F. Elevator Control System:
 - 1. Include built-in remote diagnostic module to relay constant status of elevators and control system to a 24-hour, 7-days-a-week, central-monitoring facility.
 - 2. Remote Monitoring Device: Transmit information on current status of elevators, including malfunctions, system errors, and shutdown.

PART 2 PRODUCTS

2.1 MANUFACTURER/INSTALLER

- A. Manufacturers:
1. "3300" - Schindler Elevator Corp. www.us.schindler.com (973-397-6500) (Preferred)
 2. "Gen2" - Otis Elevator Company www.otis.com (800-441-6847)
 3. "MonoSpace" – Kone, Inc www.kone.com (800-956-5663)
 4. "H Series" – ThyssenKrupp Elevator www.thyssenkruppelevator.com (877-230-0303)
- B. Elevator shall be installed by elevator manufacturer.

2.2 ELEVATOR SYSTEM AND COMPONENTS

- A. Electric Traction Passenger Elevators: Basis of design is the Schindler 3300 Gearless Traction Elevator.

- B. Elevator Equipment Summary:

- | | | |
|-----|--------------------------|---|
| 1. | Application: | Machine Room Less (MRL) |
| 2. | Counterweight Location: | Side |
| 3. | Machine Location: | Top of the hoistway mounted on car and counterweight guide rails |
| 4. | Control Space Location: | Top landing entrance frame or entrance frame at one floor below the top landing |
| 5. | Service: | General Purpose Passenger |
| 6. | Quantity of Units: | 1 Unit |
| 7. | Capacity: | 3500 lbs |
| 8. | Speed: | 150 fpm |
| 9. | Travel: | 28' 6 3/8" |
| 10. | Landings: | 4 |
| 11. | Front Openings: | 4 |
| 12. | Rear Openings: | 0 |
| 13. | Operation: | Microprocessor Single Car Automatic Operation |
| 14. | Clear Inside Dimensions: | 6'-9 3/8" W x 4'-4 1/2" D |
| 15. | Cab Height: | 7'-9" |
| 16. | Guide Rails: | Equivalent to 12 lb. per foot |
| 17. | Entrance Type and Width: | Two Speed Side Opening 3'-6"W x 7'-0"H Doors |
| 18. | Entrance height: | 7'-0" |
| 19. | Power Supply: | 208 Volts 3 Phase 60 Hz |

- C. Performance

1. Car Speed: -10% to +5% of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold up to 125% of rated load per code.

D. Ride Quality:

1. Vertical Vibration (maximum): 25 mg
2. Horizontal Vibration (maximum): 15 mg
3. Vertical Jerk (maximum): 2 ft/sec³
4. Acceleration (maximum): 1.6 ft/sec²
5. In Car Noise: 53-60 dB(A)
6. Stopping Accuracy: ±5mm
7. Starts per hour (maximum): 180

E. Elevator Operation

1. Simplex Collective Operation: Using a microprocessor based controller, operation shall be automatic by means of the car and hall buttons. When all calls have been answered, the car shall park at the last landing served.
2. Group Automatic Operation with Demand-Based Dispatching: Provide reprogrammable group automatic system that assigns cars to hall calls based on a dispatching algorithm designed to minimize passenger waiting time.

F. Operating Features - Standard

1. Door Light Curtain Protection
2. Static AC Drive
3. Phase Monitor Relay
4. Cab Overload with Indicator
5. Load-weighing
6. Central Alarm
7. Remote Monitoring
8. Firefighter's Operation
9. Automatic Evacuation

When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. If the car is at a floor when the power fails, it remains at that floor, opens its doors, and shuts down. If the car is between floors, it is raised or lowered to the first available landing, opens its doors, and shuts down.

G. Operating Features - Optional

1. Independent Service
2. Earthquake Operation compliant with ANSI A17.1
3. Hoistway Access Operation
4. Shunt Trip Protection
5. Parking Feature- Main Floor

2.3 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microprocessor based control system to perform all of the functions of safe elevator operation, as well as perform car and group operational control.

1. All high voltage (110v or above) contact points inside the inspection and test panel shall be protected from accidental contact in a situation where the access panels are open.
 2. The controller shall be distributed throughout the elevator system located in the overhead, cab and inspection and test panel. The inverter will be mounted in the overhead adjacent to the hoist machine and an inspection and test panel will be located in the door jamb at the top floor or one floor below the top floor. No elevator equipment mechanical rooms or closets are required.
 3. Provide multi-bus control architecture to reduce cabling, material and waste.
- B. Drive: Provide a Variable Voltage Variable Frequency AC Closed Loop drive system. Provide stable start without high peak current, quickly reaching a low energy consumption level.
- C. Inspection and Test Panel: Integrated control equipment, main inspection and test panel in door frame at top level served or at one floor below the top level served.

2.4 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine:
1. Gearless asynchronous AC motor with integral drive sheave, service and emergency brakes.
 2. Design machine to enable direct power transfer, thereby avoiding loss of power.
 3. Design machine to be compact, lightweight and durable to optimize material usage and save space.
 4. Mount to structural support channels on top of guide rail system as applicable in hoistway overhead.
- B. Governor:
1. Tension type over-speed governor with remote manual reset.
 2. Mount to structural support channels as applicable in hoistway overhead.
- C. Buffers, Car and Counterweight: Compression spring type buffers to meet code.
- D. Hoistway Operating Devices:
1. Emergency Stop switch in the pit
 2. Terminal stopping switches.
 3. Emergency stop switch on the machine
- E. Positioning System: System consisting of proximity sensors and door zone vanes.
- F. Guide Rails and Attachments: Provide Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.

- G. Suspension System: Non circular Elastomeric coated suspension media with high tensile grade steel cords.
- H. Governor rope: Steel wire rope with 6 mm diameter.

2.5 EQUIPMENT: HOISTWAY ENTRANCES

A. Hoistway Doors and Frames:

- 1. UL rated with required fire rating.
- 2. Doors: Rigid flush panel construction with vertical channel reinforcements.
- 3. Frames: Securely fasten at corners to form unit frame. Frames shall be bolted.

B. Finish:

- 1. Exposed Areas of Corridor Frames: Manufacturer's standard selection of baked enamel P419 Memphis Gray or equal.
- 2. Doors: Manufacturer's standard selection of baked enamel P419 Memphis Gray or equal.

C. Sills: Extruded aluminum.

- D. Entrance Markings and Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.6 EQUIPMENT: CAR COMPONENTS

- A. Car Frame and Safety: Provide car frame with adequate bracing to support the platform and car enclosure. The safety shall be integral to the car frame and shall be flexible guide clamp type.
- B. Platform: Provide platform of steel construction with plywood subfloor and aluminum threshold.
- C. Car Guides: Provide sliding guide shoes mounted to top and bottom of both car and counterweight frame. Arrange each guide shoe assembly to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- D. Provide central guiding system to reduce mechanical friction and energy consumption.
- E. Steel Cab
 - 1. Fire rating: Provide Class B fire rating for cab, or Class A fire rating where required by local Code.
 - 2. Car wall finish: Plastic laminate – Columbia Walnut selections.
 - 3. Base and frieze: Aluminum.
 - 4. Car front finish: Brushed stainless steel.
 - 5. Car door finish: Brushed stainless steel.
 - 6. Ceiling: Canopy ceiling, finished in brushed stainless steel with Compact

- Fluorescent Lighting. Provide lighting consisting of four compact fluorescent energy saving lights located in two semi-oval lateral cutouts located on the center-sides of the cab ceiling, Lexan lens cover.
7. Handrail: 1-3/8" Round and Curved Brushed Aluminum. Locate on Rear & Side walls.
 8. Flooring: By others. Not to exceed 3/8" finished depth.
 9. Ventilation: Provide one-speed fan in canopy.
 10. Emergency Car Lighting: Provide an emergency power unit employing a 12 volt sealed rechargeable battery and static circuits to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 11. Emergency Siren: Provide siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged.
 12. Emergency Exit Switch: Provide an electrical contact to open the safety circuit when the emergency car top exit is opened. When the exit door is opened, the top exit switch shall signal the control and the car will be unable to move.
 13. Emergency Exit Lock: Provide an emergency exit lock where required by local code.
 14. Emergency Exit Guard: Provide emergency exit guard on top of car when required for hoistway wall to platform clearance exceeds 12" or for multiple cars in hoistway.

2.7 DOOR OPERATOR AND REOPENING DEVICES

- A. Door Operator: Provide a closed loop VVVF high performance door operator with frequency controlled drive for fast and reliable operation to open and close the car and hoistway doors simultaneously.
- B. In case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Provide emergency devices and keys for opening doors from the landing as required by local code.
- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. Provide door open button in the car operating panel. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Provide door hangers and tracks for each car and hoistway door. Contour tracks to match the hanger sheaves. Design hangers for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed for life bearings.
- E. Electronic Door Safety Device: Equip car doors with concealed transmitter and receiver infrared beam devices to detect presence of object in process of passing through hoistway entrance and car doorway (light curtain device).
 1. Use multi-beam scanning without moving parts to detect obstructions in door opening.
 2. Detector Device: Prevent doors from closing, or if they have already started

closing, cause doors to reopen and remain open while object is within detection zone.

3. Horizontal Beams: Minimum of 33 infra red beams to fill doorway from ground level to a height of 6 feet.

2.8 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide a car operating panel with all push buttons, key switches and message indicators for elevator operation.
 1. Full height car operating panel shall be surface-mounted on front return.
 2. Comply with handicap requirements.
 3. Push Buttons: Mechanical, illuminating using long-lasting LEDs for each floor served.
 4. Emergency Buttons: Provide in accordance with code. Emergency alarm button, door open and door close buttons
- B. Features of the Car Operating Panel Shall Include:
 1. Digital Car Position Indicator with destination indicator.
 2. Audible chime to signal that the car is either stopping at or passing a floor served by the elevator.
 3. Raised markings and Braille provided to the left hand side of each push button.
 4. Car Lantern: Provide LED illuminated car lantern with direction arrows to comply with local code when hall lanterns are not provided.
 5. Door open and close push buttons.
 6. Firefighter's hat and Phase 2 Key-switch
 7. Inspection key-switch.
 8. Key-switch for optional Independent Service Operation
 9. Illuminated alarm button with raised marking.
 10. Elevator Data Plate marked with elevator capacity and car number.
 11. Help Button: Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
- C. Hall Fixtures: Provide hall fixtures with necessary push buttons and key switches for elevator operation.
 1. Push buttons: Metallic tactile push buttons, up button and down button at intermediate floors, single button at each terminal floor.
 2. Height: Comply with handicap requirements.
 3. Illumination: Illuminating using long-lasting low power LEDs.
- D. CAR Position Indicators no hall lanterns.
- E. LED illuminated Car direction arrows with audible and visible call acknowledgement.

- F. Optional LED illuminated combination hall lantern and position indicator at Main Floor landing.
- G. Hoistway access switches: Provide key-switch at top and/or bottom floor in entrance jamb as required by local code.
- H. Firefighter's Phase 1 Service: Key switch in brushed stainless steel cover plate.
- I. Fixture Cover Plates: For push buttons, hall lanterns and position indicators, resistant white back-printed glass, no screws required for mounting. Provide stainless steel cover plates for Firefighters Phase I switch and hoistway access switches, with tamper resistant screws in same finish.
- J. Mounting: Mount hall fixtures in entrance frames.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine hoistways, hoistway openings, pits, and overheads before starting elevator installation.
- B. Verify hoistway, pit, overhead, and openings are of correct size, within tolerances, and are ready for work of this section.
- C. Verify walls are plumb where openings occur and ready for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- D. Verify hoistway is clear and plumb, with variations not to exceed -0 to +1 inch at any point. Verify projections greater than 4" must be beveled not less than 75 degrees from horizontal. No negative tolerance is permitted for minimum hoistway dimensions.
- E. Verify minimum 2-hour fire-resistance rating of hatch walls.
- F. Notify Architect in writing of dimensional discrepancies or other conditions detrimental to proper installation or performance of elevators.
- G. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to manufacturer/installer.

3.2 INSTALLATION

- A. Install elevators in accordance with manufacturer/installer's instructions and ANSI/ASME A17.1.
- B. Set entrances in vertical alignment with car openings, and aligned with plumb hoistway lines.

3.3 FIELD QUALITY CONTROL

- A. Perform tests of elevator as required by ANSI/ASME A17.1 and governing codes.

3.4 ADJUSTING

- A. Adjust elevators for proper operation in accordance with manufacturer/installer's instructions.
- B. Adjust elevators for smooth acceleration and deceleration of car so not to cause passenger discomfort.
- C. Adjust doors to prevent opening of doors at landing on corridor side, unless car is at rest at that landing, or is in leveling zone and stopping at that landing.
- D. Adjust automatic floor leveling feature at each floor to within 1/4 inch of landing.
- E. Repair minor damages to finish in accordance with manufacturer/installer's instructions and as approved by Architect.
- F. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.5 CLEANING

- A. Clean elevators promptly after installation in accordance with manufacturer/installer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.6 PROTECTION

- A. Protect installed elevators from damage during construction in accordance with the negotiated temporary use agreement between Owner and manufacturer's installer.

END OF SECTION 142100

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Sleeve-seal systems.
 - 4. Sleeve-seal fittings.
 - 5. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

- G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

- A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
 - 1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
 - 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller than NPS 6 Galvanized-steel-pipe sleeves
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller than NPS 6 Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.

- 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
4. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.
5. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 210517

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.
- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type, stamped-steel type with concealed hinge.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with [polished, chrome-plated finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
 - 2. Escutcheons for Existing Piping:
 - a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
 - g. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated finish.
 - h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.

- i. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated finish.
 - j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.
 - 2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 210548.13 - VIBRATION CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Pipe-riser resilient supports.
5. Resilient pipe guides.
6. Elastomeric hangers.

- B. Related Requirements:

1. Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.
2. Section 230548.13 "Vibration Controls for HVAC" for devices for HVAC equipment and systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.

- B. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation device installation for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For testing agency.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads:
 - 1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
 - 2. Size: Factory or field cut to match requirements of supported equipment.
 - 3. Pad Material: Oil and water resistant with elastomeric properties.
 - 4. Surface Pattern: Ribbed or Waffle pattern.
 - 5. Infused nonwoven cotton or synthetic fibers.
 - 6. Load-bearing metal plates adhered to pads.
 - 7. Sandwich-Core Material: Resilient and elastomeric.
 - a. Surface Pattern: Ribbed or Waffle pattern.
 - b. Infused nonwoven cotton or synthetic fibers.

2.2 ELASTOMERIC ISOLATION MOUNTS

- A. Double-Deflection, Elastomeric Isolation Mounts:
 - 1. Mounting Plates:
 - a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
 - 2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 PIPE-RISER RESILIENT SUPPORTS

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch- thick neoprene.

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.5 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch- thick neoprene.

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.6 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

PART 3 - EXECUTION

3.1 EXAMINATION

- ### A.
- Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION CONTROL DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 210548.13

SECTION 211119 - FIRE-DEPARTMENT CONNECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exposed-type fire-department connections.
 - 2. Flush-type fire-department connections.
 - 3. Yard-type fire-department connections.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department connection.

PART 2 - PRODUCTS

2.1 EXPOSED-TYPE FIRE-DEPARTMENT CONNECTION

- A. Manufacturer approved by AHJ.
- B. Standard: UL 405.
- C. Type: Exposed, projecting, for wall mounting. Provide type of connection as required by the AHJ.
- D. Pressure Rating: 175 psig minimum.
- E. Body Material: Corrosion-resistant metal.
- F. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
- G. Caps: Brass, lugged type, with gasket and chain.

- H. Escutcheon Plate: Round, brass, wall type.
- I. Outlet: Back, with pipe threads.
- J. Number of Inlets: as required by AHJ.
- K. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE STANDPIPE."
- L. Finish: Polished chrome plated.
- M. Outlet Size: NPS 4, NPS 5, or NPS 6 as required by NFPA.

2.2 YARD-TYPE FIRE-DEPARTMENT CONNECTION

- A. Manufacturer approved by AHJ.
- B. Standard: UL 405.
- C. Type: Exposed, freestanding. Provide type of connection as required by the AHJ.
- D. Pressure Rating: 175 psig or 300 psig as required by the AHJ.
- E. Body Material: Corrosion-resistant metal.
- F. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
- G. Caps: Brass, lugged type, with gasket and chain.
- H. Escutcheon Plate: Round, brass, floor type.
- I. Outlet: Bottom, with pipe threads.
- J. Number of Inlets: as required by AHJ. .
- K. Sleeve: Brass
- L. Sleeve Height: 18 inches.
- M. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."
- N. Finish, Including Sleeve: Polished chrome plated
- O. Outlet Size: NPS 4, NPS 5, or NPS 6 as required by NFPA.

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fire-department connections.
- B. Examine roughing-in for fire-suppression standpipe system to verify actual locations of piping connections before fire-department connection installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall-type fire-department connections.
- B. Install yard-type fire-department connections in concrete slab support. Comply with requirements for concrete in Section 033000 "Cast-in-Place Concrete."
- C. Install three protective pipe bollards around each fire-department connection. Comply with requirements for bollards in Section 055000 "Metal Fabrications."
- D. Install automatic (ball-drip) drain valve at each check valve for fire-department connection.

END OF SECTION 211119

BRR Architecture, Inc.
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WoodSpring Suites
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SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide all labor, materials, equipment, tools and skilled supervision and appurtenances to provide a complete fire protection system throughout the entire building. Provide wet pipe system(s) throughout building with dry type system(s) in attic and canopies. Provide a standpipe fire protection system in stairwells per city requirements.
- B. Work shall comply with federal, state and local codes, ordinances and regulations. Materials, equipment and complete installation shall be in accordance with NFPA-13 standards. Prepare drawings, hydraulic calculations for approval by all governing agencies including:
- C. City having jurisdiction.
- D. Owners approving agency (if required)
- E. Submit four (4) copies sealed by a Fire Protection Engineer Licensed in the project State to each of the above for review and obtain approval stamp on each copy.
- F. Submit product material equipment brochures to the engineer for approval.
- G. Coordination and Work by Others: Fire protection installer shall coordinate with different trades to avoid interferences. Electrical installer will provide wiring, alarm panels, interlocks, etc. Sprinkler contractor shall provide and install flow and tamper switches. Sprinkler contractor is to furnish any local alarm bells associated with the sprinkler system. Bells will be mounted and wired by the electrician.
- H. Protection against freezing: The attic is protected with a dry-type system. The fourth floor sprinklers shall be wall mounted, concealed with piping in walls. No wet piping in the attic. At contractor's option, lower floor sprinklers may be either concealed wall or concealed ceiling mounted. Provide service/system drain valves as required to allow the dry attic sprinkler system to be drained.
- I. Provide 1" inspectors test where required. Provide double valve drain drops (Drum Drips) for maintenance of dry system. Verify location with architect for approved location of drum drip drain(s) and inspector's test(s) location(s).

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:
 - 1. Pipes, fittings, and specialties.
 - 2. Cover system for sprinkler piping.
 - 3. Specialty valves.
 - 4. Sprinklers.
 - 5. Alarm devices.
 - 6. Manual control stations.
 - 7. Control panels.
 - 8. Pressure gages.
- B. Related Requirements:
 - 1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.

1.4 DEFINITIONS

- A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than 300 psig.
- B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For wet-pipe sprinkler systems.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.

- C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. Compressed air piping.
 - 3. HVAC hydronic piping.
 - 4. Items penetrating finished ceiling include the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
- B. Qualification Data: For qualified Installer and professional engineer.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Welding certificates.
- E. Fire-hydrant flow test report.
- F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- G. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals. As-Built drawings showing all changes made during construction.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on

Project. Provide sign on cabinet stating the fire sprinklers required to be inside per NFPA 13 requirements.

1.9 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of current fire-hydrant flow test (Within 12 months). Installation shall be done by a company licensed and whose principal business is the installation and service of Fire Protection Systems.

- a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

1.10 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than Five days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Construction Manager's and Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. High-Pressure Piping System Component: Listed for 300-psig working pressure.

D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Available fire-hydrant flow test records indicate the following conditions:
 - a. Date:
 - b. Time:
 - c. Performed by: _____ of:
 - d. Location of Residual Fire Hydrant R:
 - e. Location of Flow Fire Hydrant F:
 - f. Static Pressure at Residual Fire Hydrant R:
 - g. Measured Flow at Flow Fire Hydrant F:
 - h. Residual Pressure at Residual Fire Hydrant R:
2. Sprinkler system design shall be approved by authorities having jurisdiction.
 - a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers. If additional safety is required by AHJ or owners insurance, provide the higher of the safety requirement
 - b. Sprinkler Occupancy Hazard Classifications:
 - 1) Automobile Parking Areas: Ordinary Hazard, Group 1
 - 2) Building Service Areas: Ordinary Hazard, Group 1
 - 3) Electrical Equipment Rooms: Ordinary Hazard, Group 1
 - 4) General Storage Areas: Ordinary Hazard, Group 1
 - 5) Laundries: Ordinary Hazard, Group 1
 - 6) Mechanical Equipment Rooms: Ordinary Hazard, Group 1
 - 7) Office and Public Areas: Light Hazard
 - 8) Residential Living Areas: Light Hazard
 - 9) Restaurant Service Areas: Ordinary Hazard, Group 1
3. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Residential (Dwelling) Occupancy: 0.05 gpm over 400-sq. ft. area.
 - b. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - c. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - d. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
 - e. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
 - f. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
 - g. Special Occupancy Hazard: As determined by authorities having jurisdiction.
4. Maximum Protection Area per Sprinkler: According to UL listing.
5. Maximum Protection Area per Sprinkler:
 - a. Residential Areas: 400 sq. ft.
 - b. Office Spaces: 225 sq. ft.
 - c. Storage Areas: 130 sq. ft.
 - d. Mechanical Equipment Rooms: 130 sq. ft.
 - e. Electrical Equipment Rooms: 130 sq. ft.
 - f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
 - a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
 - b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.
 - c. Extra-Hazard Occupancies: 500 gpm for 90 to 120 minutes.
- E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.2 STEEL PIPE AND FITTINGS

- A. Standard-Weight, Galvanized or Black- Steel Pipe: ASTM A53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 10, Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.
- C. Galvanized or Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- D. Galvanized or Uncoated-Steel Couplings: ASTM A 865/A 865M, threaded.
- E. Galvanized or Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- F. Malleable- or Ductile-Iron Unions: UL 860.
- G. Cast-Iron Flanges: ASME 16.1, Class 125.
- H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
 1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick EPDM rubber gasket.
 - a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
 - b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
 2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.
- I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
 1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- J. Grooved-Joint, Steel-Pipe Appurtenances:
 1. Victaulic Company – Grooved Fittings and Couplings will be allowed (No other substitutions allowed)

2. Pressure Rating: 300-psig minimum.
3. Painted Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 CPVC PIPE AND FITTINGS

- A. CPVC Pipe: ASTM F 442/F 442M and UL 1821, SDR 13.5, for 175-psig rated pressure at 150 deg F, with plain ends. Include "LISTED" and "CPVC SPRINKLER PIPE" markings.
- B. CPVC Fittings: UL listed and / or FM Global approved, for 175-psig rated pressure at 150 deg F, socket type. Include "LISTED" and "CPVC SPRINKLER FITTING" markings.
 1. NPS 3/4 to NPS 1-1/2 : ASTM F 438 and UL 1821, Schedule 40, socket type.
 2. NPS 2 to NPS 3: ASTM F 439 and UL 1821, Schedule 80, socket type.
 3. CPVC-to-Metal Transition Fittings: CPVC, one piece, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
 4. CPVC-to-Metal Transition Unions: CPVC, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
 5. Flanges: CPVC, one or two pieces.
- C. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493 solvent cement recommended by pipe and fitting manufacturer, and made for joining CPVC sprinkler pipe and fittings. Include cleaner or primer recommended by pipe and fitting manufacturer.
- D. Plastic Pipe-Flange Gasket and Bolts and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.4 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
 2. High-Pressure Piping Specialty Valves: 300-psig.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Alarm Valves:

1. Victaulic, Reliable, Viking or Tyco
2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
5. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
6. Drip Cup Assembly: Pipe drain with check valve to main drain piping.
7. 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.

G. Automatic (Ball Drip) Drain Valves:

1. Victaulic, Reliable, Viking or Tyco
2. Standard: UL 1726.
3. Pressure Rating: 175-psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.5 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Victaulic Company – Grooved Fittings and Couplings will be allowed (No other substitutions allowed)
2. Standard: UL 213.
3. Pressure Rating: 300 psig.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Potter Electric Signal Company or System Sensor
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175 psig.
3. Body Material: Brass.

4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. AGF or approved equal
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

2.6 SPRINKLERS

A. Victaulic, Reliable, Viking or Tyco

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Residential Sprinklers: 175-psig maximum.

D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

E. Pressure Rating for High-Pressure Automatic Sprinklers: 300 psig.

F. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Residential Applications: UL 1626.
4. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

G. Open Sprinklers with Heat-Responsive Element Removed: UL 199.

1. Nominal Orifice: 1/2 inch, with discharge coefficient K between 5.3 and 5.8.
2. Nominal Orifice: 17/32 inch with discharge coefficient K between 7.4 and 8.2.

H. Sprinkler Finishes: Chrome plated, bronze and painted.

I. Special Coatings: Wax and corrosion-resistant paint.

J. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel two piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: White Cover Plate.

K. Sprinkler Guards:

1. Victaulic, Reliable, Viking or Tyco must be listed with fire sprinkler head being used.
2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Victaulic, Reliable, Viking or Tyco must match Alarm valve manufacture.
2. Standard: UL 753.
3. Type: Mechanically operated, with Pelton wheel.
4. Alarm Gong: Cast aluminum with red-enamel factory finish.
5. Size: 8-1/2-inches diameter.
6. Components: Shaft length, bearings, and sleeve to suit wall construction.
7. Inlet: NPS 3/4.
8. Outlet: NPS 1 drain connection.

C. Electrically Operated Alarm Bell:

1. Potter Electric Signal Company or System Sensor
2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 10-inch diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.
6. 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.

D. Water-Flow Indicators:

1. Potter Electric Signal Company or System Sensor
2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.
8. 2 SPDT circuit switches of voltage as required for fire alarm interface, coordinate with fire alarm contractor.

E. Pressure Switches:

1. Potter Electric Signal Company or System Sensor
2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.

5. Design Operation: Rising pressure signals water flow.
6. 2 SPDT circuit switches of voltage as required for fire alarm interface, coordinate with fire alarm contractor.

F. Valve Supervisory Switches:

1. Potter Electric Signal Company or System Sensor
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. 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.
7. 2 SPDT circuit switches of voltage as required for fire alarm interface, coordinate with fire alarm contractor.

2.8 MANUAL CONTROL STATIONS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.
- B. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.9 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.
 1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
 2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
 3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- C. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- D. Panels Components:

1. Power supply.
2. Battery charger.
3. Standby batteries.
4. Field-wiring terminal strip.
5. Electrically supervised solenoid valves and polarized fire-alarm bell.
6. Lamp test facility.
7. Single-pole, double-throw auxiliary alarm contacts.
8. Rectifier.

2.10 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0- to 250-psig minimum.
- D. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Section 211100 "Facility Fire-Suppression Water-Service Piping" for exterior piping.
- B. Install shutoff valve, with any required backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

- B. Install shutoff valve, with any required backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements for backflow preventers in Section 221119 "Domestic Water Piping Specialties."
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
 - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic ball drip drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to

Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- N. Pressurize and check dry sprinkler system piping, air-pressure maintenance devices and air compressors.
- O. Fill sprinkler system piping with water.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.5 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- L. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

3.6 VE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
 3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.7 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

3.8 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Coordinate with fire-pump tests. Operate as required.
 - 7. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.11 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain all fire protection systems.

3.12 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with [threaded ends, cast-iron threaded fittings, and threaded] [grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved] joints.
- B. CPVC pipe, Schedule 80 CPVC fittings, and solvent-cemented joints may be used for light-hazard and residential occupancies.
- C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be the following:
 - 1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 3. Standard-weight, black-steel pipe with cut or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 4. Standard-weight, black-steel pipe with; steel welding fittings; and welded joints.
 - 5. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 and Larger, shall be the following:
 - 1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 3. Standard-weight, black-steel pipe with cut or roll grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 4. Standard-weight, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 5. Standard-weight, black-steel pipe with; steel welding fittings; and welded joints.
 - 6. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.13 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Brass Upright or Pendent Fire Sprinklers.

2. Rooms with Suspended Ceilings: Chrome Recessed Fire Sprinklers located in the center of tile. Heads shall be Viking "Micro-matic" or "Micro-fast" series as required.
 3. Rooms with Sheetrock Ceilings: Concealed Fire Sprinklers with White Cover Plate.
 4. Wall Mounting: Concealed Sidewall Fire Sprinklers Viking SIN-VK630 with White Cover Plate.
 5. Spaces Subject to Freezing: Brass Upright sprinklers off a dry pipe system or Dry Pendent fire sprinklers off a wet system as per NFPA 13 requirements
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
 2. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
 3. Residential Sprinklers: Finish as specified above in A.
 4. Unfinished spaces not exposed to view; Brass Upright or Pendent Fire Sprinklers with wax coating where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 211316 - DRY-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide all labor, materials, equipment, tools and skilled supervision and appurtenances to provide a complete fire protection system throughout the entire building. Provide wet pipe system(s) throughout building with dry type system(s) in attic and canopies. Provide a standpipe fire protection system in stairwell per city requirements.
- B. Work shall comply with federal, state and local codes, ordinances and regulations. Materials, equipment and complete installation shall be in accordance with NFPA-13 standards. Prepare drawings, hydraulic calculations for approval by all governing agencies including:
- C. City having jurisdiction.
- D. Owners approving agency (if required)
- E. Submit four (4) copies sealed by a Fire Protection Engineer Licensed in the project State to each of the above for review and obtain approval stamp on each copy.
- F. Submit product material equipment brochures to the engineer for approval.
- G. Coordination and Work By Others: Fire protection installer shall coordinate with different trades to avoid interferences. Electrical installer will provide wiring, alarm panels, interlocks, etc. Sprinkler contractor shall provide and install flow and tamper switches. Sprinkler contractor is to furnish any local alarm bells associated with the sprinkler system. Bells will be mounted and wired by the electrician.
- H. Protection against freezing: The attic is protected with a dry-type system. The fourth floor sprinklers shall be wall mounted, concealed with piping in walls. No wet piping in the attic. At contractor's option, lower floor sprinklers may be either concealed wall or concealed ceiling mounted. Provide service/system drain valves as required to allow the dry attic sprinkler system to be drained.
- I. Provide 1" inspectors test where required. Provide double valve drain drops (Drum Drips) for maintenance of dry system. Verify location with architect for approved location of drum drip drain(s) and inspector's test(s) location(s).

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinkler specialty pipe fittings.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gages.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.

1.4 DEFINITIONS

- #### A. Standard-Pressure Sprinkler Piping:
- Dry-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.5 ACTION SUBMITTALS

A. Product Data:

For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

For dry-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

- #### C. Delegated-Design Submittal:
- For dry-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- #### A. Coordination Drawings:
- Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. Compressed air piping.
3. HVAC hydronic piping.
4. Items penetrating finished ceiling including the following:

- a. Lighting fixtures.
 - b. Air outlets and inlets.
- B. Qualification Data: For qualified Installer and professional engineer.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Fire-hydrant flow test report.
- E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- F. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For dry-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

1.10 FIELD CONDITIONS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then

only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than Five days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Construction Manager's and Owner's written permission.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

- A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.
- B. Combined Dry-Pipe and Preaction Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Fire-detection system, located in same area as sprinklers, actuates tripping devices that open dry-pipe valve without loss of air pressure and actuates fire alarm. Water discharges from opened sprinklers.
- C. Single-Interlock Preaction Sprinkler System: Automatic sprinklers are attached to piping containing low-pressure air. Actuation of fire-detection system, located in same area as sprinklers, opens deluge valve, permitting water to flow into sprinkler piping and to discharge from opened sprinklers.
- D. Double-Interlock Preaction Sprinkler System: Automatic sprinklers are attached to piping containing low-pressure air. Actuation of a fire-detection system, located in same area as sprinklers, opens deluge valve, permitting water to flow into sprinkler piping. A closed solenoid valve in the sprinkler piping is opened by another fire-detection device; water will then discharge from opened sprinklers.

2.2 PERFORMANCE REQUIREMENTS

- A.
- B. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 1. NFPA 13.
- C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.
 1. Available fire-hydrant flow test records indicate the following conditions:

- a. Date:
- b. Time:
- c. Performed by: _____ of:
- d. Location of Residual Fire Hydrant R:
- e. Location of Flow Fire Hydrant F:
- f. Static Pressure at Residual Fire Hydrant R:
- g. Measured Flow at Flow Fire Hydrant F:
- h. Residual Pressure at Residual Fire Hydrant R:

E. Sprinkler system design shall be approved by authorities having jurisdiction.

- a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers. If additional safety is required by AHJ or owners insurance, provide the higher of the safety requirement
 - b. Sprinkler Occupancy Hazard Classifications:
 - 1) Automobile Parking Areas: Ordinary Hazard, Group 1
 - 2) Building Service Areas: Ordinary Hazard, Group 1
 - 3) Electrical Equipment Rooms: Ordinary Hazard, Group 1
 - 4) General Storage Areas: Ordinary Hazard, Group 1
 - 5) Laundries: Ordinary Hazard, Group 1
 - 6) Mechanical Equipment Rooms: Ordinary Hazard, Group 1
 - 7) Office and Public Areas: Light Hazard
 - 8) Residential Living Areas: Light Hazard
 - 9) Restaurant Service Areas: Ordinary Hazard, Group 1
2. Minimum Density for Automatic-Sprinkler Piping Design:
- a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
 - d. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
 - e. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
 - f. Special Occupancy Hazard: As determined by authorities having jurisdiction.
3. Maximum Protection Area per Sprinkler: According to UL listing.
4. Maximum Protection Area per Sprinkler:
- a. Office Spaces: 225 sq. ft.
 - b. Storage Areas: 130 sq. ft.
 - c. Mechanical Equipment Rooms: 130 sq. ft.
 - d. Electrical Equipment Rooms: 130 sq. ft.
 - e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
- a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
 - b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.
 - c. Extra-Hazard Occupancies: 500 gpm for 90 to 120 minutes.

- F. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.3 STEEL PIPE AND FITTINGS

- A. Standard-Weight, Galvanized or Black Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 10, Galvanized or Black Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.
- C. Galvanized or Black Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- D. Galvanized or Uncoated Steel Couplings: ASTM A 865/A 865M, threaded.
- E. Galvanized or Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- F. Malleable- or Ductile-Iron Unions: UL 860.
- G. Cast-Iron Flanges: ASME 16.1, Class 125.
- H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
 - 1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick EPDM rubber gasket approved for dry system use.
 - a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
 - b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
 - 2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.
- I. Steel Welding Fittings: ASTM A 234 and ASME B16.9.
 - 1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- J. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Victaulic Company – Grooved Fittings and Couplings will be allowed (No other substitutions allowed) – Verify listed for use with dry pipe systems with proper gasket.
 - 2. Pressure Rating: 300-psig minimum.
 - 3. Painted Grooved-End Fittings for Steel Piping: ASTM A 47, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.

4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Dry-Pipe Valves:
 1. Victaulic, Reliable, Viking or Tyco
 2. Standard: UL 260.
 3. Design: Differential-pressure type.
 4. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 5. Air-Pressure Maintenance Device:
 6. Listed for use with dry pipe valve used.
 7. Standard: UL 260.
 8. Type: Automatic device to maintain minimum air pressure in piping.
 9. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.
 10. Air Compressor:
 - a. Shall be UL listed or FM approved for use on a dry pipe fire sprinkler system(s).
 - b. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - c. Motor Horsepower: Fractional.
 - d. Power: 120-V ac, 60 Hz, single phase.
- G. Automatic (Ball Drip) Drain Valves:
 1. Standard: UL 1726.
 2. Pressure Rating: 175-psig minimum.
 3. Type: Automatic draining, ball check.
 4. Size: NPS 3/4.
 5. End Connections: Threaded.

2.5 SPRINKLER PIPING SPECIALTIES

- A. General Requirements for Dry-Pipe System Fittings: UL listed and or FM approved for dry-pipe service.
- B. Branch Outlet Fittings:
 - 1. Victaulic Company – Grooved Fittings and Couplings will be allowed (No other substitutions allowed)
 - 2. Standard: UL 213.
 - 3. Pressure Rating: 300 psig.
 - 4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 - 5. Type: Mechanical-tee and -cross fittings.
 - 6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 - 7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
 - 8. Branch Outlets: Grooved, plain-end pipe, or threaded.
- C. Flow Detection and Test Assemblies:
 - 1. Potter Electric Signal Company or System Sensor
 - 2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - 3. Pressure Rating: 175-psig minimum.
 - 4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
 - 5. Size: Same as connected piping.
 - 6. Inlet and Outlet: Threaded.
- D. Branch Line Testers:
 - 1. Standard: UL 199.
 - 2. Pressure Rating: 175-psig minimum.
 - 3. Body Material: Brass.
 - 4. Size: Same as connected piping.
 - 5. Inlet: Threaded.
 - 6. Drain Outlet: Threaded and capped.
 - 7. Branch Outlet: Threaded, for sprinkler.
- E. Sprinkler Inspector's Test Fittings:
 - 1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - 2. Pressure Rating: 175-psig minimum.
 - 3. Body Material: Cast- or ductile-iron housing with sight glass.
 - 4. Size: Same as connected piping.
 - 5. Inlet and Outlet: Threaded.

2.6 SPRINKLERS

- A. Victaulic, Reliable, Viking or Tyco
- B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

- C. Pressure Rating for Residential Sprinklers: 175-psig maximum.
- D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- E. Pressure Rating for High-Pressure Automatic Sprinklers: 300 psig .
- F. Automatic Sprinklers with Heat-Responsive Element:
 - 1. Nonresidential Applications: UL 199.
 - 2. Residential Applications: UL 1626.
 - 3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- G. Sprinkler Temperatures: 212 Degree Upright Fire Sprinklers shall be used in Attic areas
- H. Sprinkler Finishes: Chrome plated, bronze and painted.
- I. Special Coatings: Wax or corrosion-resistant paint.
- J. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: Chrome-plated steel two piece, with 1-inch vertical adjustment.
 - 2. Sidewall Mounting: White Cover Plate.
- K. Sprinkler Guards:
 - 1. Victaulic, Reliable, Viking or Tyco must be listed with fire sprinkler head being used.
 - 2. Standard: UL 199.
 - 3. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell:
 - 1. Potter Electric Signal Company or System Sensor
 - 2. Standard: UL 464.
 - 3. Type: Vibrating, metal alarm bell.
 - 4. Size: 10-inch diameter.
 - 5. Finish: Red-enamel factory finish, suitable for outdoor use.
 - 6. 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.
- C. Pressure Switches:
 - 1. Potter Electric Signal Company or System Sensor

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.
6. 2 SPDT circuit switches of voltage as required for fire alarm interface (coordinate with fire alarm contractor)

D. Valve Supervisory Switches:

1. Potter Electric Signal Company or System Sensor
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. 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
7. 2 SPDT circuit switches of voltage as required for fire alarm interface (coordinate with fire alarm contractor)

2.8 MANUAL CONTROL STATIONS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.
- B. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.9 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned type control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.
 1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
 2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
 3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
- B. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- C. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.

D. Panels Components:

1. Power supply.
2. Battery charger.
3. Standby batteries.
4. Field-wiring terminal strip.
5. Electrically supervised solenoid valves and polarized fire-alarm bell.
6. Lamp test facility.
7. Single-pole, double-throw auxiliary alarm contacts.
8. Rectifier.

2.10 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0- to 250-psig minimum.
- D. Label: Include "WATER" or "AIR/WATER" label on dial face.
- E. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements in Section 211100 "Facility Fire-Suppression Water-Service Piping" for exterior piping.
- B. Install shutoff valve, with any required backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."
- B. Install shutoff valve, with any required backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements for backflow preventers in Section 221119 "Domestic Water Piping Specialties."
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
 - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or to outside building.
- K. Connect compressed-air supply to dry-pipe sprinkler piping.

- L. Connect air compressor to the following piping and wiring:
 - 1. Pressure gages and controls.
 - 2. Electrical power system.
 - 3. Fire-alarm devices, including low-pressure alarm.
- M. Install alarm devices in piping systems.
- N. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
- O. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- P. Drain dry-pipe sprinkler piping.
- Q. Pressurize and check dry-pipe sprinkler system piping, air-pressure maintenance devices and air compressors.
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.5 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.6 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 - 2. Install dry-pipe valves with trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air-supply piping.
 - b. Install air-pressure maintenance device with shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.

- c. Install compressed-air-supply piping from building's compressed-air piping system.

3.7 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

3.8 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run air compressors.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.11 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain all fire protection systems.

3.12 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe.
- B. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be the following:
 - 1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 3. Standard-weight, galvanized or black-steel pipe with cut or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 4. Standard-weight, galvanized or black-steel pipe with; steel welding fittings; and welded joints.
 - 5. Schedule 10 galvanized or black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- C. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 and Larger, shall be the following:
 - 1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 3. Standard-weight, black-steel pipe with cut or roll grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 4. Standard-weight, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 5. Standard-weight, galvanized or black-steel pipe with; steel welding fittings; and welded joints.
 - 6. Schedule 10 galvanized or black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.13 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Brass Upright or Pendent Fire Sprinklers.
2. Rooms with Suspended Ceilings: Chrome Recessed Fire Sprinklers located in the center of tile. Heads shall be Viking "Micro-matic" or "Micro-fast" series as required.
3. Rooms with Sheetrock Ceilings: Concealed Fire Sprinklers with White Cover Plate.
4. Wall Mounting: Concealed Sidewall Fire Sprinklers Viking SIN-VK630 with White Cover Plate.
5. Spaces Subject to Freezing: Brass Upright sprinklers off a dry pipe system or Dry Pendent fire sprinklers off a wet system as per NFPA 13 requirements

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
3. Residential Sprinklers: Finish as specified above in A.
4. Unfinished spaces not exposed to view; Brass Upright or Pendent Fire Sprinklers with wax coating where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211316

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513

SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Alignment guides and anchors.
 - 2. Pipe loops and swing connections.

1.3 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.
- B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 ALIGNMENT GUIDES AND ANCHORS

- A. Alignment Guides:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Adesco Manufacturing LLC.
 - b. Advanced Thermal Systems, Inc.

- c. Flexicraft Industries.
 - d. Flex-Weld, Inc.
 - e. Mason Industries, Inc.
 - f. Metraflex Company (The).
 - g. U.S. Bellows, Inc.
2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Stud: Threaded, zinc-coated carbon steel.
 - b. Expansion Plug: Zinc-coated steel.
 - c. Washer and Nut: Zinc-coated steel.
5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
 - b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
 - c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

- A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
- B. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.

- C. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.
- D. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

- A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
- B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.
- C. Attach guides to pipe, and secure guides to building structure.
- D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- E. Anchor Attachments:
 - 1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.
- F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
 - 1. Anchor Attachment to Steel Structural Members: Attach by welding.
 - 2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
- G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 22016

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Sleeve-seal fittings.
 - 4. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40, if permitted by local authority having jurisdiction.

2.2 STACK-SLEEVE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Jay R. Smith Mfg. Co.
 - 2. Zurn Industries, LLC.
- B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
 2. Using grout, seal the space outside of sleeves in slabs and walls.
- C. Install sleeves for pipes passing through interior partitions.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
 - 1. Install fittings that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
 - 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
 - 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.
 - 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Sleeve-seal fittings.
 - 2. Exterior Concrete Walls below Grade:
 - a. Sleeve-seal fittings.
 - 3. Concrete Slabs-on-Grade:
 - a. Sleeve-seal fittings.
 - 4. Concrete Slabs above Grade:
 - a. Stack-sleeve fittings.
 - 5. Interior Partitions:
 - a. PVC-pipe sleeves.

END OF SECTION 220517

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
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SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

- 1. Escutcheons for New Piping:

- a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

- C. Install floor plates for piping penetrations of equipment-room floors.

- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

- 1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Liquid-in-glass thermometers.
 - 2. Thermowells.
 - 3. Dial-type pressure gages.
 - 4. Gage attachments.
 - 5. Test plugs.
 - 6. Test-plug kits.
- B. Related Sections:
 - 1. Section 221113 "Facility Water Distribution Piping" for domestic water meters and combined domestic and fire-protection water-service meters outside the building.
 - 2. Section 221116 "Domestic Water Piping" for water meters inside the building.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

- A. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Miljoco Corporation.
 - b. Palmer Wahl Instrumentation Group.
 - c. Watts; a Watts Water Technologies company.
 - d. Weiss Instruments, Inc.
 - e. Weksler Glass Thermometer Corp.
 - f. WIKA Instrument Corporation.
2. Standard: ASME B40.200.
3. Case: Plastic; 7-inch (178-mm) nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
7. Window: Glass or plastic.
8. Stem: Brass and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Ametek U.S. Gauge.
 - b. Ashcroft Inc.
 - c. Flo Fab inc.
 - d. Marsh Bellofram.
 - e. Miljoco Corporation.
 - f. Palmer Wahl Instrumentation Group.
 - g. Tel-Tru Manufacturing Company.
 - h. Terice, H. O. Co.
 - i. Weiss Instruments, Inc.
 - j. Weksler Glass Thermometer Corp.
 - k. WIKA Instrument Corporation.
 - l. Winters Instruments - U.S.
2. Standard: ASME B40.100.
3. Case: Sealed type; plastic; 4-1/2-inch (114-mm) nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass ball, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. Peterson Equipment Co., Inc.
4. Sisco Manufacturing Company, Inc.
5. Trerice, H. O. Co.
6. Watts; a Watts Water Technologies company.
7. Weiss Instruments, Inc.
8. Weksler Glass Thermometer Corp.

- B. Description: Test-station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/4 (DN 8) or NPS 1/2 (DN 15), ASME B1.20.1 pipe thread.
- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.6 TEST-PLUG KITS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Flow Design, Inc.
 2. Miljoco Corporation.
 3. Peterson Equipment Co., Inc.
 4. Trerice, H. O. Co.
 5. Watts; a Watts Water Technologies company.
 6. Weiss Instruments, Inc.
- B. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.
- C. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F (minus 18 to plus 104 deg C).
- D. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- (51- to 76-mm-) diameter dial and probe. Dial range shall be at least 0 to 200 psig (0 to 1380 kPa).
- E. Carrying Case: Metal or plastic, with formed instrument padding.

3.1 INSTALLATION

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- G. Install valve and snubber in piping for each pressure gage for fluids.
- H. Install test plugs in piping tees.
- I. Install thermometers in the following locations:
 - 1. Inlet and outlet of each water heater.
 - 2. Inlet and outlet of each domestic hot-water storage tank.
 - 3. Outlet of each thermostatic mixing valve.
- J. Install pressure gages in the following locations:
 - 1. Building water service entrance into building.
 - 2. Inlet and outlet of each pressure-reducing valve.
 - 3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).
- B. Scale Range for Domestic Hot-Water Piping: 30 to 240 deg F (0 to plus 115 deg C).

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 160 psi (0 to 1100 kPa).
- B. Scale Range for Domestic Water Piping: 0 to 160 psi (0 to 1100 kPa).

END OF SECTION 220519

SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and soldered ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.18 for solder-joint connections.
 - 2. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

- A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Conbraco Industries, Inc.
 - b. Crane; Crane Energy Flow Solutions.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Watts; a Watts Water Technologies company.
 - f. Zurn Industries, LLC.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.

- e. Ends: Soldered.
- f. Seats: PTFE.
- g. Stem: Bronze or brass.
- h. Ball: Chrome-plated brass.
- i. Port: Full.

B. Three-Piece, Bronze Ball Valves with Full Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Conbraco Industries, Inc.
 - b. DynaQuip Controls.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Watts; a Watts Water Technologies company.
2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Three piece.
 - d. Body Material: Bronze.
 - e. Ends: Soldered.
 - f. Seats: PTFE.
 - g. Stem: Bronze or brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.

2.3 CPVC BALL VALVES

A. One-Piece, CPVC Ball Valves with Full Port, and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. NIBCO INC.
 - b. Spear Manufacturing
2. Description:
 - a. Standard: NSF/ANSI 61.
 - b. CWP Rating: 150 psig.
 - c. Body Design: One piece.
 - d. Body Material: CPVC.
 - e. Ends: Socket.
 - f. Seal: EPDM
 - g. Seats: PTFE.
 - h. Stem: Zinc Plated Steel.
 - i. Ball: CPVC.
 - j. Port: Full.

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Soldered ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: Provided with solder-joint ends.
2. Two-piece, bronze ball valves with full port and bronze or brass trim.
3. Three-piece, bronze ball valves with full port and bronze or brass trim.
4. CPVC Valves: EPDM Seal, Rated for 100 PSI at 180°F minimum.

END OF SECTION 220523.12

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

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SECTION 220523.14 - CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze lift check valves.
 - 2. Bronze swing check valves.
 - 3. Bronze swing check valves, press ends.
 - 4. Iron swing check valves.
 - 5. Iron swing check valves with closure control.
 - 6. CPVC ball check valves.
 - 7. PVC ball check valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set check valves in either closed or open position.
- B. Use the following precautions during storage:

1. Maintain valve end protection.
 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
 2. ASME B16.1 for flanges on iron valves.
 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 4. ASME B16.18 for solder joint.
 5. ASME B31.9 for building services piping valves.
- C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- D. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.
- E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.
- H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE LIFT CHECK VALVES

- A. Bronze Lift Check Valves with Bronze Disc, Class 125:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Crane; a Crane brand.
 - b. Jenkins Valves; a Crane brand.

- c. Stockham; a Crane brand.

2. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Design: Vertical flow.
- d. Body Material: ASTM B61 or ASTM B62, bronze.
- e. Ends: Threaded or soldered. See valve schedule articles.
- f. Disc: Bronze.

2.3 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Crane; a Crane brand.
- b. Jenkins Valves; a Crane brand.
- c. Milwaukee Valve Company.
- d. NIBCO INC.
- e. Stockham; a Crane brand.
- f. WATTS.

2. Description:

- a. Standard: MSS SP-80, Type 3.
- b. CWP Rating: 200 psig.
- c. Body Design: Horizontal flow.
- d. Body Material: ASTM B62, bronze.
- e. Ends: Threaded or soldered. See valve schedule articles.
- f. Disc: Bronze.

2.4 IRON SWING CHECK VALVES

A. Iron Swing Check Valves with Metal Seats, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Milwaukee Valve Company.
- b. NIBCO INC.
- c. WATTS.

2. Description:

- a. Standard: MSS SP-71, Type I.

- b. CWP Rating: 200 psig .
- c. Body Design: Clear or full waterway.
- d. Body Material: ASTM A126, gray iron with bolted bonnet.
- e. Ends: Flanged or threaded. See valve schedule articles.
- f. Trim: Bronze.
- g. Gasket: Asbestos free.

2.5 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Iron Swing Check Valves with Lever- and Spring-Closure Control, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. WATTS.
2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A126, gray iron with bolted bonnet.
 - e. Ends: Flanged or threaded. See valve schedule articles.
 - f. Trim: Bronze.
 - g. Gasket: Asbestos free.
 - h. Closure Control: Factory-installed exterior lever and weight.

2.6 IRON, CENTER-GUIDED, SPRING-LOADED CHECK VALVES

A. Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. WATTS.
2. Description:
 - a. Standard: MSS SP-125.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A126, gray iron.
 - d. Style: Compact wafer, spring loaded.
 - e. Seat: Bronze.

2.7 CPVC BALL CHECK VALVES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. NIBCO INC.
2. Spears Manufacturing Company.

- B. Description:

1. Pressure Rating and Temperature: 150 psig at 73 deg F.
2. Body Material: CPVC.
3. Body Design: Union-type ball check.
4. End Connections for Valves NPS 2 and Smaller: Detachable, socket.
5. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket or threaded.
6. Ball: CPVC.
7. Seals: EPDM- or FKM-rubber O-rings.

2.8 PVC BALL CHECK VALVES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. NIBCO INC.
2. Spears Manufacturing Company.

- B. Description:

1. Pressure Rating and Temperature: 150 psig at 73 deg F.
2. Body Material: PVC.
3. Body Design: Union-type ball check.
4. End Connections for Valves NPS 2 and Smaller: Detachable, socket.
5. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket or threaded.
6. Ball: PVC.
7. Seals: EPDM- or FKM-rubber O-rings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Check Valves: Install check valves for proper direction of flow.
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Center-Guided Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.
- F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
 - b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; or iron, center-guided, metal-seat check valves.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. End Connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered or press-ends.
2. For Copper Tubing, NPS 2-1/2 to NPS: Flanged or threaded.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze swing check valves with bronze disc, Class 125, with soldered end connections.
2. Bronze swing check valves with press-end connections.

B. Pipe NPS 2-1/2 and Larger:

1. Iron swing check valves with closure control lever and spring, Class 125, with threaded end connections.

C. CPVC Pipe NPS 4 and Smaller: CPVC ball check valve.

D. PVC Pipe NPS 4 and Smaller: PVC ball check valve.

END OF SECTION 220523.14

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August 16, 2023

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SECTION 220523.15 - GATE VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Iron gate valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. NRS: Nonrising stem.
- C. OS&Y: Outside screw and yoke.
- D. RS: Rising stem.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set gate valves closed to prevent rattling.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.1 for flanges on iron valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder joint.
 - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream piping unless otherwise indicated.
- F. RS Valves in Insulated Piping: With 2-inch stem extensions.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 IRON GATE VALVES

- A. Class 125, OS&Y, Iron Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Crane; Crane Energy Flow Solutions.
 - b. Flo Fab inc.
 - c. Jenkins Valves; Crane Energy Flow Solutions.
 - d. KITZ Corporation.
 - e. Legend Valve & Fitting, Inc.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Watts; a Watts Water Technologies company.
 - 2. Description:
 - a. Standard: MSS SP-70, Type I.

- b. CWP Rating: 200 psig.
- c. Body Material: Gray iron with bolted bonnet.
- d. Ends: Flanged.
- e. Trim: Bronze.
- f. Disc: Solid wedge.
- g. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. Use gate valves for shutoff service only.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- C. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2-1/2 and Larger: Iron gate valves, Class 125, OS&Y with flanged ends.

END OF SECTION 220523.15

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Pipe stands.
 - 6. Pipe positioning systems.
 - 7. Equipment supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.

- a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches (long and 0.048 inch thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- F. Use padded hangers for piping that is subject to scratching.
- G. Use thermal-hanger shield inserts for insulated piping and tubing.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 4.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 4, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 4 if little or no insulation is required.
 - 4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 4.
 - 6. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 4.
 - 7. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 - 8. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 4.
 - 9. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 10. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 34, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 11. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 4 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 4.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 4 if longer ends are required for riser clamps.
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
 - 6.
- K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- L. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- M. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

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- N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

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SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: Black.
 - 3. Background Color: White.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 - 7. .
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the

Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick.
- B. Letter Color: Red.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- H. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- D. Pipe Label Color Schedule:

1. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.
2. Sanitary Waste Piping:
 - a. Background Color: Safety white.
 - b. Letter Color: Black.

END OF SECTION 220553

SECTION 220716 - PLUMBING EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following plumbing equipment:

- 1. Domestic water, hot-water pumps.
- 2. Domestic water storage tanks.

- B. Related Sections:

- 1. Section 220719 "Plumbing Piping Insulation."

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

- 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with equipment Installer for equipment insulation application.
- C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- D. Fiberglass:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Owens Corning.
 - 2. Pipe Insulation is molded of heavy density resin bonded inorganic glass fibers that come in one-piece Comply with ASTM C 547, Type I & IV.

2.2 ADHESIVES

- A. Materials shall be compatible with fiberglass insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Grade A for bonding insulation jacket lap seams and joints.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Owens Corning.
 - b. Eagle Bridges - Marathon Industries.
 - c. Foster Brand; H. B. Fuller Construction Products.
 - d. Mon-Eco Industries, Inc.

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Foster Brand; H. B. Fuller Construction Products.
 - b. Knauf Insulation.
 - c. Vimasco Corporation.
 - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 5. Color: White.

2.4 SECUREMENTS

- A. Bands:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. ITW Insulation Systems; Illinois Tool Works, Inc.
 - b. RPR Products, Inc.
 - 2. Stainless Steel: ASTM A 167 or ASTM A 240, Type 304 Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
 - 3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
 - 4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

2.5 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Keep insulation materials dry during application and finishing.
- E. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- F. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- G. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
- H. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- I. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- J. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- K. For above ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.4 INSTALLATION OF FIBERGLASS INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023
END OF SECTION 220716

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Domestic recirculating hot-water piping.
 - 4. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Related Sections:
 - 1. Section 220716 "Plumbing Equipment Insulation."

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.6 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- C. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Owens Corning.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534/C534M, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Aeroflex USA.
 - b. Armacell LLC.
- E. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Knauf Insulation.
 - c. Manson Insulation Inc.
 - d. Owens Corning.
 2. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ.
 3. 850 deg F (454 deg C).
 4. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
 5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Ramco Insulation, Inc.
- B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Ramco Insulation, Inc.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Foster Brand; H. B. Fuller Construction Products.
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges - Marathon Industries.
 - c. Foster Brand; H. B. Fuller Construction Products.
 - d. Mon-Eco Industries, Inc.
- D. PVC Jacket Adhesive: Compatible with PVC jacket.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Dow Corning Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. P.I.C. Plastics, Inc.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Foster Brand; H. B. Fuller Construction Products.
 - b. Knauf Insulation.
 - c. Vimasco Corporation.
 - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil dry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges - Marathon Industries.
 - c. Foster Brand; H. B. Fuller Construction Products.
 - d. Mon-Eco Industries, Inc.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 3. Service Temperature Range: 0 to 180 deg F.
 4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges - Marathon Industries.
 - c. Foster Brand; H. B. Fuller Construction Products.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil (0.8-mm) dry film thickness.
 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 5. Color: White.

2.5 SEALANTS

- A. Joint Sealants for Cellular-Glass and Phenolic Products:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges - Marathon Industries.
 - c. Foster Brand; H. B. Fuller Construction Products.

- d. Mon-Eco Industries, Inc.
 - e. Pittsburgh Corning Corporation.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Permanently flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 100 to plus 300 deg F.
 - 5. Color: White or gray.
- B. FSK and Metal Jacket Flashing Sealants:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges - Marathon Industries.
 - c. Foster Brand; H. B. Fuller Construction Products.
 - d. Mon-Eco Industries, Inc.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 5. Color: Aluminum.
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 5. Color: White.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
- 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. P.I.C. Plastics, Inc.
 - c. Proto Corporation.
 - d. Speedline Corporation.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White.
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division.
 - b. Compac Corporation.
 - c. Ideal Tape Co., Inc., an American Biltrite Company.
 - d. Knauf Insulation.
 - e. Venture Tape.
 - 2. Width: 3 inches.
 - 3. Thickness: 11.5 mils.
 - 4. Adhesion: 90 ounces force/inch width.
 - 5. Elongation: 2 percent.
 - 6. Tensile Strength: 40 lbf/inch width.
 - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division.
 - b. Compac Corporation.
 - c. Ideal Tape Co., Inc., an American Biltrite Company.
 - d. Knauf Insulation.
 - e. Venture Tape.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Compac Corporation.
 - b. Ideal Tape Co., Inc., an American Biltrite Company.
 - c. Venture Tape.
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. ITW Insulation Systems; Illinois Tool Works, Inc.
 - b. RPR Products, Inc.
2. Stainless Steel: ASTM A 167 or ASTM A 240, Type 304 or Type 316; 0.015 inch thick, 1/2 inch (wide with wing seal or closed seal).

3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless steel.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. C & F Wire.

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Engineered Brass Company.
 - b. Insul-Tect Products Co.
 - c. McGuire Manufacturing.
 - d. Plumberex Specialty Products, Inc.
 - e. Truebro.
 - f. Zurn Industries, LLC.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Truebro.
 - b. Zurn Industries, LLC.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- D. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. Insulation shall be one of the following:
 - a. 1-1/2 inches thick.
- B. Domestic Hot and Recirculated Hot Water:
 1. Insulation shall be one of the following:
 - a. 1-1/2 inches thick.
- C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
- D. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
- B. Related Requirements:
 - 1. Section 221113 "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- G. Copper Pressure-Seal-Joint Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Elkhart Products Corporation.
 - b. NIBCO INC.
 - c. Viega LLC.
 - d. Uponor
 - 2. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 3. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
- H. Copper Push-on-Joint Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Victaulic Company.
 - 2. Description:
 - a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
- I. Appurtenances for Grooved-End Copper Tubing:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Anvil International.
 - b. Grinnell Mechanical Products.
 - c. Shurjoint Piping Products.
 - d. Victaulic Company.
2. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 copper tube or ASTM B 584 bronze castings.
3. Mechanical Couplings for Grooved-End Copper Tubing:
 - a. Copper-tube dimensions and design similar to AWWA C606.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating: 300 psig.

2.3 CPVC PIPING

- A. CPVC Pipe: ASTM F 441/F 441M, Schedule 40.
 1. CPVC Socket Fittings: ASTM F 438 for Schedule 40.
 2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.
- B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.

2.4 PEX TUBE AND FITTINGS

- A. PEX Distribution System: ASTM F 877, SDR 9 tubing.
- B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper crimp rings and matching PEX tube dimensions. Steel crimp rings are not allowed.
- C. Manifold: Multiple-outlet, metal assembly; with corrosion-resistant-metal valve for each outlet. Plastic manifolds not allowed.

2.5 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- F. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.6 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cascade Waterworks Mfg. Co.
 - b. Jay R. Smith Mfg. Co.
 - c. JCM Industries, Inc.
 - d. Smith-Blair, Inc.
 - e. Viking Johnson.
- D. Plastic-to-Metal Transition Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Charlotte Pipe and Foundry Company.
 - b. Harvel Plastics, Inc.
 - c. Spears Manufacturing Company.
 - d. Uponor.
 - 2. Description:
 - a. CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket end.
- E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Colonial Engineering, Inc.
 - b. NIBCO INC.
 - c. Spears Manufacturing Company.
2. Description:
 - a. CPVC four-part union.
 - b. Brass or stainless-steel threaded end.
 - c. Solvent-cement-joint plastic end.
 - d. Rubber O-ring.
 - e. Union nut.

2.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Central Plastics Company.
 - b. HART Industrial Unions, LLC.
 - c. Jomar Valve.
 - d. Watts; a Watts Water Technologies company.
 - e. Wilkins.
 - f. Zurn Industries, LLC.
 2. Standard: ASSE 1079.
 3. Pressure Rating: 125 psig minimum at 180 deg F.
 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Matco-Norca.
 - d. Watts; a Watts Water Technologies company.
 - e. Wilkins.

- f. Zurn Industries, LLC.
 - 2. Standard: ASSE 1079.
 - 3. Factory-fabricated, bolted, companion-flange assembly.
 - 4. Pressure Rating: 150 psig.
 - 5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric Nipples:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Elster Perfection Corporation.
 - b. Grinnell Mechanical Products.
 - c. Matco-Norca.
 - d. Precision Plumbing Products.
 - e. Victaulic Company.
 - 2. Standard: IAPMO PS 66.
 - 3. Electroplated steel nipple complying with ASTM F 1545.
 - 4. Pressure Rating and Temperature: 300 psig at 225 deg F.
 - 5. End Connections: Male threaded or grooved.
 - 6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- F. Install shutoff valve immediately upstream of each dielectric fitting.
- G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.
- P. Install fittings for changes in direction and branch connections.
- Q. Install PEX piping with loop at each change of direction of more than 90 degrees.
- R. Copper stub outs are to be used for every fixture. PEX stub outs are not allowed.
- S. When using PEX each fixture supply line is to be a continuous home run from the fixture to the manifold no fittings/joints of any kind will be allowed.
- T. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

- U. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- V. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."
- W. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- X. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Y. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Z. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. PEX joints not allowed piping is to be continuous from manifold to individual fixture.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- E. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- F. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- G. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

- H. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
 - I. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2104. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
 - J. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.
 - K. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
 - L. Joint Construction for Grooved-End Steel Piping: Make joints according to AWWA C606. Roll groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
 - M. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
 - N. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 - 2. CPVC Piping: Join according to ASTM D 2846 Appendix.
 - 3. PVC Piping: Join according to ASTM D 2855.
 - O. Joints for PEX Piping: Join according to ASTM F 1807.
 - P. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.
- 3.4 TRANSITION FITTING INSTALLATION
- A. Install transition couplings at joints of dissimilar piping.
- 3.5 DIELECTRIC FITTING INSTALLATION
- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
- D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2 (DN 65): 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 4: 10 feet with 1/2-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.
- G. Install supports for vertical steel piping every 15 feet.
- H. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.
 - 2. NPS 1-1/4 to NPS 2: 48 inches with 3/8-inch rod.
 - 3. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
 - 4. NPS 4: 48 inches with 5/8-inch rod.
- I. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.

- J. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.
- K. Install hangers for vertical PEX piping every 48 inches.
- L. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
 - 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 - e. Manufacturer's representative is to conduct installation inspection.
2. Piping Tests:
- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Plumbers must be certified and have their tools properly calibrated/tested.

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

- b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:
 - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- E. Under-building-slab, domestic water, building-service piping, NPS 4 and larger, shall be the following:
 - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- F. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
 - 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
 - 3. Hard copper tube, ASTM B 88, Type L; copper push-on-joint fittings; and push-on joints.
 - 4. CPVC, Schedule 40 or Schedule 80; socket fittings; and solvent-cemented joints.
 - 5. PEX tube, NPS 1 (DN 25) and smaller; fittings for PEX tube; and crimped joints.
- G. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
 - 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
 - 3. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

- 4.
5. CPVC, Schedule 40; socket fittings; and solvent-cemented joints.
6. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use, ball or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 2. Throttling Duty: Use ball valves for piping NPS 2 and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 and larger.
 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

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SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Outlet boxes.
8. Hose bibbs.
9. Wall hydrants.
10. Water-hammer arresters.
11. Trap-seal primer valves.

- B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Hose-Connection Vacuum Breakers:
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, nonremovable, with manual drain.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 4. Finish: Chrome or nickel plated.
- B. Pressure Vacuum Breakers:
 - 1. Standard: ASSE 1020.
 - 2. Operation: Continuous-pressure applications.
 - 3. Pressure Loss: 5 psig maximum, through middle third of flow range.

2.4 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts; a Watts Water Technologies company.
 - b. Zurn Industries, LLC.
 - 2. Standard: ASSE 1013.
 - 3. Operation: Continuous-pressure applications.
 - 4. Pressure Loss: 12 psig maximum, through middle third of flow range.
 - 5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
 - 6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 - 7. Configuration: Designed for horizontal, straight-through flow.
 - 8. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
- B. Double-Check, Backflow-Prevention Assemblies:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts; a Watts Water Technologies company.
 - b. Zurn Industries, LLC.
 - 2. Standard: ASSE 1015.
 - 3. Operation: Continuous-pressure applications unless otherwise indicated.

4. Pressure Loss: 5 psig maximum, through middle third of flow range.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

C. Dual-Check-Valve Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts; a Watts Water Technologies company.
 - b. Zurn Industries, LLC.
2. Standard: ASSE 1024.
3. Operation: Continuous-pressure applications.
4. Body: Bronze with union inlet.

D. Backflow-Preventer Test Kits:

1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts; a Watts Water Technologies company.
 - b. Zurn Industries, LLC.
2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.6 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
 2. Body: Brass or bronze.
 3. Size: Same as connected piping, but not larger than NPS 2.
 4. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- C. Memory-Stop Balancing Valves:
1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
 2. Pressure Rating: 400-psig minimum CWP.
 3. Size: NPS 2 or smaller.
 4. Body: Copper alloy.
 5. Port: Standard or full port.
 6. Ball: Chrome-plated brass.
 7. Seats and Seals: Replaceable.
 8. End Connections: Solder joint or threaded.
 9. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. Primary, Thermostatic, Water Mixing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Symmons Industries, Inc.
 2. Standard: ASSE 1017.
 3. Pressure Rating: 125 psig minimum unless otherwise indicated.
 4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
 5. Material: Bronze body with corrosion-resistant interior components.
 6. Connections: Threaded inlets and outlet.
 7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
 8. Tempered-Water Setting: 115 deg F.
 9. Valve Finish: Rough bronze.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

- A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum unless otherwise indicated.
 2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.

3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.9 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Mainline.
2. Mounting: Recessed.
3. Material and Finish: Plastic box and faceplate.
4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
6. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.

2.10 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Wheel handle.
14. Include wall flange with each chrome- or nickel-plated hose bibb.

2.11 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Woodford Manufacturing Company.
2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): One with each wall hydrant.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Precision Plumbing Products.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
- D. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, and pump.
- E. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch (38-by-89-mm) fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."
- F. Install water-hammer arresters in water piping according to PDI-WH 201.
- G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Reduced-pressure-principle backflow preventers.
 - 2. Double-check, backflow-prevention assemblies.
 - 3. Water pressure-reducing valves.
 - 4. Calibrated balancing valves.
 - 5. Primary, thermostatic, water mixing valves.

- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Horizontally mounted, in-line, close-coupled centrifugal pumps.

1.3 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.

- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 HORIZONTALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bell & Gossett; a Xylem brand.
 - 2. TACO Incorporated.
- B. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal.
- C. Pump Construction:
 - 1. Casing: Radially split with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
 - 2. Impeller: Statically and dynamically balanced, closed, and keyed to shaft.
 - 3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
 - 4. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
 - 5. Bearings: Oil-lubricated; bronze-journal or ball type.
 - 6. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
- D. Motor: Single speed, with grease-lubricated ball bearings; and resiliently or rigidly mounted to pump casing.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.3 CONTROLS

- A. Thermostats: Electric; adjustable for control of hot-water circulation pump.
 - 1. Type: Water-immersion temperature sensor, for installation in piping.
 - 2. Range: 65 to 200 deg F.
 - 3. Enclosure: NEMA 250, Type 4X.
 - 4. Operation of Pump: On or off.
 - 5. Transformer: Provide if required.
 - 6. Power Requirement: 120 V, ac.
 - 7. Settings: Start pump at 105 deg F and stop pump at 115 deg F.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.2 PUMP INSTALLATION

- A. Comply with HI 1.4.
- B. Install in-line, sealless centrifugal pumps with shaft horizontal unless otherwise indicated.
- C. Install horizontally mounted, in-line, close-coupled centrifugal pumps with shaft(s) horizontal.
- D. Pump Mounting: Install vertically mounted, in-line, close-coupled centrifugal pumps with cast-iron base mounted on concrete base using restrained spring isolators. Comply with requirements for concrete base specified in Section 033053 "Miscellaneous Cast-in-Place Concrete."
 - 1. Minimum Deflection: 1/4 inch.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
- E. Install continuous-thread hanger rods and spring hangers of size required to support pump weight.

1. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
 2. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- F. Install pressure switches in water supply piping.
- G. Install thermostats in hot-water return piping.

3.3 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps to allow service and maintenance.
- C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:
 - a. Horizontally mounted, in-line, separately coupled centrifugal pumps.
 - b. Horizontally mounted, in-line, close-coupled centrifugal pumps.
 - c. Vertically mounted, in-line, close-coupled centrifugal pumps.
 - d. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."
- D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."
1. Install pressure gage at suction of each pump and pressure gage at discharge of each pump. Install at integral pressure-gage tapings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- E. Connect thermostats, and timers to pumps that they control.

3.4 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.5 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set thermostats, and timers for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

3.6 ADJUSTING

- A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust initial temperature set points.
- C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 221123

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Project No. 31000541
August 16, 2023

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SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

2.2 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 - 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 - 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

- a. Straight tees, elbows, and crosses may be used on vent lines.
- 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- K. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install aboveground PVC piping according to ASTM D 2665.
- N. Install underground PVC piping according to ASTM D 2321.
- O. Install engineered soil and waste and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
 - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- P. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - a. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

- R. Install sleeves for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs.
 - 1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. .
 - 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in ODs.
 - 2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

- b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
- 5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- 6. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for ABS and PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch (10-mm) rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- G. Install supports for vertical PVC piping every 48 inches.
- H. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
 - c. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

- a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

- A. Aboveground, soil and waste piping shall be any of the following:
 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- B. Underground, soil, waste, and vent piping shall be any of the following:
 1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION 221316

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SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cleanouts.
 - 2. Roof flashing assemblies.
 - 3. Through-penetration firestop assemblies.
 - 4. Miscellaneous sanitary drainage piping specialties.
- B. Related Requirements:
 - 1. Section 221423 "Storm Drainage Piping Specialties" for trench drains for storm water, channel drainage systems for storm water, roof drains, and catch basins.
 - 2. Section 334100 "Storm Utility Drainage Piping" for storm drainage piping and piping specialties outside the building.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary waste piping specialty components.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing, and marked for intended location and application.

2.2 CLEANOUTS

- A. Cast-Iron Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Body or Ferrule: Cast iron.
5. Closure: Plastic plug.
6. Adjustable Housing Material: Cast iron with threads.
7. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
8. Frame and Cover Shape: Square.
9. Top Loading Classification: Light Duty.
10. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug:
 - a. Brass.
 - b. Countersunk head.
 - c. Drilled and threaded for cover attachment screw.
 - d. Size: Same as or not more than one size smaller than cleanout size.
6. Wall Access: Round, deep, stainless-steel cover plate with screw.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - a. Open-Top Vent Cap: Without cap.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Standard: UL 1479 assembly of sleeve-and-stack fitting with firestopping plug.
2. Size: Same as connected soil, waste, or vent stack.
3. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
4. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
 - a. NPS 2: 4-inch- (100-mm-) minimum water seal.
 - b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch (25 mm) above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

E. Expansion Joints:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet.
 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
 1. Comply with requirements in Section 078413 "Penetration Firestopping."
- G. Install deep-seal traps on all floor drains.
- H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- I. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.
- J. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- K. Install wood-blocking reinforcement for wall-mounting-type specialties.

- L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

- A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- B. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.
- C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- D. Set flashing on floors and roofs in solid coating of bituminous cement.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections, and prepare test reports.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

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- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221319.13 - SANITARY DRAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Floor drains.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

- A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

- A. Cast-Iron Floor Drains:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Zurn Industries, LLC.
 - 2. Standard: ASME A112.6.3.
 - 3. Outlet: Bottom.
 - 4. Provide with Trap-seal primer connection.
 - 5. Sediment Bucket: Not required.
 - 6. Top or Strainer Material: Nickel bronze.
 - 7. Top of Body and Strainer Finish: Nickel bronze.
 - 8. Top Shape: Round.
 - 9. Top Loading Classification: Light Duty.

3.1 INSTALLATION

- A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
 - 3. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 - 4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
 - a. Maintain integrity of waterproof membranes where penetrated.
 - 5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319.13

SECTION 221429 - SUMP PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Submersible sump pumps.
 - 2. Sump-pump basins and basin covers.
 - 3. Packaged drainage-pump units.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

2.1 SUBMERSIBLE SUMP PUMPS

A. Submersible, Fixed-Position, Single-Seal Sump Pumps:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Zoeller Company.
2. Description: Factory-assembled and -tested sump-pump unit.
3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
5. Impeller: Statically and dynamically balanced, ASTM A 48/A 48M, Class No. 25 A cast iron and ASTM B 584, cast bronze, design for clear wastewater handling, and keyed and secured to shaft.
6. Pump and Motor Shaft: Stainless steel or steel, with factory-sealed, grease-lubricated ball bearings.
7. Seal: Mechanical.
8. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
9. Controls:
 - a. Enclosure: NEMA 250, Type 1.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
 - d. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120-V ac, with transformer and contacts for remote alarm bell.
10. Control-Interface Features:
 - a. Remote Alarm Contacts: For remote alarm interface.

2.2 SUMP-PUMP BASINS AND BASIN COVERS

- ### A. Basins: Factory-fabricated, watertight, cylindrical, basin sump with top flange and sidewall openings for pipe connections.
1. Material: Fiberglass or Polyethylene.
 2. Reinforcement: Mounting plates for pumps, fittings, and accessories.

2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of storm drainage piping connections before sump pump installation.

3.2 INSTALLATION

- A. Pump Installation Standards: Comply with HI 1.4 for installation of sump pumps.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Pumps and controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 ADJUSTING

A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust control set points.

END OF SECTION 221429

SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.
 - 2. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Controls and Other Components: One year(s).
 - b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

- A. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. A. O. Smith.
 - b. State Water heaters
- 2. Standard: ANSI Z21.10.3/CSA 4.3.
 - 3. Description: Manufacturer's proprietary design to provide at least 95 percent combustion efficiency at optimum operating conditions.
 - 4. Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.
 - a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.
 - 1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
 - 2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.24 for copper and copper-alloy flanges.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Lining: Glass complying with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.
 - 5. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
 - e. Jacket: Steel with enameled finish.
 - f. Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for gas-fired, high-efficiency, domestic-water heaters and natural-gas fuel.
 - g. Temperature Control: Adjustable thermostat.
 - h. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
 - i. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. AMTROL, Inc.
2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and calibrated balancing valves to provide balanced flow through each domestic-water heater.
- F. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
 1. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."
- G. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.
- H. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
- I. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- J. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.
 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- K. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
 1. Maintain manufacturer's recommended clearances.
 2. Arrange units so controls and devices that require servicing are accessible.
 3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 6. Install anchor bolts to elevations required for proper attachment to supported equipment.
 7. Anchor domestic-water heaters to substrate.
- B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 and Section 220523.15 "Gate Valves for Plumbing Piping."
- C. Install gas-fired, domestic-water heaters according to NFPA 54.
 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
 3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.

4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."
- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- G. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- H. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
- I. Fill domestic-water heaters with water.
- J. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.

END OF SECTION 223400

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SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Water closets.
 - 2. Toilet seats.
 - 3. Supports.

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 INSTALLATION

- A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Install toilet seats on water closets.

C. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

D. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

2.3 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

2.4 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

2.5 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.

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- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

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SECTION 224216.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Service sinks.
 - 2. Utility sinks.
 - 3. Sink faucets.
 - 4. Supply fittings.
 - 5. Waste fittings.
 - 6. Supports.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
 - 2. Include rated capacities, operating characteristics and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sinks to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Equal to 2 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 2 percent of amount of each type and size installed.

2.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install water-supply piping with stop on each supply to each sink faucet.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
 - 2. Install stops in locations where they can be easily reached for operation.
- C. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- D. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- E. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

2.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

2.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

2.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

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SECTION 224223 - COMMERCIAL SHOWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Individual shower receptors.
 - 2. Shower faucets.
 - 3. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for showers.
 - 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For shower faucets to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Equal to 5 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 2 percent of amount of each type and size installed.

2.1 EXAMINATION

- A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.
- B. Examine walls and floors for suitable conditions where showers will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 INSTALLATION

- A. Assemble shower components according to manufacturers' written instructions.
- B. Install showers level and plumb according to roughing-in drawings.
- C. Install water-supply piping with stop on each supply to each shower faucet.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with shower. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
 - 2. Install stops in locations where they can be easily reached for operation.
- D. Set shower receptors in leveling bed of cement grout.
- E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheons requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- F. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

2.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with traps and soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

2.4 ADJUSTING

- A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.

2.5 CLEANING AND PROTECTION

- A. After completing installation of showers and basins, inspect and repair damaged finishes.
- B. Clean showers and basins, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed fixtures and fittings.
- D. Do not allow use of showers and basins for temporary facilities unless approved in writing by Owner.

END OF SECTION 224223

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SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed ductwork located in conditioned space.
 - 2. Indoor, concealed ductwork located in unconditioned space.
- B. Related Sections:
 - 1. Section 230716 "HVAC Equipment Insulation."
 - 2. Section 230719 "HVAC Piping Insulation."
 - 3. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Provide with factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.

- b. Johns Manville; a Berkshire Hathaway company.
- c. Knauf Insulation.
- d. Owens Corning.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.

2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
 - 1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
 - 2. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
 - 3. Color: White.

2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 - 4. Color: Aluminum.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

2.7 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Width: 3 inches (75 mm).
 2. Thickness: 6.5 mils (0.16 mm).
 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.8 SECUREMENTS

- A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant.
 3. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant.
 3. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
1. Comply with requirements in Section 078413 "Penetration Firestopping."
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

- b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
4. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
5. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.5 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 1. Indoor, concealed ductwork.
 2. Indoor, exposed ductwork.
- B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches (38 mm) thick and 1.5-lb/cu. ft. (24-kg/cu. m) nominal density.

B. Exposed duct shall be lined as per Section 233113 Metal Ducts – 2.4 Duct Liner.

END OF SECTION 230713

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.
 - 6. Service meters.
 - 7. Concrete bases.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: 100 psig (690 kPa) minimum unless otherwise indicated.
 - 2. Service Regulators: 65 psig (450 kPa) minimum unless otherwise indicated.
 - 3. Minimum Operating Pressure of Service Meter: 5 psig (34.5 kPa).
- B. Natural-Gas System Pressure within Buildings: 0.5 psig (3.45 kPa) or less More than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa).

- C. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa), and is reduced to secondary pressure of 0.5 psig (3.45 kPa) or less.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Piping specialties.
 - 2. Corrugated, stainless-steel tubing with associated components.
 - 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 - 4. Pressure regulators. Indicate pressure ratings and capacities.
 - 5. Service meters. Indicate pressure ratings and capacities. Include bypass fittings.
 - 6. Dielectric fittings.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
- D. Protect stored PE pipes and valves from direct sunlight.

1.8 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

- B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
 - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of natural-gas service.
 - 2. Do not proceed with interruption of natural-gas service without Construction Manager's written permission.

1.9 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
 - 5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
 - 6. Mechanical Couplings:

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Wheatland Tube.
- b. Steel flanges and tube with epoxy finish.
- c. Buna-nitrile seals.
- d. Stainless-steel bolts, washers, and nuts.
- e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
- f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

- 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
- 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
- 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
- 4. Corrugated stainless-steel tubing with polymer coating.
- 5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
- 6. End Fittings: Zinc-coated steel.
- 7. Threaded Ends: Comply with ASME B1.20.1.
- 8. Maximum Length: 72 inches (1830 mm.)

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

- 1. Copper-alloy convenience outlet and matching plug connector.
- 2. Nitrile seals.
- 3. Hand operated with automatic shutoff when disconnected.
- 4. For indoor or outdoor applications.
- 5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

- 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
- 3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
- 4. CWP Rating: 125 psig (862 kPa).

D. Basket Strainers:

- 1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

E. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

F. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
 1. CWP Rating: 125 psig (862 kPa).
 2. Threaded Ends: Comply with ASME B1.20.1.
 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
 6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.
- B. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig (862 kPa).
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BrassCraft Manufacturing Co.; a Masco company.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. BrassCraft Manufacturing Co.; a Masco company.
 - d. Viega
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. BrassCraft Manufacturing Co.; a Masco company.
 - c. Lyall, R. W. & Company, Inc.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton.
 - b. Honeywell Building Solutions; Honeywell International, Inc.
 - c. Johnson Controls.
2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. Normally closed.
6. Visual position indicator.
7. Electrical operator for actuation by appliance automatic shutoff device.

B. Electrically Operated Valves: Comply with UL 429.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eclipse Innovative Thermal Technologies.

- b. Parker Hannifin Corporation.
- c. WATTS.

- 2. Pilot operated.
- 3. Body: Brass or aluminum.
- 4. Seats and Disc: Nitrile rubber.
- 5. Springs and Valve Trim: Stainless steel.
- 6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
- 7. NEMA ICS 6, Type 4, coil enclosure.
- 8. Normally closed.
- 9. Visual position indicator.

2.6 EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Vanguard Valves, Inc.
- 2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
- 3. Maximum Operating Pressure: 5 psig (34.5 kPa).
- 4. Cast-aluminum body with nickel-plated chrome steel internal parts.
- 5. Nitrile-rubber valve washer.
- 6. Sight windows for visual indication of valve position.
- 7. Threaded end connections complying with ASME B1.20.1.
- 8. Wall mounting bracket with bubble level indicator.

2.7 PRESSURE REGULATORS

A. General Requirements:

- 1. Single stage and suitable for natural gas.
- 2. Steel jacket and corrosion-resistant components.
- 3. Elevation compensator.
- 4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Actaris.
 - b. Fisher Control Valves & Instruments; a brand of Emerson Process Management.

c. Invensys.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig (690 kPa).

C. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Actaris.
 - b. American Meter Company.
 - c. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
 - d. Maxitrol Company.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig (13.8 kPa).

D. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton.
 - b. Maxitrol Company.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 1 psig (6.9 kPa).

2.8 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Matco-Norca.
 - c. WATTS.
 - d. Wilkins.
 - e. Zurn Industries, LLC.
 2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Matco-Norca.
 - b. WATTS.
 - c. Wilkins.

2. Description:

- a. Standard: ASSE 1079.
- b. Factory-fabricated, bolted, companion-flange assembly.
- c. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
- d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.9 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 for installation and purging of natural-gas piping.
- B. Install underground, natural-gas piping buried at least 36 inches (900 mm) below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
 - 1. If natural-gas piping is installed less than 36 inches (900 mm) below finished grade, install it in containment conduit.

C. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

D. Copper Tubing with Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

E. Install fittings for changes in direction and branch connections.

F. Install pressure gage downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
 - 1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
 - 2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
 - 3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
 - 4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
 - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
 - 5. Prohibited Locations:
 - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - b. Do not install natural-gas piping in solid walls or partitions.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.

- S. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- T. Do not use natural-gas piping as grounding electrode.
- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- V. Install pressure gage downstream from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."
- W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.

3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.7 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).

5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (15.8 mm).
- D. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
 2. NPS 1/2 and NPS 5/8 (DN 15 and DN 18): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
 3. NPS 3/4 and NPS 7/8 (DN 20 and DN 22): Maximum span, 84 inches (2134 mm); minimum rod size, 3/8 inch (10 mm).
 4. NPS 1 (DN 25): Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).
- E. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:
1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
 2. NPS 1/2 (DN 15): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
 3. NPS 3/4 (DN 20) and Larger: Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

3.8 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.10 PAINTING

- A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior natural-gas piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel (flat).
 - d. Color: Gray.
- C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (flat).
 - d. Color: Gray.
 - 2. Alkyd System: MPI INT 5.1E.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd (flat).
 - d. Color: Gray.
- D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.12 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

3.13 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be one of the following:
 - 1. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.
- B. Aboveground natural-gas piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.
 - 3. Annealed-temper copper tube with wrought-copper fittings and brazed joints.
- C. Branch Piping in Cast-in-Place Concrete to Single Appliance: Annealed-temper copper tube with wrought-copper fittings and brazed joints. Install piping embedded in concrete with no joints in concrete.
- D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)

- A. Aboveground, branch piping NPS 1 (DN 25) and smaller shall be the following:
 - 1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
 - 2. Annealed-temper, tin-lined copper tube with flared joints and fittings.
 - 3. Annealed-temper, copper tube with wrought-copper fittings and brazed joints.
 - 4. Aluminum tube with flared fittings and joints.
 - 5. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.
 - 3. Drawn-temper copper tube with wrought-copper fittings and brazed joints.
- C. Underground, below building, piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.
- D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

- E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.15 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG (3.45 kPa) AND LESS THAN 5 PSIG (34.5 kPa)

- A. Aboveground, branch piping NPS 1 (DN 25) and smaller shall be the following:
 - 1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
 - 2. Annealed-temper, tin-lined copper tube with flared joints and fittings.
 - 3. Annealed-temper, copper tube with wrought-copper fittings and brazed joints.
 - 4. Aluminum tube with flared fittings and joints.
 - 5. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with steel welding fittings and welded joints.
 - 3. Drawn-temper copper tube with wrought-copper fittings and brazed joints.
- C. Underground, below building, piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.
- D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.
- E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.16 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 5 PSIG (34.5 kPa)

- A. Aboveground Piping: Maximum operating pressure more than 5 psig (34.5 kPa).
- B. Aboveground, Branch Piping: Steel pipe with steel welding fittings and welded joints.
- C. Aboveground, distribution piping shall be the following:
 - 1. Steel pipe with steel welding fittings and welded joints.
 - 2. Drawn-temper copper tube with wrought-copper fittings and brazed joints.
- D. Underground, below building, piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.

- E. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- F. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.17 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.

END OF SECTION 231123

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Dryer Vent
3. Sheet metal materials.
4. Duct liner.
5. Sealant and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DRYER VENT

- A. Galvanized steel snap-lock with taped joints (screw fastening not allowed). Elbows shall be smooth radius (1) piece stamped fittings. Piping and fittings must be smooth on the interior with no obstructions to collect lint. Use 45 degree elbows in lieu of 90 degree fittings if allowable. Duct support brackets shall be field fabricated and adhered to duct with gear clamps or similar devices.

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653.
 - 1. Galvanized Coating Designation: G60.

2.5 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 1) Type I, Flexible: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature. R value of at least 4.
 - 2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature. R value of at least 4.
 2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 3. Solvent or Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

2.7 HANGERS AND SUPPORTS

- A. Strap Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- B. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Where ducts pass through fire-rated interior partitions and exterior walls, comply with requirements in Section 078413 "Penetration Firestopping." Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.4 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.5 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.6 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units:

- a. Pressure Class: Positive 1-inch wg.
- b. Minimum SMACNA Seal Class: C.
- c. SMACNA Leakage Class for Rectangular: 24.
- d. SMACNA Leakage Class for Round and Flat Oval: 12.

B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

- a. Pressure Class: Positive or negative 1-inch wg.
- b. Minimum SMACNA Seal Class: C.
- c. SMACNA Leakage Class for Rectangular: 24.
- d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

- a. Pressure Class: Negative 1-inch wg.
- b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
- c. SMACNA Leakage Class for Rectangular: 12.
- d. SMACNA Leakage Class for Round and Flat Oval: 6.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units:

- a. Pressure Class: Positive or negative 1-inch wg (250 Pa).

- b. Minimum SMACNA Seal Class: B.
- c. SMACNA Leakage Class for Rectangular: 24.
- d. SMACNA Leakage Class for Round and Flat Oval: 12.

E. Intermediate Reinforcement:

- 1. Galvanized-Steel Ducts: Galvanized steel.

F. Liner:

- 1. Ductwork within 10'-0" of equipment connections: Fibrous glass, Type I, 1 inch (25 mm) thick.

G. Elbow Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.

H. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
- 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1500 fpm (7.6 m/s) or Lower: Conical tap.
 - b. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023
END OF SECTION 233113

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire dampers.
 - 2. Ceiling radiation dampers.
 - 3. Combination fire and smoke dampers.
 - 4. Duct-mounted access doors.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90 (Z275).
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Ruskin Company.

- B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 2000-fpm (10-m/s) velocity.
- D. Fire Rating: 1-1/2 hours.
- E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.39 inch (9.9 mm) thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

2.4 CEILING RADIATION DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Ruskin Company.
- B. General Requirements:
 - 1. Labeled according to UL 555C by an NRTL.
 - 2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.
- D. Blades: Galvanized sheet steel with refractory insulation.
- E. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.
- F. Fire Rating: 1-1/2 hours.

2.5 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 2000-fpm (10-m/s) velocity.
- D. Fire Rating: 1-1/2 hours.
- E. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel, with mechanically attached corners and mounting flange.
- F. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.
- G. Heat-Responsive Device: Electric resettable link and switch package, factory installed, rated.
- H. Smoke Detector: Integral, factory wired for single-point connection.
- I. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel.
- J. Leakage: Class I.
- K. Rated pressure and velocity to exceed design airflow conditions.
- L. Mounting Sleeve: Factory-installed, 0.039-inch- (1.0-mm-) thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- M. Damper Motors: two-position action.
- N. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 3. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
 - 4. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
 - 5. Electrical Connection: 115 V, single phase, 60 Hz.

O. Accessories:

1. Auxiliary switches for signaling or position indication.
2. Test and reset switches, remote mounted.

2.6 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Ruskin.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:
 - a. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches (460 mm) Square: Continuous and two sash locks.

2.7 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

- C. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 - "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 - 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 - 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
- J. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. Install duct test holes where required for testing and balancing purposes.
- M. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceiling-mounted ventilators.

1.2 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on actual Project site elevations.
- B. Operating Limits: Classify according to AMCA 99.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
1. Certified fan performance curves with system operating conditions indicated.
 2. Certified fan sound-power ratings.
 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 4. Material thickness and finishes, including color charts.
 5. Dampers, including housings, linkages, and operators.
 6. Fan speed controllers.
- B. MAINTENANCE MATERIAL SUBMITTALS

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705.

1.5 COORDINATION

- A. Coordinate size and location of structural support members.

- B. Coordinate sizes and locations of equipment supports and penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Loren Cook Company.
- B. Housing: Steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- D. Grille: Plastic or Aluminum, as called for in equipment schedule.
- E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- F. Accessories:
 - 1. Variable-Speed Controller: Unit mounted solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Controls: As called for in equipment schedule.
 - 3. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
 - 4. Isolation: Rubber-in-shear vibration isolators.
 - 5. Exhaust Wall Caps: Aluminum (0.025") heavy duty exhaust vent cap. Standard sizes range from 4" to 12" diameter with connector duct. See plans for exact size and location. Provide with 1/4" x 1/4" galvanized bird screen for studio exhaust fan exterior vent terminations and omit on dryer exterior vent terminations. Reversomatic Model ECA.
- G. Capacities and Characteristics:
 - 1. All units shall meet or exceed performance indicated in the equipment schedules and shall be selected at conditions indicated in the schedule.

2.2 MOTORS

- A. Provide fans of the type, capacity, and size as scheduled on the drawings.
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- C. Support suspended units from structure using threaded steel rods and spring hangers.
- D. Install units with clearances for service and maintenance.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories.
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 3. Verify that cleaning and adjusting are complete.
 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 5. Adjust belt tension.
 6. Adjust damper linkages for proper damper operation.
 7. Verify lubrication for bearings and other moving parts.
 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 10. Shut unit down and reconnect automatic temperature-control operators.
 11. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust solid-state speed controller.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Lubricate bearings.

END OF SECTION 233423

SECTION 233713.13 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:.

1. Louver face diffusers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
2. Section 233713.23 "Registers and Grilles" for adjustable registers and grilles and fixed-face registers and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 LOUVER FACE DIFFUSERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Titus.

B. Material: Aluminum.

C. Finish: Baked enamel, white.

D. Mounting: Surface.

E. Pattern: Adjustable core style.

- F. Dampers: Radial opposed blade.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

SECTION 233713.23 - AIR REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adjustable blade registers and grilles.
2. Fixed face registers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 REGISTERS AND GRILLES

A. Adjustable Blade Register and/or grille:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
6. Mounting: Countersunk screw.
7. Damper Type: Adjustable opposed blade.

B. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Mounting: Countersunk screw.
6. Damper Type: Adjustable opposed blade.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

SECTION 233723 - HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof hoods.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include operating characteristics, furnished specialties, and accessories.

1.3 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 ROOF HOODS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cook.

- B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 6-6 and 6-7.

- C. Materials: Aluminum sheet, minimum 0.063-inch thick base and 0.050-inch thick hood; suitably reinforced.

- D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base. Curb shall match roof slope and be compatible with roof construction

1. Overall Height: 14 inches.

- E. Bird Screening: Galvanized-steel, 1/2-inch square mesh.

- F. Capacities and Characteristics:

1. All units shall meet or exceed performance indicated in the equipment schedules and shall be selected at conditions indicated in the schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.
- B. Install gravity ventilators with clearances for service and maintenance.
- C. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Section 079200 "Joint Sealants" for sealants applied during installation.
- E. Label gravity ventilators according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."
- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in Section 233113 "Metal Ducts." Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

- A. Adjust damper linkages for proper damper operation.

END OF SECTION 233723

SECTION 238113.11 - PACKAGED TERMINAL AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes packaged, terminal, through-the-wall air conditioners.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Equipment supplier shall provide complete wiring diagrams for field wiring and control connections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Amana; a division of Whirlpool Corporation.
 - 2. Friedrich Air Conditioning Company.

2.2 MANUFACTURED UNITS

- A. Description: Factory-assembled and -tested, self-contained, packaged, terminal air conditioner with room cabinet, electric refrigeration system, heating, and temperature controls; fully charged with refrigerant and filled with oil; with cord-connected chassis.
- B. 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.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Ventilation Rate Procedures," and Section 7 - "Construction and Startup."
- D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.
- E. ASHRAE Thermal Comfort: Applicable requirements in ASHRAE 55.
- F. UL listed and ETL performance certified.

- A. Cabinet: powder-coated steel with removable front panel with concealed latches.
 - 1. Mounting: Wall with wall sleeve and removable cabinet.
 - 2. Louvers: Stamped aluminum.
 - 3. Cabinet Extension: Matching cabinet in construction and finish, allowing diversion of airflow to adjoining room; with grille.
 - 4. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
 - 5. Wall Sleeves: 18 gauge zinc-coated, phosphatized steel, insulated, with baked-on enamel finish.
 - 6. Adjustable indoor air discharge louver.
- B. Refrigeration System: Direct-expansion indoor coil with capillary restrictor and hermetically sealed scroll compressor with external vibration isolation and overload protection.
 - 1. Indoor and Outdoor Coils: Seamless copper tubes mechanically expanded into aluminum fins.
- C. Indoor Fan: Forward curved, centrifugal; with two-speed motor.
- D. Outside air ventilation control with positive closing damper.
- E. Condensate Drain: Drain pan to direct condensate to outdoor coil for re-evaporation and, when applicable, piping to direct condensate to building waste and vent piping.
- F. Outdoor Fan: Forward curved, centrifugal; with two speed motor.
- G. Unit mounted fan cycle switch.
- H. Universal power cord.
- I. Factory wired controls with unit mounted thermostat.

2.4 HEATING

- A. Electric-Resistance Heating Coil: Nickel-chromium-wire, electric-resistance heating elements with contactor and high-temperature-limit switch.

2.5 CAPACITIES AND CHARACTERISTICS

- A. All units shall meet or exceed performance indicated in the equipment schedules and shall be selected at conditions indicated in the schedule.

3.1 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.
- B. Install wall sleeves in finished wall assembly; seal and weatherproof.
- C. Install and anchor wall sleeves to withstand, without damage to equipment and structure, seismic forces required by building code.
- D. Provide additional case support angles as required. Caulk or gasket all exterior openings between wall case and wall surface. Receptacle and wiring by the Electrical Contractor.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections:
 - 1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 - 2. After installing packaged, terminal air conditioners and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Unit is level on base and is flashed in exterior wall.
 - 4. Unit casing has no visible damage.
 - 5. Compressor, air-cooled condenser coil, and fans have no visible damage.
 - 6. Labels are clearly visible.
 - 7. Controls are connected and operable.
 - 8. Shipping bolts, blocks, and tie-down straps are removed.
 - 9. Filters are installed and clean.
 - 10. Drain pan and drain line are installed correctly.
 - 11. Electrical wiring installation complies with manufacturer's submittal and installation requirements in electrical Sections.
 - 12. Installation: Perform startup checks according to manufacturer's written instructions, including the following:
 - a. Lubricate bearings on fan.
 - b. Check fan-wheel rotation for correct direction without vibration and binding.
 - 13. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 14. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. After operational test, change filters.

- D. Packaged, terminal air conditioners will be considered defective if they do not pass tests and inspections.

3.3 ADJUSTING

- A. Adjust initial temperature set points.

END OF SECTION 238113.11

SECTION 238126 - SPLIT-SYSTEM HEAT PUMPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes split-system heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set for each air-handling unit.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Product Options: Drawings indicate size, profiles and dimensional requirements of split-system units and are based on the specific system indicated.

1.5 COORDINATION

- A. Coordinate sizes and locations of bases with actual equipment provided and other trades.
- B. Coordinate sizes, locations, and connections of equipment supports with actual equipment provided and other trades.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. For Compressor, Parts, and Labor: One year from date of Substantial Completion.
- B. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. RUUD.

2.2 INDOOR FAN COIL UNITS

- A. Features: Blower unit shall be completely factory assembled including refrigerant coil, condensate drain pan, fan, motor, filters, and controls in an insulated casing that can be applied in a horizontal or vertical configuration.
- B. Casing: Casing shall be constructed of rugged galvanized sheet metal and steel frame construction. Casing shall be insulated and include knockouts for electrical power and control wiring.
- C. Refrigerant Circuit: Unit shall have single refrigeration circuit controlled by a factory installed non-bleed thermal expansion valve.
- D. Coil: Cooling/heating coil shall be aluminum fins bonded to copper tubing and shall be pressure and leak tested at the factory.
- E. Fan: Blower housing shall be forward curved, dynamically balanced with a direct drive fan motor. Fan motor shall be permanently lubricated.
- F. Filters: Standard size filters shall be included.
- G. Electric Heater: Electric heater shall be included and fit inside an internal compartment of the casing.

- H. Condensate overflow switch.

2.3 OUTDOOR UNITS (5 TONS (18 kW) OR LESS)

- A. Features: Unit shall be fully charged with refrigerant for up to 50 ft. of piping. Unit shall be designed to operate in outdoor ambient temperatures as high as 115 Deg F. Cooling capacity shall be ARI Certified when matched with coil in indoor fan coil unit. Unit shall be UL listed and exterior shall be designed for outdoor application.
- B. Casing: Unit casing shall be constructed of heavy gauge steel and painted with a weather resistant powder paint.
- C. Refrigerant Controls: Refrigerant controls shall include condenser fan and compressor contractor, high and low pressure controls and a factory installed liquid line dryer.
- D. Compressor: Compressor shall have a 5-year limited warranty, internal over temperature and pressure protection, epoxy dipped hermetic motor windings, thermostatic controlled sump heater, and internal spring mounts to reduce vibration and noise.
- E. Condenser Coil: Outdoor coil shall be protected on all four sides by louvered panels and carry a 5-year warranty.
- F. Low ambient cooling controls down to 0 degrees minimum.

2.4 ACCESSORIES

- A. Thermostat: Low voltage 7-day programmable with subbase to control compressor and evaporator fan and supplemental heat. Provide clear locking cover.
- B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- C. Upflow indoor fan coil units shall be mounted on factory furnished pedestal plenums.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on 4" concrete base.
- D. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

- A. Ground equipment.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Installation Inspection: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections.
- B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Verify that units are installed and connected according to the Contract Documents.
- C. Lubricate bearings, Lubricate bearings, adjust belt tension, and change filters.
- D. Perform startup checks according to manufacturer's written instructions and do the following:
1. Fill out manufacturer's checklists.
 2. Check for unobstructed airflow over coils.
 3. Check operation of condenser capacity-control device.
 4. Verify that vibration isolation devices and flexible connectors dampen vibration transmission to structure.

END OF SECTION 238126

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

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SECTION 238239.19 - WALL AND CEILING UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wall and ceiling unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Marley Engineered Products.
 - 2. Berko.
 - 3. QMARK.

2.2 DESCRIPTION

- A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
- B. 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.

2.3 CABINET

- A. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

2.4 COIL

- A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection. Provide integral circuit breaker for overcurrent protection.

2.5 FAN AND MOTOR

- A. Fan: Aluminum propeller directly connected to motor.
- B. Motor: Permanently lubricated, multispeed.

2.6 CONTROLS

- A. Controls: Unit-mounted thermostat and low-voltage relay with transformer kit.
- B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

2.7 CAPACITIES AND CHARACTERISTICS

- A. All units shall meet or exceed performance indicated in the equipment schedules and shall be selected at conditions indicated in the schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wall and ceiling unit heaters to comply with NFPA 90A.
- B. Install wall and ceiling unit heaters level and plumb.
- C. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with all drawings and room details before installation.

END OF SECTION 238239.19

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper building wire rated 600 V or less.
 - 2. Aluminum building wire rated 600 V or less.
 - 3. Metal-clad cable, Type MC, rated 600 V or less.
 - 4. Armored cable, Type AC, rated 600 V or less.
 - 5. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
 - 1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
 - 2. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

- A. RoHS: Restriction of Hazardous Substances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. RoHS compliant.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- D. Conductor Insulation:
 - 1. Type NM: Comply with UL 83 and UL 719.
 - 2. Type THHN and Type THWN-2: Comply with UL 83.

2.2 ALUMINUM BUILDING WIRE

- A. Aluminum wire is NOT allowed for branch circuits. Aluminum wire is allowed for service entrance feeders. Contractor is responsible for redesign of aluminum service entrance feeders if aluminum is desired on this project.
- B. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. RoHS compliant.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Aluminum, complying with ASTM B 800 and ASTM B 801.
- E. Conductor Insulation:
 - 1. Type THHN and Type THWN-2: Comply with UL 83.

2.3 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Comply with UL 1569.
 - 3. RoHS compliant.
 - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Circuits:
 - 1. Single circuit and multicircuit with color-coded conductors.
 - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Ground Conductor: Insulated.
- F. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
 - 2. Type XHHW-2: Comply with UL 44.
- G. Armor: Steel, interlocked.
- H. Jacket: PVC applied over armor.

2.4 ARMORED CABLE, TYPE AC

- A. Description: A factory assembly of insulated current-carrying conductors with or without an equipment grounding conductor in an overall metallic sheath.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. RoHS compliant.
 - 3. Comply with UL 4.
 - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Circuits:
 - 1. Single circuit and multicircuit with color-coded conductors.
 - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Ground Conductor: Insulated.
- F. Conductor Insulation: Type THHN/THWN-2. Comply with UL 83.
- G. Armor: Steel, interlocked.

2.5 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway, Armored cable, Type AC, Metal-clad cable, Type MC,

Nonmetallic-sheathed cable, Type NM. Verify with local AHJ prior to selecting type of conductors being used on project. Nonmetallic-sheathed cable, type NM is preferred.

- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
- B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

BRR Architecture, Inc.
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August 16, 2023

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 5. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- I. Straps: Solid copper, cast-bronze clamp. Rated for 600 A.
- J. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one-piece clamp.
- K. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- L. Water Pipe Clamps:
 1. Mechanical type, two pieces with zinc-plated bolts.
 - a. Material: Tin-plated aluminum.
 - b. Listed for direct burial.
 2. U-bolt type with malleable-iron clamp and copper ground connector.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad; 3/4 inch by 10 feet (19 mm by 3 m).
- B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- E. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

G. Concrete-Encased Grounding Electrode (Under Ground): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.

- a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
 5. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Related Requirements:
 - 1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Hangers.
 - b. Steel slotted support systems.
 - c. Nonmetallic support systems.
 - d. Trapeze hangers.
 - e. Clamps.
 - f. Turnbuckles.
 - g. Sockets.
 - h. Eye nuts.
 - i. Saddles.
 - j. Brackets.
 - 2. Include rated capacities and furnished specialties and accessories.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified."
 - 2. Component Importance Factor: 1.5.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. B-line, an Eaton business.
 - b. Unistrut; Part of Atkore International.
 - 2. Material: Galvanized steel.
 - 3. Channel Width: 1-5/8 inches (41.25 mm).
 - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

8. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 6. Toggle Bolts: All-steel springhead type.
 7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.
- B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMTs, IMCs, and RMCs may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

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Project No. 31000541
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SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Boxes, enclosures, and cabinets.
 - 4. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allied Tube & Conduit; a part of Atkore International.
 - 2. Southwire Company.
 - 3. Thomas & Betts Corporation; A Member of the ABB Group.
 - 4. Wheatland Tube Company.

- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ENT: Comply with NEMA TC 13 and UL 1653.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Rigid HDPE: Comply with UL 651A.
- F. RTRC: Comply with UL 1684A and NEMA TC 14.
- G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

- H. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 3R as indicated on drawings unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Wireway Covers: Hinged type unless otherwise indicated.
- D. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Crouse-Hinds, an Eaton business.
 - 2. RACO; Hubbell.
 - 3. Thomas & Betts Corporation; A Member of the ABB Group.
 - 4. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- K. Gangable boxes are allowed.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 or Type 3R as noted on drawings with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- M. Cabinets:
 - 1. NEMA 250, Type 1 or Type 3R as required by drawings, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
 - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
 - 1. Standard: Comply with SCTE 77.
 - 2. Configuration: Designed for flush burial with open] bottom unless otherwise indicated.
 - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 - 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - 5. Cover Legend: Molded lettering, "ELECTRIC."
 - 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

7. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete.
1. Standard: Comply with SCTE 77.
 2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, "ELECTRIC."
 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 7. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Tests of materials shall be performed by an independent testing agency.
 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC or IMC.
 2. Concealed Conduit, Aboveground: GRC.
 3. Underground Conduit: RNC, Type EPC-40-PVC.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed and Subject to Severe Physical Damage: GRC or IMC.
 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 5. Damp or Wet Locations: GRC or IMC.
- C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use setscrew or compression, steel] fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches ((300 mm)) of enclosures to which attached.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot ((3-m)) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

I. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

L. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

M. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

N. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where an underground service raceway enters a building or structure.
2. Where otherwise required by NFPA 70.

- R. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- S. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC[and EMT] conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
 - d. Attics: 135 deg F (75 deg C) temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- W. Locate boxes so that cover or plate will not span different building finishes.
- X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

- Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- Z. Set metal floor boxes level and flush with finished floor surface.
- AA. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

- D. Install handholes with bottom below frost line.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

- B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading:
 - 1. Basic Wind Speed: coordinate with structural engineer.
 - 2. Building Classification Category: coordinate with structural engineer.
 - 3. Minimum 10 lb/sq. ft. (48.8 kg/sq. m) multiplied by maximum area of HVAC component projected on vertical plane normal to wind direction and 45 degrees either side of normal.
- B. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: coordinate with structural engineer.
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: coordinate with structural engineer.
 - a. Component Importance Factor: coordinate with structural engineer..
 - b. Component Response Modification Factor: coordinate with structural engineer.
 - c. Component Amplification Factor: coordinate with structural engineer.
 - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): coordinate percentage with structural engineer.
 - 4. Design Spectral Response Acceleration at 1.0-Second Period: coordinate percentage with structural engineer.

2.2 RESTRAINT CHANNEL BRACINGS

- A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to

building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

- A. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

- A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.6 ADHESIVE ANCHOR BOLTS

- A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Equipment and Hanger Restraints:
 - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

- E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- F. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
 - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 - 5. Test to 90 percent of rated proof load of device.

- C. Seismic controls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548.16

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
 - 2. Labels.
 - 3. Bands and tubes.
 - 4. Tapes and stencils.
 - 5. Tags.
 - 6. Signs.
 - 7. Cable ties.
 - 8. Paint for identification.
 - 9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.
- B. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

- E. Comply with NFPA 70E requirements for arc-flash warning labels.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage.
- B. Color-Coding for Phase-Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Color for Neutral: White.
 - 4. Color for Equipment Grounds: Green.
- C. Warning Label Colors:
 - 1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

- C. Self-Adhesive Wraparound Labels: Preprinted 3-mil- (0.08-mm-) thick, polyester flexible label with acrylic pressure-sensitive adhesive.
 - 1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 - 2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
- D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 - 1. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
 - b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
 - c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.

2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
- C. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and is 12 inches (300 mm) wide. Stop stripes at legends.
- D. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.
- E. Underground-Line Warning Tape:
 - 1. Tape:

- a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 - 2. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE" .
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE".
 - 3. Tag: Type I:
 - a. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - b. Width: 3 inches (75 mm).
 - c. Thickness: 4 mils (0.1 mm).
 - d. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
 - e. Tensile according to ASTM D 882: 30 lbf (133.4 N) and 2500 psi (17.2 MPa).
 - 4. Tag: Type II:
 - a. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - b. Width: 3 inches (75 mm).
 - c. Thickness: 12 mils (0.3 mm).
 - d. Weight: 36.1 lb/1000 sq. ft. (17.6 kg/100 sq. m).
 - e. Tensile according to ASTM D 882: 400 lbf (1780 N) and 11,500 psi (79.2 MPa).
 - F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).
- 2.6 TAGS
- A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
 - B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch (0.38 mm) thick, color-coded for phase and voltage level, with factory [screened] [printed] permanent designations; punched for use with self-locking cable tie fastener.

C. Write-on Tags:

1. Polyester Tags: 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, [high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches (250 by 360 mm).

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:
 - a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick).
 - b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
 - c. Engraved legend with black letters on white face.
 - d. Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 - 5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.

- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch (10-mm) high letters for emergency instructions at equipment used for power transfer.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- K. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "EMERGENCY POWER."
 - 2. "POWER."
- L. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- N. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- O. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch (13-mm) high letters on 1-1/2-inch (38-mm) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

- P. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- Q. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- R. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- S. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
- T. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- U. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- V. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
 - 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- W. Metal Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose cable ties.
- X. Nonmetallic Preprinted Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose cable ties.
- Y. Write-on Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose cable ties.
- Z. Baked-Enamel Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch (13-mm) high letters on minimum 1-1/2-inch (38-mm) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- AA. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch (13-mm) high letters on 1-1/2-inch (38-mm) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

BB. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch (13-mm) high letters on 1-1/2-inch (38-mm) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

CC. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
 1. "EMERGENCY POWER."
 2. "POWER."
- E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags with the conductor or cable designation, origin, and destination.
- F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

- G. Auxiliary Electrical Systems Conductor Identification: Marker tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- H. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- I. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- J. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
- L. Arc Flash Warning Labeling: Self-adhesive labels.
- M. Operating Instruction Signs: Self-adhesive labels.
- N. Emergency Operating Instruction Signs: Self-adhesive labels with white legend on a red background with minimum 3/8-inch (10-mm) high letters for emergency instructions at equipment used for power transfer.
- O. Equipment Identification Labels:
 - 1. Indoor Equipment: laminated phenolic plastic, black with white core.
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
 - 3. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchgear.
 - e. Switchboards.
 - f. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.

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WoodSpring Suites
1010 NW Ward Road
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- g. Emergency system boxes and enclosures.
- h. Enclosed switches.
- i. Contactors.

END OF SECTION 260553

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SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Electronic time switches.
 - 2. Outdoor photoelectric switches, solid state, flexible mounting.
 - 3. Indoor occupancy and vacancy sensors.
 - 4. Lighting contactors.
- B. Related Requirements:
 - 1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.
 - 2. Warranty Period: Two years from date of Substantial Completion.

2.1 ELECTRONIC TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Intermatic, Inc.
 2. Leviton Manufacturing Co., Inc.
 3. NSi Industries LLC
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
1. Listed and labeled as defined in NFPA 70 and marked for intended location and application.
 2. Contact Configuration: SPDT.
 3. Contact Rating: 20-A ballast load, 120-/240-V ac.
 4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
 5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on all channels.
 6. Astronomic Time: All channels.
 7. Automatic daylight savings time changeover.
 8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES, SOLID STATE, FLEXIBLE MOUNTING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Intermatic, Inc.
 2. Leviton Manufacturing Co., Inc.
 3. NSi Industries LLC
- B. Description: Solid state, with SPST dry contacts rated for 1800 VA, to operate connected contactor coils; complying with UL 773A, and compatible with ballasts and LED lamps.
1. Listed and labeled as defined in NFPA 70, by agency NRTL, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
 3. Time Delay: Five-second minimum, to prevent false operation.
 4. Surge Protection: Metal-oxide varistor.
 5. Mounting: Twist lock complies with ANSI C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure from same source and manufacturer as switch.
 6. Failure Mode: Luminaire stays ON.

2.3 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Wattstopper, W-1000A, W-2000H, & LMDC-100
- B. General Requirements for Sensors:
1. Ceiling-mounted, solid-state indoor occupancy sensors.
 2. Ultrasonic technology.
 3. Separate power pack, Wattstopper model# BZ-150.
 4. Hardwired connection to switch.
 5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 6. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
 7. Sensor Output: Sensor is powered from the power pack.
 8. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac and for 1 hp at 120-V ac. Sensor has 24-V dc, 225-mA, Class 2 power source, as defined by NFPA 70.
 9. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Power Pack: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 11. Bypass Switch: Override the "on" function in case of sensor failure.
- C. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (W-1000A): Detect occupancy anywhere within 40 feet when mounted on a 10-foot high ceiling in a corridor not wider than 24 feet.
 3. Detection Coverage (W-2000H): Detect occupancy anywhere within 50 feet when mounted on a 10-foot high ceiling in a corridor not wider than 40 feet.
 4. Detection Coverage (LMDC-100): Detect occupancy anywhere within a circular area of 1000 sq. ft when mounted on a 120-inch high ceiling.

2.4 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton
 - 2. Leviton Manufacturing Co., Inc.
 - 3. Schneider Electric USA (Square D)
 - 4. Siemens
- B. Description: Electrically operated and electrically held, combination-type lighting contactors with non-fused disconnect, complying with NEMA ICS 2 and UL 508.
 - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
 - 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 - 3. Enclosure: Comply with NEMA 250.
 - 4. Provide with control and pilot devices as indicated on drawings, matching the NEMA type specified for the enclosure.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 CONTACTOR INSTALLATION

- A. Comply with NECA 1.
- B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lighting control devices will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262413 - SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Service and distribution switchboards rated 600 V and less.
 - 2. Surge protection devices.
 - 3. Disconnecting and overcurrent protective devices.
 - 4. Instrumentation.
 - 5. Accessory components and features.
 - 6. Identification.

1.3 ACTION SUBMITTALS

- A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.
 - 1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For each switchboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include schematic and wiring diagrams for power, signal, and control wiring.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.
- B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.
- C. Handle and prepare switchboards for installation according to NECA 400.

1.6 FIELD CONDITIONS

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
- B. Environmental Limitations:
 - 1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).

1.7 COORDINATION

- A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.
- B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
 - 2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.2 SWITCHBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. Siemens Power Transmission & Distribution, Inc.
 - 4. Square D; by Schneider Electric.
- B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. 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.
- E. Comply with NEMA PB 2.

- F. Comply with NFPA 70.
- G. Comply with UL 891.
- H. Front-Connected, Front-Accessible Switchboards:
 - 1. Main Devices: Panel mounted.
 - 2. Branch Devices: Panel mounted.
 - 3. Sections front and rear aligned.
- I. Front- and Side-Accessible Switchboards:
 - 1. Main Devices: Fixed, individually mounted.
 - 2. Branch Devices: Panel mounted.
 - 3. Section Alignment: Front and Rear aligned.
- J. Nominal System Voltage: 208Y/120 V.
- K. Main-Bus Continuous: 1600 A.
- L. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
- M. Indoor Enclosures: Steel, NEMA 250, Type 1.
- N. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
- O. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.
- P. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.
- Q. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- R. Removable, Hinged Rear Doors and Compartment Covers: Secured by captive thumb screws, for access to rear interior of switchboard.
- S. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
- T. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity.
3. Copper feeder circuit-breaker line connections.
4. Ground Bus: **1/4-by-2-inch- (6-by-50-mm-)** hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
5. Disconnect Links:
 - a. Isolate neutral bus from incoming neutral conductors.
 - b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
6. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

2.3 SURGE PROTECTION DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton.
 2. General Electric Company.
 3. Siemens Power Transmission & Distribution, Inc.
 4. Square D; by Schneider Electric.
- B. SPDs: Comply with UL 1449, Type 1.
- C. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.
- D. Features and Accessories:
 1. Integral disconnect switch.
 2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
 3. Indicator light display for protection status.
 4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
 5. Surge counter.
- E. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- F. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
 1. Line to Neutral: 700 V for 208Y/120 V.
 2. Line to Ground: 1200 V for 208Y/120 V.

3. Line to Line: 1000 V for 208Y/120 V.

G. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Line to Line: 1000 V.

H. SCCR: Equal or exceed 200 kA.

I. Nominal Rating: 20 kA.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long and short time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
8. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

- d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
 - f. Communication Capability: Integral communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 - g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - i. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 - j. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
- B. Insulated-Case Circuit Breaker (ICCB): 100 percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.
- 1. Fixed circuit-breaker mounting.
 - 2. Two-step, stored-energy closing.
 - 3. Standard-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Time adjustments for long- and short-time pickup.
 - c. Ground-fault pickup level, time delay, and I^2t response.
 - 4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
 - 5. Remote trip indication and control.
 - 6. Communication Capability: Web enabled integral Ethernet communication module and embedded Web server with factory-configured Web pages (HTML file format). Provide functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 - 7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 - 8. Control Voltage: 120-V ac.
- C. Bolted-Pressure Contact Switch: Operating mechanism uses rotary-mechanical-bolting action to produce and maintain high clamping pressure on the switch blade after it engages the stationary contacts.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton
 - b. Siemens Power Transmission & Distribution, Inc.
 - c. Square D; by Schneider Electric

2. Main-Contact Interrupting Capability: Minimum of 12 times the switch current rating.
 3. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.
 - a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
 - b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.
 4. Auxiliary Switches: Factory installed, SPDT, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
 5. Service-Rated Switches: Labeled for use as service equipment.
 6. Ground-Fault Relay: Comply with UL 1053; self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.
 - a. Configuration: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - b. Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.
 - c. No-Trip Relay Test: Permits ground-fault simulation test without tripping switch.
 - d. Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).
 7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.
- D. High-Pressure, Butt-Type Contact Switch: Operating mechanism uses butt-type contacts and a spring-charged mechanism to produce and maintain high-pressure contact when switch is closed.
1. Manufacturers: subject to compliance with requirements, provide products by one of the following:
 - a. General Electric Company
 2. Main-Contact Interrupting Capability: Minimum of 12 times the switch current rating.
 3. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.
 - a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
 - b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.
 4. Auxiliary Switches: Factory installed, SPDT, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
 5. Service-Rated Switches: Labeled for use as service equipment.

6. Ground-Fault Relay: Comply with UL 1053; self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.
 - a. Configuration: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - b. Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.
 - c. No-Trip Relay Test: Permits ground-fault simulation test without tripping switch.
 - d. Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).
7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.
- E. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- F. Fuses are specified in Section 262813 "Fuses."

2.5 INSTRUMENTATION

- A. Instrument Transformers: NEMA EI 21.1, and the following:
 1. Potential Transformers: NEMA EI 21.1; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
 2. Current Transformers: NEMA EI 21.1; 5 A, 60 Hz, secondary; wound bar type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
 3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
 4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.
- B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
 1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
 - a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
 - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
 - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
 - d. Megawatts: Plus or minus 1 percent.
 - e. Megavars: Plus or minus 1 percent.
 - f. Power Factor: Plus or minus 1 percent.
 - g. Frequency: Plus or minus 0.1 percent.

- h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
 - i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
 - j. Contact devices to operate remote impulse-totalizing demand meter.
 - 2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.
- C. Analog Meters:
 - 1. Meters: 4-inch (100-mm) diameter or 6 inches (150 mm) square, flush or semiflush, with anti-parallax 250-degree scales and external zero adjustment.
- D. Voltmeters: Cover an expanded-scale range of nominal voltage plus 10 percent.
- E. Instrument Switches: Rotary type with off position.
 - 1. Voltmeter Switches: Permit reading of all phase-to-phase voltages and, where a neutral is indicated, phase-to-neutral voltages.
 - 2. Ammeter Switches: Permit reading of current in each phase and maintain current-transformer secondaries in a closed-circuit condition at all times.
- F. Ammeters: 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale. Meter and transfer device with off position, located on overcurrent device door for indicated feeder circuits only.
- G. Watt-Hour Meters and Wattmeters:
 - 1. Comply with ANSI C12.1.
 - 2. Three-phase induction type with two stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
 - 3. Suitable for connection to three- and four-wire circuits.
 - 4. Potential indicating lamps.
 - 5. Adjustments for light and full load, phase balance, and power factor.
 - 6. Four-dial clock register.
 - 7. Integral demand indicator.
 - 8. Contact devices to operate remote impulse-totalizing demand meter.
 - 9. Ratchets to prevent reverse rotation.
 - 10. Removable meter with drawout test plug.
 - 11. Semiflush mounted case with matching cover.
 - 12. Appropriate multiplier tag.
- H. Impulse-Totalizing Demand Meter:
 - 1. Comply with ANSI C12.1.
 - 2. Suitable for use with switchboard watt-hour meter, including two-circuit totalizing relay.
 - 3. Cyclometer.
 - 4. Four-dial, totalizing kilowatt-hour register.
 - 5. Positive chart drive mechanism.

6. Capillary pen holding a minimum of one month's ink supply.
7. Roll chart with minimum 31-day capacity; appropriate multiplier tag.
8. Capable of indicating and recording five-minute integrated demand of totalized system.

2.6 CONTROL POWER

- A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.
- B. Control Circuits: 120-V ac, supplied from remote branch circuit.
- C. Control Circuits: 12-V dc.
- D. Electrically Interlocked Main and Tie Circuit Breakers: Two control-power transformers in separate compartments, with interlocking relays, connected to the primary side of each control-power transformer at the line side of the associated main circuit breaker. 120-V secondaries connected through automatic transfer relays to ensure a fail-safe automatic transfer scheme.
- E. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.
- F. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.7 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.
- C. Portable Circuit-Breaker Lifting Device: Floor-supported, roller-based, elevating carriage arranged for movement of circuit breakers in and out of compartments for present and future circuit breakers.
- D. Overhead Circuit-Breaker Lifting Device: Mounted at top front of switchboard, with hoist and lifting yokes matching each drawout circuit breaker.
- E. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.
- F. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with requirements in Section 260548.16 "Seismic Controls for Electrical Systems" or manufacturer's instructions.

2.8 IDENTIFICATION

- A. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on a photoengraved nameplate.
 - 1. Nameplate: At least **0.032-inch- (0.813-mm-)** thick anodized aluminum, located at eye level on front cover of the switchboard incoming service section.
- B. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on an engraved laminated-plastic (Gravoply) nameplate.
 - 1. Nameplate: At least **0.0625-inch- (1.588 mm-)** thick laminated plastic (Gravoply), located at eye level on front cover of the switchboard incoming service section.
- C. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram.
- D. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.
- E. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.
- F. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store switchboards according to NECA 400.
 - 1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
 - 2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
 - 3. Protect from moisture, dust, dirt, and debris during storage and installation.
 - 4. Install temporary heating during storage per manufacturer's instructions.
- B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.
- C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install switchboards and accessories according to NECA 400.
- B. Equipment Mounting: Install switchboards on concrete base, **4-inch (100-mm)** nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
 - 1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend **2 inches (50-mm)** above concrete base after switchboard is anchored in place.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **18-inch (450-mm)** centers around the full perimeter of concrete base.
 - 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to switchboards.
 - 6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.
- D. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- F. Install filler plates in unused spaces of panel-mounted sections.
- G. Install overcurrent protective devices, surge protection devices, and instrumentation.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Install spare-fuse cabinet.
- I. Comply with NECA 1.

3.3 CONNECTIONS

- A. Comply with requirements for terminating feeder bus specified in Section 262500 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.

- B. Comply with requirements for terminating cable trays specified in Section 260536 "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.
- C. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.
- D. Support and secure conductors within the switchboard according to NFPA 70.
- E. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Acceptance Testing:
 - a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
 - b. Test continuity of each circuit.
 - 2. Test ground-fault protection of equipment for service equipment per NFPA 70.

3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Perform the following infrared scan tests and inspections, and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Switchboard will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

3.7 PROTECTION

- A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.
 - 3. Load centers.

1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. SPD: Surge protective device.
- G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Keys: Two spares for each type of panelboard cabinet lock.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407.

1.8 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet (2000 m).

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. 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.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.
- F. Enclosures: Flush and Surface-mounted, dead-front cabinets.
 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 2. Height: 84 inches (2.13 m) maximum.
 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 4. Finishes:
 - a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.
 - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
- G. Phase, Neutral, and Ground Buses:
 1. Material: Tin-plated aluminum.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 4. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
- H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
1. Panelboards rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
- B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. General Electric Company; GE Energy Management - Electrical Distribution.
 3. Siemens Energy.
 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: Circuit breaker.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers or Bolt-on circuit breakers are acceptable.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company; GE Energy Management - Electrical Distribution.
 - 3. Siemens Energy.
 - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Plug-in or Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- F. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.5 LOAD CENTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company; GE Energy Management - Electrical Distribution.
 - 3. Siemens Energy.
 - 4. Square D; by Schneider Electric.
- B. Load Centers: Comply with UL 67.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges secured with flush latch with tumbler lock; keyed alike.
- F. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.6 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Energy.
4. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with series-connected rating to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
4. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
5. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
6. Subfeed Circuit Breakers: Vertically mounted.
7. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - h. Multipole units enclosed in a single housing with a single handle.
 - i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on position.

2.7 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NECA 407.
- D. Equipment Mounting:
 - 1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Attach panelboard to the vertical finished or structural surface behind the panelboard.

3. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- G. Mount panelboard cabinet plumb and rigid without distortion of box.
- H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- I. Install overcurrent protective devices and controllers not already factory installed.
 1. Set field-adjustable, circuit-breaker trip ranges.
 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- J. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- K. Install filler plates in unused spaces.
- L. Stub four 1-inch (25 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (25 mm) empty conduits into raised floor space or below slab not on grade.
- M. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
 - 1. Measure loads during period of normal facility operations.
 - 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
 - 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262713 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes electricity metering.

1.3 DEFINITIONS

- A. KY or KYZ Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity (kWh) that is based on a relay opening and closing in response to the rotation of the disk in the meter. Electronic meters generate pulses electronically.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metering equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Damage from transient voltage surges.
 - 2. Warranty Period: Cost to repair or replace any parts for two years from date of Substantial Completion.
 - 3. Extended Warranty Period: Cost of replacement parts (materials only, f.o.b. the nearest shipping point to Project site), for eight years, that failed in service due to transient voltage surges.

1.6 COORDINATION

- A. Electrical Service Connections:

1. Coordinate with utility companies and utility-furnished components.
 - a. Comply with requirements of utility providing electrical power services.
 - b. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 916.

2.2 UTILITY METERING INFRASTRUCTURE

- A. Install metering accessories furnished by the utility company, complying with its requirements.
- B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.
- C. Meter Sockets:
 1. Comply with requirements of electrical-power utility company.
 2. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.
- D. Arc-Flash Warning Labels;
 1. Labels: Comply with requirements for "Arc-Flash Warning Labels" as required by the National Electric Code and any local or national code that has authority.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install arc-flash labels as required by NFPA 70.

D. Wiring Method:

1. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Minimum conduit size shall be 1/2 inch (13 mm).

3.2 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Series Combination Warning Label: Self-adhesive labels, with text as required by NFPA 70.
2. Equipment Identification Labels: Self-adhesive labels with clear protective overlay.

END OF SECTION 262713

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Straight-blade convenience and tamper-resistant receptacles.
 - 2. GFCI receptacles.
 - 3. Toggle switches.
 - 4. Wall switch sensor light switches with dual technology sensors.
 - 5. Wall switch sensor light switches with passive infrared sensors.
 - 6. Wall plates.

1.3 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
 - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
 - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
 - 3. Leviton: Leviton Mfg. Company, Inc.
 - 4. Pass & Seymour: Pass & Seymour/Legrand.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.
- D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bryant.
 - b. GE.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Manufacturing Co., Inc.
 - e. Pass & Seymour/Legrand (Pass & Seymour).
- B. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bryant.
 - b. Eaton (Arrow Hart).
 - c. GE.
 - d. Leviton Manufacturing Co., Inc.
 - e. Pass & Seymour/Legrand (Pass & Seymour).

2.3 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bryant.
 - b. GE.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Manufacturing Co., Inc.
 - e. Pass & Seymour/Legrand (Pass & Seymour).

2.4 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Bryant.
 - 2) GE.
 - 3) Hubbell Incorporated; Wiring Device-Kellems.
 - 4) Leviton Manufacturing Co., Inc.
 - 5) Pass & Seymour/Legrand (Pass & Seymour).

2. Two Pole:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Bryant.
 - 2) GE.
 - 3) Hubbell Incorporated; Wiring Device-Kellems.
 - 4) Leviton Manufacturing Co., Inc.
 - 5) Pass & Seymour/Legrand (Pass & Seymour).

3. Three Way:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Bryant.
- 2) GE.
- 3) Hubbell Incorporated; Wiring Device-Kellems.
- 4) Leviton Manufacturing Co., Inc.
- 5) Pass & Seymour/Legrand (Pass & Seymour).

C. Pilot-Light Switches: 120/277 V, 20 A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Bryant.
- b. GE.
- c. Hubbell Incorporated; Wiring Device-Kellems.
- d. Leviton Manufacturing Co., Inc.
- e. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Single pole, with LED-lighted handle, illuminated when switch is off.

2.5 WALL SWITCH SENSOR LIGHT SWITCH, DUAL TECHNOLOGY

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Wattstopper.

- B. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual technology.

1. Connections: Hard wired.
2. Rated 800 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/6 hp at 120-V ac.
3. Adjustable time delay of five, 15 or 30 minutes.
4. Comply with NEMA WD 1, UL 20, and FS W-S-896.

- C. Wattstopper Settings:

WattStopper DW 100

1. Dip Switches #1 & 2: ON, ON – Time Delay; maximum fixed time of 30 minutes.
2. Dip Switch #3: OFF- Walk Through Mode; designed for office building that are entered occasionally after hours.
3. Dip Switch #4: OFF - PIR Sensitivity; this results in high sensitivity for the Passive Infrared Sensor.
4. Dip Switches #5 & 6: OFF, OFF - Trigger Mode.
5. Dip Switch #7: OFF - Audible Alerts; this turns off whistles, beeps and chirps.

6. Dip Switch #8: OFF – This will turn the master switch on when guest occupancy is detected. If the detection of the guest is lost while they sleep, this will turn the master switch back on upon sensors detecting movement. They can turn off individual ceiling lights by using the toggle switch nearest each fixture.
 7. Ultrasonic Sensitivity: MAX – This produces an inaudible 40 kHz signal that detects motion with a receiver and should detect guests around the corner of the bed/ bath wall.
 8. Light Level Adjustment: Press switch down for 7 seconds to disable.
- D. Quick Checks for Proper Configuration: After setting the DW-100 as above, exit the room without touching the master switch. After 30 minutes, the lights should be off, as viewed from the exterior. Upon re-entry into the room, the lights should come back on without touching anything. The lights should remain on the entire time the room is occupied. If the lights turn off if the sensors do not detect a person, moving in the room should re-activate the lights. The small LED indicators should flash in response to detecting movement

2.6 WALL SWITCH SENSOR LIGHT SWITCH, PASSIVE INFRARED

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Wattstopper.
- B. CS-50 Bathroom Sensor
- Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using passive infrared technology.
1. Connections: Hard wired.
 2. Adjustable time delay max of 30 minutes.
 3. Comply with NEMA WD 1, UL 20, and FS W-S-896.
 4. Status LED: ON – This will locate the switch in case it turns off when the bathroom is occupied.

2.7 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, thermoplastic with lockable cover.

2.8 FINISHES

- A. Device Color:

1. Wiring Devices Connected to Normal Power System: white unless otherwise indicated or required by NFPA 70 or device listing.
 2. Color of receptacles over Guestroom FRP backsplash to be White.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.

- B. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

- C. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

D. Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Enclosed switches.
 - 2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.5 FIELD CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bussmann, an Eaton business.
 - 2. Edison; a brand of Bussmann by Eaton.
 - 3. Ferraz.
 - 4. Littelfuse, Inc.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
 - 1. Type RK-1: 250-V, zero- to 600-A rating, 200 kAIC.
 - 2. Type RK-5: 250-V, zero- to 600-A rating, 200 kAIC.
 - 3. Type L: 600-V, 601- to 6000-A rating, 200 kAIC.
- B. 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.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

2.3 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.

2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
 1. Service Entrance: Class L, time delay.
 2. Feeders: Class RK5, fast acting, time delay.
 3. Motor Branch Circuits: Class RK5, time delay.
 4. Other Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location as indicated in the field by Construction Manager.

3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023
END OF SECTION 262813

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SECTION 262816 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 1. Enclosure types and details for types other than NEMA 250, Type 1.
 2. Current and voltage ratings.
 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
 2. Altitude: Not exceeding 6600 feet (2010 m).

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.2 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

- A. Type HD, Heavy Duty:
 - 1. Single throw.
 - 2. Three pole.
 - 3. 240-V ac.
 - 4. 1200 A and smaller.
 - 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
 - 6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- B. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Hookstick Handle: Allows use of a hookstick to operate the handle.
 - 5. Lugs: Mechanical type, suitable for number, size, and conductor material.
 - 6. Service-Rated Switches: Labeled for use as service equipment.

2.4 NONFUSIBLE SWITCHES

- A. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- B. Type HD, Heavy Duty, Three Pole, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Hookstick Handle: Allows use of a hookstick to operate the handle.

5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.

2.5 ENCLOSURES

- A. Enclosed Switches UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.

3.3 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NFPA 70 and NECA 1.

3.4 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that the unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.
 - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
 - i. Verify correct phase barrier installation.
 - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.
- B. Related Requirements:
 - 1. Section 262413 "Switchboards" for factory-installed SPDs.
 - 2. Section 262416 "Panelboards" for factory-installed SPDs.

1.3 DEFINITIONS

- A. Inominal: Nominal discharge current.
- B. MCOV: Maximum continuous operating voltage.
- C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
- D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SPD: Surge protective device.
- H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Comply with UL 1449.
- D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

- A. SPDs: Comply with UL 1449, Type 1.
1. SPDs with the following features and accessories:
 - a. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
 - b. Indicator light display for protection status.
 - c. Surge counter.
- B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- C. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
1. Line to Neutral: 700 V for 208Y/120 V.
 2. Line to Ground: 1200 V for 208Y/120 V.
 3. Line to Line: 1000 V for 208Y/120 V.
- D. SCCR: Equal or exceed 100 kA.

2.3 PANEL SUPPRESSORS

- A. SPDs: Comply with UL 1449, Type 1.
 - 1. Include LED indicator lights for power and protection status.
 - 2. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
- B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- C. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 700 V for 208Y/120 V.
 - 2. Line to Ground: 700 V for 208Y/120 V.
 - 3. Neutral to Ground: 700 V for 208Y/120 V.
 - 4. Line to Line: 1200 V for 208Y/120 V.
- D. SCCR: Equal or exceed 100 kA.

2.4 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 1.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Wiring:
 - 1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 - 2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
 - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
 - 2. Inspect anchorage, alignment, grounding, and clearances.
 - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

- A. Complete startup checks according to manufacturer's written instructions.
- B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.
- C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.
- B. Related Requirements:
 - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.

4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
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.
 - a. 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.
 - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

- B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.6 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- E. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
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.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. Recessed Fixtures: Comply with NEMA LE 4.
- D. Bulb shape complying with ANSI C79.1.

- E. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- F. CRI of minimum 80. CCT of 3500 K.
- G. Rated lamp life of 35,000 hours.
- H. Lamps dimmable from 100 percent to 0 percent of maximum light output where noted on drawings.
- I. Internal driver.
- J. Nominal Operating Voltage: 120 V ac.
 - 1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- K. Housings:
 - 1. Extruded-aluminum housing and heat sink.
 - 2. Finish color as noted on drawings.

2.3 DOWNLIGHT

- A. Universal mounting bracket.
- B. Integral junction box with conduit fittings.

2.4 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
 - 1. Tempered Fresnel glass unless noted otherwise on drawings.
 - 2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 3. Glass: Annealed crystal glass unless otherwise indicated.
 - 4. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Finish color as noted on drawings.

E. 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.

1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.5 METAL FINISHES

A. 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.

2.6 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. 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

- A. 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

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 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.
- E. Flush-Mounted Luminaire Support:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
 - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
 - 1. Ceiling mount with two 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to 120 inches (6 m) in length.
 - 2. Ceiling mount with pendant mount with 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to 120 inches (6 m) in length.
 - 3. Ceiling mount with hook mount.
- H. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide

- damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
- 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
- 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- I. Ceiling-Grid-Mounted Luminaires:
 - 1. Secure to any required outlet box.
 - 2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
 - 3. 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.
- J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. 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.
 - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.

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Project No. 31000541
August 16, 2023

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2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 265219 - EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Emergency lighting units.
 - 2. Exit signs.
 - 3. Luminaire supports.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Fixture: See "Luminaire" Paragraph.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.
 - 1. Include data on features, accessories, and finishes.
 - 2. Include physical description of the unit and dimensions.
 - 3. Battery and charger for light units.
 - 4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
 - 5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.

- a. Testing Agency Certified Data: For indicated luminaires and signs, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires and signs shall be certified by manufacturer.
- b. 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.

B. Product Schedule:

1. For emergency lighting units. Use same designations indicated on Drawings.
2. For exit signs. Use same designations indicated on Drawings.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Luminaire-mounted, emergency battery pack: One for every 20 emergency lighting units. Furnish at least one of each type.
 3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.6 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two year(s) from date of Substantial Completion.
- B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Power Unit Batteries: Five years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining four years.
 - 2. Warranty Period for Self-Powered Exit Sign Batteries: Two years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7
 - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

2.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with NFPA 70 and NFPA 101.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for fluorescent luminaires.
- F. Lamp Base: Comply with ANSI C81.61 or IEC 60061-1.
- G. Bulb Shape: Complying with ANSI C79.1.

H. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.

1. Emergency Connection: Operate one lamp(s) continuously at an output of 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
 - b. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
 - c. Humidity: More than 95 percent (condensing).
 - d. Altitude: Exceeding 3300 feet (1000 m).
4. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
5. Battery: Sealed, maintenance-free, nickel-cadmium type.
6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
7. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.3 EMERGENCY LIGHTING

A. General Requirements for Emergency Lighting Units: Self-contained units.

B. Emergency Luminaires:

1. Emergency Luminaires: as indicated on drawings, with the following additional features:
 - a. Operating at nominal voltage of 120 V ac.
 - b. Internal emergency power unit.

- c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
 - d. UL 94 5VA flame rating.
- C. Emergency Lighting Unit:
 - 1. Emergency Lighting Unit: as indicated on drawings.
 - 2. Operating at nominal voltage of 120 V ac.
 - 3. Wall with universal junction box adaptor.
 - 4. UV stable thermoplastic housing, rated for damp locations where noted on drawings.
 - 5. Two LED lamp heads.
 - 6. Internal emergency power unit as indicated on drawings.
- D. Remote Emergency Lighting Units:
 - 1. Emergency Lighting Unit: as indicated on drawings.
 - 2. Operating at nominal voltage of 120 V ac.
 - 3. Wall with universal junction box adaptor.
 - 4. UV stable thermoplastic housing, rated for damp locations.
 - 5. Two LED lamp heads.
 - 6. External emergency power unit.

2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Operating at nominal voltage of 120 V ac.
 - 2. Lamps for AC Operation: Fluorescent, two for each luminaire; 20,000 hours of rated lamp life.
 - 3. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
 - 4. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

2.5 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access:
 - 1. Smooth operating, free of light leakage under operating conditions.
 - 2. Designed to permit relamping without use of tools.
 - 3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Housings:

1. Extruded aluminum housing and heat sink or as indicated on drawings.
2. Clear anodized finish or as indicated on drawings.

E. Conduit: as required in specifications, minimum 3/4 inch (21 mm) in diameter.

2.6 METAL FINISHES

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.

- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire and emergency power unit weight.
 - 2. Able to maintain luminaire position when testing emergency power unit.
 - 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.
- E. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
 - 2. Do not attach luminaires directly to gypsum board.
- F. Ceiling Grid Mounted Luminaires:
 - 1. Secure to any required outlet box.
 - 2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
 - 3. 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 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Perform startup service:

1. Charge emergency power units and batteries minimum of one hour and depress switch to conduct short-duration test.
2. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.
 - a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 265219

SECTION 265613 - LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Poles and accessories for support of luminaires.

1.3 DEFINITIONS

- A. EPA: Equivalent projected area.
- B. Luminaire: Complete lighting fixture.
- C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.
- D. Standard: See "Pole."

1.4 ACTION SUBMITTALS

- A. Product Data: For each pole, accessory, and luminaire-supporting arranged as indicated.
 - 1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
 - 2. Include finishes for lighting poles and luminaire-supporting devices.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Pole repair materials.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for foundation testing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store poles on decay-resistant skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of poles and luminaire-lowering devices that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
 - 2. Warranty Period for Corrosion Resistance: Five years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design pole foundation and pole power system.
- B. Seismic Performance: Foundation and pole shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
 - 2. Component Importance Factor: 1.5.
- C. Structural Characteristics: Comply with AASHTO LTS-6-M.
- D. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.
- E. Live Load: Single load of 500 lbf (2200 N) distributed according to AASHTO LTS-6-M.
- F. Ice Load: Load of 3 lbf/sq. ft. (145 Pa), applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

- G. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.
 - 1. Basic wind speed for calculating wind load for poles 50 feet (15 m) high or less is 100 mph (45 m/s).
 - a. Wind Importance Factor: 1.0.
 - b. Minimum Design Life: 25 years.
 - c. Velocity Conversion Factor: 1.0.
- H. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.
- I. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 STEEL POLES

- A. Source Limitations: Obtain poles from single manufacturer or producer.
- B. Source Limitations: For poles, obtain each color, grade, finish, type, and variety of pole from single source with resources to provide products of consistent quality in appearance and physical properties.
- C. Poles: Comply with ASTM A 500/A 500M, Grade B carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in height with access handhole in pole wall.
 - 1. Shape: Square, straight.
 - 2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- D. Steel Mast Arms: Single-arm type, continuously welded to pole attachment plate. Material and finish same as plate.
- E. Brackets for Luminaires: Detachable, cantilever, without underbrace.
 - 1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adaptor, then bolted together with stainless-steel bolts.
 - 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire. Match pole material and finish.
- F. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- G. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
- H. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.
- I. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.
- J. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
 2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
 3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high gloss, high-build polyurethane enamel.
 - a. Color: As indicated on drawings.

2.3 MOUNTING HARDWARE

- A. Anchor Bolts: Manufactured to ASTM F 1554, Grade 55, with a minimum yield strength of 55,000 psi (380,000 kPa).
1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
 2. Bent rods as required by pole manufacturer.
 3. Threading: Uniform National Coarse, Class 2A.
- B. Nuts: ASTM A 563, Grade A, Heavy-Hex
1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
 2. Two nuts provided per anchor bolt , shipped with nuts pre-assembled to the anchor bolts.
- C. Washers: ASTM F 436, Type 1.
1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
 2. One washers provided per anchor bolt.

2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.
- C. Examine roughing-in for foundation and conduit to verify actual locations of installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE FOUNDATION

- A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123 M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- B. Pre-Cast Foundations: Factory fabricated, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- C. Anchor Bolts: Install plumb using manufacturer-supplied steel template, uniformly spaced.

3.3 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing.

1. Fire Hydrants and Water Piping: 60 inches (1520 mm).
 2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet (3 m).
 3. Trees: 15 feet (5 m) from tree trunk.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
- D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.
1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
 2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
 3. Install base covers unless otherwise indicated.
 4. Use a short piece of 1/2 -inch (13-mm) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- E. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch- (150-mm-) wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch (25 mm) below top of concrete slab.
- F. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.4 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.
- B. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.5 GROUNDING

- A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
1. Install grounding electrode for each pole unless otherwise indicated.
 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.6 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Inspect poles for nicks, mars, dents, scratches, and other damage.
 2. System function tests.

END OF SECTION 265613

SECTION 265619 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
 - 2. Luminaire supports.
- B. Related Requirements:
 - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
 - 2. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaire.
 4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 5. Photometric data and adjustment factors based on laboratory tests, complying with [IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project] [IES LM-79] [IES LM-80].
 - a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
 - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
 6. Wiring diagrams for power, control, and signal wiring.
 7. Photoelectric relays.
 8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.
- B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.
- C. Delegated-Design Submittal: For luminaire supports.
1. Include design calculations for luminaire supports and seismic restraints.

1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.7 FIELD CONDITIONS

- A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.
- B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.8 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including luminaire support components.
 - b. Faulty operation of luminaires and accessories.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- F. Bulb shape complying with ANSI C79.1.
- G. CRI of minimum 80. CCT of 3500 K.
- H. L70 lamp life of 35,000 hours.
- I. Lamps dimmable from 100 percent to 0 percent of maximum light output (where indicated on drawings).
- J. Internal driver.
- K. Nominal Operating Voltage: as shown on drawings.
- L. In-line Fusing: On the primary for each luminaire.
- M. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.
- N. Source Limitations: Obtain luminaires from single source from a single manufacturer.
- O. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

- A. Area and Site:
 - 1. Luminaire Shape: refer to drawings for requirements.
 - 2. Mounting: : refer to drawings for requirements.
 - 3. Luminaire-Mounting Height: refer to drawings for all requirements.
 - 4. Distribution: refer to drawings for all requirements.
 - 5. Diffusers and Globes: refer to drawings for all requirements.
 - 6. Housings: refer to drawings for all requirements.

2.4 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- G. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.
- H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage and coating.
 - c. CCT and CRI for all luminaires.

2.5 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
 - 3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 - 4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
 - a. Color: as indicated on drawings.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
- C. Examine walls, roofs, and canopy ceilings for suitable conditions where luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Support luminaires without causing deflection of finished surface.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
- G. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
- I. Coordinate layout and installation of luminaires with other construction.
- J. Adjust luminaires that require field adjustment or aiming.
- K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- C. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - a. IES LM-5.
 - b. IES LM-50.
 - c. IES LM-52.
 - d. IES LM-64.
 - e. IES LM-72.
 - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.
- E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 ADJUSTING

- A. 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.
 - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265619

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Grounding conductors.
 - 2. Grounding connectors.
 - 3. Grounding busbars.
 - 4. Grounding rods.
 - 5. Grounding labeling.

1.3 DEFINITIONS

- A. BCT: Bonding conductor for telecommunications.
- B. EMT: Electrical metallic tubing.
- C. TGB: Telecommunications grounding busbar.
- D. TMGB: Telecommunications main grounding busbar.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Field Inspector: Currently registered by BICSI as a registered communications distribution designer to perform the on-site inspection.

2.1 SYSTEM COMPONENTS

- A. Comply with J-STD-607-A.

2.2 CONDUCTORS

- A. Comply with UL 486A-486B.
- B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
 - 1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
- C. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4 inch (6.3 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

- A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.
- B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
 - 1. Electroplated tinned copper, C and H shaped.
- C. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.
- D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

- A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, [1/4 by 4 inches (6.3 by 100 mm)] in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with J-STD-607-A.
 - 1. Predrilling shall be with holes for use with lugs specified in this Section.
 - 2. Mounting Hardware: Stand-off brackets that provide a 4-inch (100-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
 - 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
- B. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.
 - 1. Predrilling shall be with holes for use with lugs specified in this Section.
 - 2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch (50-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
 - 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

2.5 GROUND RODS

- A. Ground Rods: Copper-clad; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

2.6 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.
- B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.
- B. Comply with NECA 1.
- C. Comply with J-STD-607-A.

3.3 APPLICATION

- A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
 - 1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than [No. 6] <Insert number> AWG.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2 AWG minimum.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.
- D. Conductor Support:
 - 1. Secure grounding and bonding conductors at intervals of not less than 36 inches (900 mm).
- E. Grounding and Bonding Conductors:
 - 1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
 - 2. Install without splices.
 - 3. Support at not more than 36-inch (900-mm) intervals.
 - 4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding

conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

- a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

- A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 1/0 AWG.

3.5 GROUNDING BUSBARS

- A. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

3.6 CONNECTIONS

- A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.
- B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
- C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
 - 1. Use crimping tool and the die specific to the connector.
 - 2. Pretwist the conductor.
 - 3. Apply an antioxidant compound to all bolted and compression connections.
- D. Primary Protector: Bond to the TMGB with insulated bonding conductor.
- E. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.
- F. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.
- G. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

- H. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when grounding screened, balanced, twisted-pair cables.

3.7 IDENTIFICATION

- A. Labels shall be preprinted or computer-printed type.
 - 1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
 - 2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
 - 3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.
 - a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.
 - 3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.
 - a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.
- D. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.
- E. Grounding system will be considered defective if it does not pass tests and inspections.

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F. Prepare test and inspection reports.

END OF SECTION 270526

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings.
 - 2. Nonmetallic conduits and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Nonmetallic wireways and auxiliary gutters.
 - 5. Hooks.
 - 6. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid conduit.
- C. IMC: Intermediate metal conduit.
- D. RTRC: Reinforced thermosetting resin conduit.

1.4 ACTION SUBMITTALS

- A. Product data for the following:
 - 1. Wireways and fittings.
 - 2. Boxes, enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-C.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated GRC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Set screw or compression.
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.

B. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Comply with TIA-569-C.

- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Rigid HDPE: Comply with UL 651A.
- E. Continuous HDPE: Comply with UL 651A.
- F. RTRC: Comply with UL 2515A and NEMA TC 14.
- G. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.
- H. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 HOOKS

- A. Description: Prefabricated sheet metal cable supports for telecommunications cable.
- B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- C. Comply with TIA-569-C.
- D. Galvanized steel.
- E. J shape.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Description: Enclosures for communications.
- B. General Requirements for Boxes, Enclosures, and Cabinets:
 - 1. Comply with TIA-569-C.
 - 2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
 - 3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
 - 4. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
 - 5. Gangable boxes are allowed.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

- G. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures:
 - a. Material: Plastic.
 - b. Finished inside with radio-frequency-resistant paint.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- I. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

- A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC.
 - 2. Concealed Conduit, Aboveground: GRC.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply pathway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT or RNC.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:
 - a. Mechanical rooms.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 5. Damp or Wet Locations: GRC.

6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Pathway Size: 3/4-inch (21-mm) trade size for copper and aluminum cables.
- D. Pathway Fittings: Compatible with pathways and suitable for use and location.
 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use set-screw or compression, steel fittings. Comply with NEMA FB 2.10.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
 1. NECA 1.
 2. NECA/BICSI 568.
 3. TIA-569-C.
 4. NECA 101
 5. NECA 102.
 6. NECA 105.
 7. NECA 111.
- B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- D. Comply with requirements in Section 270528.29 "Hangers and Supports for Communications Systems" for hangers and supports.
- E. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling" for sleeves and sleeve seals for communications.

- F. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- G. Complete pathway installation before starting conductor installation.
- H. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- I. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.
- J. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- L. Pathways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.
 - 2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
 - 3. Arrange pathways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from nonmetallic conduit and fittings to GRC or IMC and fittings before rising above floor.
- M. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for pathways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
- O. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- P. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
- Q. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

- R. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.
- S. Cut conduit perpendicular to the length. For conduits of 2-inch (50-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- T. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.
- U. Surface Pathways:
 - 1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
 - 2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
 - 3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- V. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.
- W. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service pathway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- X. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
- Y. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F (55 deg C), and that has straight-run length that exceeds 100 feet (30 m).
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

- a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C)] temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- Z. Hooks:
1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
 2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
 3. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
 4. Space hooks no more than 5 feet (1.5 m) o.c.
 5. Provide a hook at each change in direction.
- AA. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to [center] [top] [bottom] of box unless otherwise indicated.
- BB. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- CC. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- DD. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- EE. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

FF. Set metal floor boxes level and flush with finished floor surface.

GG. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe of less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete around conduit for a minimum of 12 inches (300 mm) on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, but a minimum of 6 inches (150 mm) below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 270553 "Identification for Communications Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes with bottom below frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage or deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

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SECTION 270528.29 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Conduit and cable support devices.
 - 2. Support for conductors in vertical conduit.
 - 3. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
 - 4. Fabricated metal equipment support assemblies.
- B. Related Requirements:
 - 1. Section 270548 "Seismic Controls for Communications Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Clamps.
 - b. Hangers.
 - c. Sockets.
 - d. Eye nuts.
 - e. Fasteners.
 - f. Anchors.
 - g. Saddles.
 - h. Brackets.
- B. Seismic Qualification Certificates: For hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M.
 2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 2. Component Importance Factor: 1.5.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame Rating: Class 1.
 2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Conduit and Cable Support Devices: Steel clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- B. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

- C. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type [zinc-coated steel] [stainless steel] for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA/BICSI 568.
 - 3. TIA-569-C.
 - 4. NECA 101
 - 5. NECA 102.
 - 6. NECA 105.
 - 7. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Use expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated-driven threaded studs, provided with lock washers and nuts, may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 270528.29

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SECTION 270544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

- B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized-steel sheet.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 270544

SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Backboards.
 - 2. Grounding.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. LAN: Local area network.
- C. RCDD: Registered Communications Distribution Designer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

PART 2 - PRODUCTS

2.1 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements for plywood backing panels specified in Section 061000 "Rough Carpentry."

2.2 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide (6 mm thick by 100 mm wide) with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Comply with J-STD-607-A.

2.3 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

- A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.
- B. Comply with requirements in Section 270528 "Pathways for Communications Systems" for materials and installation requirements for entrance pathways.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
- C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- D. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
 2. Record agreements reached in meetings and distribute them to other participants.

3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
 4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.
- E. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.3 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-B, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

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- B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
- D. Labels shall be preprinted or computer-printed type.

END OF SECTION 271100

SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. UTP cabling.
 - 2. Coaxial cable.
 - 3. Multiuser telecommunications outlet assemblies.
 - 4. Cable connecting hardware, patch panels, and cross-connects.
 - 5. Telecommunications outlet/connectors.
 - 6. Cabling system identification products.
 - 7. Cable management system.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. EMI: Electromagnetic interference.
- E. IDC: Insulation displacement connector.
- F. LAN: Local area network.
- G. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.
- H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- I. RCDD: Registered Communications Distribution Designer.
- J. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For coaxial cable, include the following installation data for each type used:
 - a. Nominal OD.
 - b. Minimum bending radius.
 - c. Maximum pulling tension.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Testing Agency Qualifications: An NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect

located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
 2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
 3. Bridged taps and splices shall not be installed in the horizontal cabling.
 4. Splitters shall not be installed as part of the optical fiber cabling.
- B. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.
- C. 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.
- D. Grounding: Comply with J-STD-607-A.

2.3 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm) unless noted otherwise on drawings. Comply with requirements in Section 061000 "Rough Carpentry" for plywood backing panels.

2.4 UTP CABLE

- A. Description: 100-ohm, four-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties.
 2. Comply with TIA/EIA-568-B.1 for performance specifications.

3. Comply with TIA/EIA-568-B.2, Category 5e.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: Type CM or CMG.
 - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
 - d. Communications, Limited Purpose: Type CMX.
 - e. Multipurpose: Type MP or MPG.
 - f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
 - g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.5 UTP CABLE HARDWARE

- A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- B. Connecting Blocks: 110-style IDC for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- C. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 1. Number of Terminals per Field: One for each conductor in assigned cables.
- D. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 1. Number of Jacks per Field: One for each four-pair UTP cable indicated.
- E. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- F. Patch Cords: Factory-made, four-pair cables in 36-inch (900 mm) lengths; terminated with eight-position modular plug at each end.
 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 2. Patch cords shall have color-coded boots for circuit identification.

2.6 COAXIAL CABLE

- A. General Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

B. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

C. RG59/U: NFPA 70, Type CATVR.

1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.
4. Color-coded PVC jacket.

D. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

E. RG59/U: NFPA 70, Type CATV.

1. No. 20 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.
3. PVC jacket.

F. RG59/U (Plenum Rated): NFPA 70, Type CMP.

1. No. 20 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 65 percent aluminum braid.
3. Copolymer jacket.

G. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR, complying with UL 1666.

4. CATV Limited Rating: Type CATVX.

2.7 COAXIAL CABLE HARDWARE

- A. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.8 CONSOLIDATION POINTS

- A. Description: Consolidation points shall comply with requirements for cable connecting hardware.
 1. Number of Terminals per Field: One for each conductor in assigned cables.
 2. Number of Connectors per Field:
 - a. One for each four-pair UTP cable indicated.
 - b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
 3. Mounting: Recessed in ceiling.
 4. NRTL listed as complying with UL 50 and UL 1863.
 5. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.9 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.
- B. Workstation Outlets: Two or Four-port-connector assemblies (or as noted on drawings) mounted in multigang faceplate.
 1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
 2. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
 3. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
 4. Legend: Factory labeled by silk-screening or engraving for faceplates.
 5. Legend: Machine printed, in the field, using adhesive-tape label.
 6. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.10 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

- B. Comply with J-STD-607-A.

2.11 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.12 CABLE MANAGEMENT SYSTEM

- A. Description: Computer-based cable management system, with integrated database capabilities.
- B. Document physical characteristics by recording the network, TIA/EIA details, and connections between equipment and cable.
- C. System shall interface with the following testing and recording devices:
 - 1. Direct upload tests from circuit testing instrument into the personal computer.
 - 2. Direct download circuit labeling into labeling printer.

2.13 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.
- E. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
- F. Cable will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements in Section 270528 "Pathways for Communications Systems."
- B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures:
 - 1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
 - 2. Install lacing bars and distribution spools.
 - 3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. MUTOA shall not be used as a cross-connect point.
 - 5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
 - b. Locate consolidation points for UTP at least 49 feet (15 m) from communications equipment room.
 - 6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.

7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
3. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches (915 mm).

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-B, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 - 1. Administration Class: 1.
 - 2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.
- C. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
- E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- F. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
 6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.
- G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 2. Visually confirm Category 5e, marking of outlets, cover plates, outlet/connectors, and patch panels.
 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)"

Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. UTP Performance Tests:

- a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

- 1) Wire map.
- 2) Length (physical vs. electrical, and length requirements).
- 3) Insertion loss.
- 4) Near-end crosstalk (NEXT) loss.
- 5) Power sum near-end crosstalk (PSNEXT) loss.
- 6) Equal-level far-end crosstalk (ELFEXT).
- 7) Power sum equal-level far-end crosstalk (PSELFEXT).
- 8) Return loss.
- 9) Propagation delay.
- 10) Delay skew.

6. Coaxial Cable Tests: Conduct tests according to Section 274133 "Master Antenna Television System."

7. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

- a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
- b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

- D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

- F. Prepare test and inspection reports.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023
END OF SECTION 271500

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. UTP cabling.
 - 2. 62.5/125-micrometer, multimode optical-fiber cabling.
 - 3. Coaxial cabling.
 - 4. RS-232 cabling.
 - 5. RS-485 cabling.
 - 6. Control-voltage cabling.
 - 7. Control-circuit conductors.
 - 8. Fire alarm wire and cable.
 - 9. Identification products.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. IDC: Insulation displacement connector.
- C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- E. RCDD: Registered Communications Distribution Designer.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate layout and installation of electronic safety and security cabling with Owner's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Installation data for UTP and optical-fiber cables as specified in TIA 569-C-1.
2. For coaxial cable, include the following installation data for each type used:
 - a. Nominal OD.
 - b. Minimum bending radius.
 - c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:
 - a. Cross-connects.
 - b. Patch panels.
 - c. Patch cords.
5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical-fiber cable to determine the continuity of the strand, end to end. Use optical-fiber flashlight or optical loss test set.

2. Test optical-fiber cable on reels. Use an optical time domain reflectometer to verify the cable length, and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.
- B. 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.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."

2.3 UTP CABLE

- A. UTP cable shall be as manufactured by Genesis Cable Products, a Honeywell company.
- B. UTP cable as manufactured by West Penn Wire, equal to that specified and approved by engineer, will be acceptable.
- C. Description: 100-ohm, four-pair UTP, covered with a thermoplastic jacket.
 1. Comply with ICEA S-90-661 for mechanical properties.
 2. Comply with TIA-568-C.1 for performance specifications.
 3. Comply with TIA-568-C.2, Category 5e.
 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: Type CM or Type CMG; or Type MPP, Type CMP, Type MPR, Type CMR, Type MP, or Type MPG.
 - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - c. Communications, Riser Rated: Type CMR; or Type CMP, complying with UL 1666.
 - d. Communications, Limited Purpose: Type CMX; or Type MPP, Type CMP, Type MPR, Type CMR, Type MP, Type MPG, Type CM, or Type CMG.

- e. Multipurpose: Type MP or Type MPG; or Type MPP or Type MPR.
- f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
- g. Multipurpose, Riser Rated: Type MPR[or Type MPP, complying with UL 1666.

2.4 UTP CABLE HARDWARE

- A. UTP cable hardware shall be as manufactured by Genesis Cable Products.
- B. UTP cable hardware as manufactured by Belden Inc., equal to that specified and approved by engineer, will be acceptable.
- C. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.
- D. Connecting Blocks: 110-style for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

2.5 OPTICAL-FIBER CABLE

- A. Optical-fiber cable shall be as manufactured by West Penn Wire.
- B. Optical-fiber cable as manufactured by Belden Inc., equal to that specified and approved by engineer, will be acceptable.
- C. Description: Multimode, 62.5/125-micrometer, 24 -fiber, nonconductive, tight buffer, optical-fiber cable.
 - 1. Comply with ICEA S-83-596 for mechanical properties.
 - 2. Comply with TIA-568-C.3 for performance specifications.
 - 3. Comply with TIA-492AAAB for detailed specifications.
 - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - a. General Purpose, Nonconductive: Type OFN or Type OFNG, or Type OFNR, Type OFNP.
 - b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
 - c. Riser Rated, Nonconductive: Type OFNR or Type OFNP, complying with UL 1666.
 - d. General Purpose, Conductive: Type OFC or Type OFCG; or Type OFNG, Type OFN, Type OFCR, Type OFNR, Type OFCP, or Type OFNP.
 - e. Plenum Rated, Conductive: Type OFCP or Type OFNP, complying with NFPA 262.
 - f. Riser Rated, Conductive: Type OFCR; or Type OFNR, Type OFCP, or Type OFNP, complying with UL 1666.
 - 5. Conductive cable shall be steel armored type.

6. Maximum Attenuation: 3.50 db/km at 850 nm; 1.5 db/km at 1300 nm.
7. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

D. Jacket:

1. Jacket Color: Orange for 62.5/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.6 OPTICAL-FIBER CABLE HARDWARE

- A. Optical-fiber cable hardware shall be as manufactured by West Penn Wire.
- B. Optical-fiber cable hardware as manufactured by Belden Inc., equal to that specified and approved by engineer, will be acceptable.
- C. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
 1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- D. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.
- E. Cable Connecting Hardware: Comply with the Fiber Optic Connector Intermateability Standard (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA-604-12. Comply with TIA-568-C.3.
 1. Quick-connect, simplex and duplex, Type SC Type ST Type LC or Type MT-RJ connectors. Insertion loss not more than 0.75 db.
 2. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.7 COAXIAL CABLE

- A. Coaxial cable shall be as manufactured by Genesis Cable Products.
- B. Coaxial cable as manufactured by West Penn Wire, equal to that specified and approved by engineer, will be acceptable.
- C. General Coaxial-Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data-transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 db maximum from 7 to 806 MHz.
- D. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

E. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 18 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with PVC or PE.
4. Suitable for indoor installations.

F. RG-6/U (Plenum Rated): NFPA 70, Type CMP.

1. No. 18 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with PE.

G. NFPA and UL Compliance: Coaxial cables shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70, Article 820 "Radio and Television Equipment" and Article 830 "Community Antenna Television and Radio Distribution Systems." Types are as follows:

1. CATV Cable: Type CATV, or Type CATVP or Type CATVR.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR; or Type CATVP, Type CATVR, or Type CATV, complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.8 COAXIAL-CABLE HARDWARE

- A. Coaxial cable hardware shall be as manufactured by Genesis Cable Products.
- B. Coaxial cable hardware as manufactured by West Penn Wire, equal to that specified and approved by engineer, will be acceptable.
- C. Coaxial-Cable Connectors:
1. Type BNC, 75 ohms, crimp on style.
 2. Type F compression style for RG-6/U cables.

2.9 RS-232 CABLE

- A. RS-232 cable shall be as manufactured by Genesis Cable Products.
- B. RS-232 cable as manufactured by Belden Inc., equal to that specified and approved by engineer, will be acceptable.
- C. Standard Cable: NFPA 70, Type CM.
 - 1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. Polypropylene insulation.
 - 3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
 - 4. PVC jacket.
 - 5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 - 6. Flame Resistance: Comply with UL 1581.
- D. Plenum-Rated Cable: NFPA 70, Type CMP.
 - 1. Three No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. PE insulation.
 - 3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
 - 4. Fluorinated ethylene propylene jacket.
 - 5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 - 6. Flame Resistance: Comply with NFPA 262.

2.10 RS-485 CABLE

- A. RS-485 cable shall be as manufactured by Genesis Cable Products.
- B. RS-485 cable as manufactured by Belden Inc., equal to that specified and approved by engineer, will be acceptable.
- C. Standard Cable: NFPA 70, Type CM or Type CMG.
 - 1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with UL 1581.
- D. Plenum-Rated Cable: NFPA 70, Type CMP.
 - 1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. Fluorinated ethylene propylene insulation.
 - 3. Unshielded.
 - 4. Fluorinated ethylene propylene jacket.
 - 5. Flame Resistance: NFPA 262, Flame Test.

2.11 CONTROL-VOLTAGE CABLE

- A. Control-voltage cable shall be as manufactured by Genesis Cable Products.
- B. Control-voltage cable as manufactured by Belden Inc., equal to that specified and approved by engineer, will be acceptable.
- C. Paired Cable: NFPA 70, Type CMG.
 - 1. One pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with UL 1581.
- D. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - 1. One pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with NFPA 262.

2.12 CONTROL-CIRCUIT CONDUCTORS

- A. Control-circuit cable shall be as manufactured by Genesis Cable Products.
- B. Control-circuit cable as manufactured by Belden Inc., equal to that specified and approved by engineer, will be acceptable.
- C. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in pathway XLP/PVC tray cable, complying with UL 83, in cable tray.
- D. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in pathway power-limited cable, complying with UL 83, concealed in building finishes power-limited tray cable, complying with UL 83, in cable tray.
- E. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF in pathway Power-limited tray cable, complying with UL 83, in cable tray, complying with UL 83.

2.13 FIRE ALARM WIRE AND CABLE

- A. Fire alarm wire and cable shall be as manufactured by Genesis Cable Products.
- B. Fire alarm wire and cable as manufactured by West Penn Wire, equal to that specified and approved by engineer, will be acceptable.

- C. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- D. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.
 - 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.
- E. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
 - 3. Multi-conductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NRTL listed for fire alarm and cable tray installation, plenum rated.

2.14 CONSOLIDATION POINTS

- A. Consolidation points shall be as manufactured by Brady Corporation.
- B. Description: Consolidation points shall comply with requirements for cable connecting hardware.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
 - 2. Number of Connectors per Field:
 - a. One for each four-pair UTP cable indicated.
 - b. One for each four-pair conductor group of indicated cables.
 - 3. Mounting: Recessed in ceiling or Wall.
 - 4. NRTL listed as complying with UL 50 and UL 1863.
 - 5. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.15 IDENTIFICATION PRODUCTS

- A. Identification products shall be as manufactured by Brady Corporation.
- B. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.16 CABLE MANAGEMENT SYSTEM

- A. Cable management systems shall be as manufactured by Brady Corporation.
- B. Description: Computer-based cable management system, with integrated database capabilities.
- C. Document physical characteristics by recording the network, TIA details, and connections between equipment and cable.
- D. Information shall be presented in database view schematic plans, or technical drawings.
 - 1. AutoCAD drawing software shall be used as drawing and schematic plans software.
- E. System shall interface with the following testing and recording devices:
 - 1. Direct upload tests from circuit-testing instrument into the personal computer.
 - 2. Direct download circuit labeling into labeling printer.

2.17 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical-fiber cables on reels according to TIA-568-C.1.
- C. Factory test UTP cables according to TIA-568-C.2.
- D. Factory test multimode optical fiber cables according to TIA-526.14-B and TIA-568-C.3.
- E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results. Structural Return Loss shall be less than 20 db.
- F. Cable will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

3.2 WIRING METHOD

- A. Install wiring in metal pathways and wireways.
 - 1. Minimum conduit size shall be 3/4 inch. Control and data-transmission wiring shall not share conduits with other building wiring systems.
 - 2. Comply with requirements in Section 280528 "Pathways for Electronic Safety and Security."
 - 3. Comply with requirements in Section 260536 "Cable Trays for Electrical Systems."
 - 4. Comply with requirements in Section 270536 "Cable Trays for Communications Systems."
- B. Install cable, concealed in accessible ceilings, walls, and floors when possible.
- C. Wiring on Racks and within Enclosures:
 - 1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM's "Cabling Termination Practices" chapter. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.
 - 2. Install lacing bars and distribution spools.
 - 3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
 - 4. Install conductors parallel with or at right angles to sides and back of enclosure.
 - 5. Connect conductors associated with intrusion system that are terminated, spliced, or interrupted in any enclosure onto terminal blocks.
 - 6. Mark each terminal according to system's wiring diagrams.
 - 7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
- D. Install UTP, optical-fiber, and coaxial cables and connecting materials after spaces are complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- E. General Requirements for Cabling:
 - 1. Comply with TIA-568-C.1.

2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels. Leave a minimum of 6 inches of slack at outlet terminations and coil loosely into box after termination on outlet fitting.
 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 5. Maintain minimum cable bending radius during installation and termination of cables.
 6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 7. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
 8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions. Do not exceed manufacturer's rated cable-pulling tension.
 9. Riser Cable: Riser cable support intervals shall be in accordance with manufacturer's recommendations.
 10. Comply with Section 280544 "Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling."
- F. UTP Cable Installation: Install using techniques, practices, and methods that are consistent with Category 5e rating of components and that ensure Category 5e performance of completed and linked signal paths, end to end.
1. Comply with TIA-568-C.2.
 2. Install 110-style IDC termination hardware unless otherwise indicated.
 3. Do not untwist UTP cables more than 1/2 inch from point of termination to maintain cable geometry.
- G. Optical-Fiber Cable Installation:
1. Comply with TIA-568-C.3.
 2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.
- H. Coaxial-Cable Installation:
1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
 2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.
 3. Install indoor cables in pathway.
- I. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.

2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart. Cable supports shall be fastened to structural members or floor slabs in accordance with Section 260529 "Hangers and Supports for Electrical Systems."
3. Cable shall not be run in contact with pipes, ducts, or other potentially damaging items. Cables shall not be run through structural members or use structural members, pipes, ducts, or equipment as a support.

J. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-C recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communication cables or cables in nonmetallic pathways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communication cables in grounded metallic pathways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between cables in grounded metallic pathways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or hp and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method:
 1. Install plenum cable in environmental air spaces, including plenum ceilings.

2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.
 3. Cables and pathways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
 4. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is permitted.
 5. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or pathway as signaling line circuits.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- E. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and another for supervisory circuits. Color code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
- G. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.
- 3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS
- A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
- B. Minimum Conductor Sizes:
1. Class 1 remote-control and signal circuits, No. 14 AWG.
 2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
 3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.6 CONNECTIONS

- A. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

3.7 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-C, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.8 GROUNDING

- A. For communication wiring, comply with J-STD-607-A and with BICSI TDMM's "Grounding, Bonding, and Electrical Protection" chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Section 280526 "Grounding and Bonding for Electronic Safety and Security."

3.9 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections
 - 1. Visually inspect UTP and optical-fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.

- a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
4. Optical-Fiber Cable Tests:
 - a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
 - 2) Attenuation test results for links shall be less than 2.0 db. Attenuation test results shall be less than that calculated according to equation in TIA-568-C.1.
5. Coaxial-Cable Tests:
 - a. Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
 - b. Replace malfunctioning or damaged items.
 - c. Retest until satisfactory performance and conditions are achieved.
 - d. Use an agile receiver and signal strength meter or spectrum analyzer for testing.
 - e. CCTV Sources: Connect receiver to the output of each CCTV signal source or the distribution amplifier associated with it.
 - f. Test Schedule: Schedule tests after pretesting has successfully been completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
 - g. Operational Tests: Perform tests of operational system to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
 - h. Distribution System Acceptance Tests:
 - 1) Field-Strength Instrument: Rated for minus 40-db mV measuring sensitivity and a frequency range of 54 to 812 MHz, minimum. Provide documentation of recent calibration against recognized standards.
 - 2) Signal Level and Picture Quality: Use a field-strength meter or spectrum analyzer, as well as a standard television receiver, to measure signal levels and check picture quality at all user-interface outlets.
 - a) Test the signal strength in db mV at 55 and 750 MHz.
 - b) Minimum acceptable signal level is zero db mV (1000 mV).

- c) Maximum acceptable signal level over the entire bandwidth is 15 db mV.
 - d) Television receiver shall show no evidence of cross-channel intermodulation, ghost images, or beat interference.
 - i. Signal-to-Noise-Ratio Test: Use a field-strength meter to make a sequence of measurements at the output of the last distribution amplifier or of another agreed-on location in system. With system operating at normal levels, tune meter to the picture carrier frequency of each of the designated channels in turn, and record the level. With signal removed and input to corresponding headend amplifier terminated at 75 ohms, measure the level of noise at same tuning settings. With meter correction factor added to last readings, differences from first set shall not be less than 45 db.
 - j. Qualitative and Quantitative Performance Tests: Demonstrate reception quality of color-television program transmissions at each user interface from each designated channel and source. Quality shall be equal or superior to that obtained with performance checks specified below, using a standard, commercial, cable-ready, color-television receiver. Level and quality of signal at each outlet and from each service and source shall comply with the following Specifications when tested according to 47 604-12 76:
 - 1) RF video-carrier level.
 - 2) Relative video-carrier level.
 - 3) Carrier-level stability, during 60-minute and 24-hour periods.
 - 4) Broadband frequency response.
 - 5) Channel frequency response.
 - 6) Carrier-to-noise ratio.
 - 7) RF visual signal-to-noise ratio.
 - 8) Antenna combiner insertion loss.
 - 9) Signal power splitter loss.
 - 10) Cable connector attenuation.
 - 11) Cross modulation.
 - 12) Carrier-to-echo ratio.
 - 13) Composite triple beat.
 - 14) Second order beat.
 - 15) Terminal isolation.
 - 16) Terminal isolation between television and FM.
 - 17) Hum modulation.
 - 18) RF FM carrier level.
 - 19) FM frequency response.
 - 20) FM carrier-to-noise ratio.
- D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023
END OF SECTION 280513

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Fire-alarm control unit.
- 2. Manual fire-alarm boxes.
- 3. System smoke detectors.
- 4. Air-sampling smoke detectors.
- 5. Heat detectors.
- 6. Notification appliances.
- 7. Magnetic door holders.
- 8. Remote annunciator.
- 9. Graphic annunciator.
- 10. Addressable interface device.
- 11. Digital alarm communicator transmitter.
- 12. Radio alarm transmitter.
- 13. Network communications.

- B. Related Requirements:

- 1. Section 280513 "Conductors and Cables for Electronic Safety and Security" for cables and conductors for fire-alarm systems.

1.3 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. HLI: High Level Interface.
- D. NICET: National Institute for Certification in Engineering Technologies.
- E. PC: Personal computer.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including furnished options and accessories.
 - 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
 - 2. Include rated capacities, operating characteristics, and electrical characteristics.
- B. Shop Drawings: For fire-alarm system.
 - 1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - 2. Include plans, elevations, sections, details, and attachments to other work.
 - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
 - 4. Detail assembly and support requirements.
 - 5. Include voltage drop calculations for notification-appliance circuits.
 - 6. Include battery-size calculations.
 - 7. Include input/output matrix.
 - 8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
 - 9. Include performance parameters and installation details for each detector.
 - 10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
 - a. Show field wiring required for HVAC unit shutdown on alarm.
 - b. Locate detectors according to manufacturer's written recommendations.
 - 11. Include floor plans showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
- C. General Submittal Requirements:
 - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
 - 2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified, fire-alarm technician; Level III minimum.
 - c. Licensed or certified by authorities having jurisdiction.
- D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.

2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
 - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
 - d. Riser diagram.
 - e. Device addresses.
 - f. Record copy of site-specific software.
 - g. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
 - 1) Equipment tested.
 - 2) Frequency of testing of installed components.
 - 3) Frequency of inspection of installed components.
 - 4) Requirements and recommendations related to results of maintenance.

5) Manufacturer's user training manuals.

- h. Manufacturer's required maintenance related to system warranty requirements.
- i. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

- 1. Software operating and upgrade manuals.
- 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
- 3. Device address list.
- 4. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.
- C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

1.8 PROJECT CONDITIONS

- A. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

- B. Automatic sensitivity control of certain smoke detectors.
- C. All components provided shall be listed for use with the selected system.
- D. 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.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Duct smoke detectors.
 - 5. Carbon monoxide detectors.
 - 6. Automatic sprinkler system water flow.
 - 7. Fire standpipe system.
 - 8. Dry system pressure flow switch.
 - 9. Fire pump running.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm notification appliances.
 - 2. Identify alarm and specific initiating device at fire-alarm control unit, and remote annunciators.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Unlock electric door locks in designated egress paths.
 - 5. Release fire and smoke doors held open by magnetic door holders.
 - 6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 - 7. Activate stairwell and elevator-shaft pressurization systems.
 - 8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 - 9. Recall elevators to primary or alternate recall floors.
 - 10. Activate elevator power shunt trip.
 - 11. Activate emergency lighting control.
 - 12. Activate emergency shutoffs for gas and fuel supplies.
 - 13. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
 - 1. Valve supervisory switch.
 - 2. High- or low-air-pressure switch of a dry-pipe sprinkler system.
 - 3. Alert and Action signals of air-sampling detector system.
 - 4. Elevator shunt-trip supervision.
 - 5. Fire pump running.
 - 6. Fire-pump loss of power.

7. Fire-pump power phase reversal.
8. User disabling of zones or individual devices.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances at fire alarm control unite and remote annunciators.
2. Identify specific device initiating the event at fire-alarm control unit[, and remote annunciators.
3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
4. Transmit system status to building management system.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 FIRE-ALARM CONTROL UNIT

- A. Equipment shall be Silent Knight 5820XL or Notifier NFS2-3030, as manufactured and supplied by Honeywell Fire Systems. Maximum number of devices on a circuit shall not exceed 80% of the rated capacity of the circuit. Unless otherwise indicated; the system shall be the standard product of one manufacturer and shall be factory coordinated/
- B. Systems as manufactured by Fire-Lite, equal to those specified and approved by the Engineer, will be acceptable. Manufacturer shall submit to engineer prior to bidding proposed equipment list.
- C. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
 - a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
 - b. Include a real-time clock for time annotation of events on the event recorder and printer.
 - c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
 - d. The FACP shall be listed for connection to a central-station signaling system service.
 - e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.
 2. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.
- D. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.
- E. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
1. Annunciator and Display: Liquid-crystal type, four line(s) of 20 characters, minimum.
 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
- F. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
1. Pathway Class Designations: NFPA 72, Class B.
 2. Install no more than 100 addressable devices on each signaling-line circuit.
 3. Serial Interfaces:
 - a. One dedicated RS 485 port for remote station operation using point ID DACT.
 - b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
 - c. One RS 232 port for PC configuration.

G. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Sound general alarm if the alarm is verified.
4. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

H. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

I. Elevator Recall:

1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room.
 - c. Smoke detectors in elevator hoistway.
2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
 - a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

J. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.

K. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

L. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

- M. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.
 - 1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- N. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
 - 1. Batteries: Sealed lead acid
- O. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.5 MANUAL FIRE-ALARM BOXES

- A. Manual fire-alarm boxes shall be as manufactured by Silent Knight.
- B. Manual fire-alarm boxes as manufactured by Fire-Lite, equal to those specified and approved by the Engineer, will be acceptable.
- C. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
 - 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 2. Station Reset: Key- or wrench-operated switch.
 - 3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
 - 4. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.6 SYSTEM SMOKE DETECTORS

- A. System smoke detectors shall be as manufactured by Silent Knight.
- B. System smoke detectors as manufactured by Fire-Lite, equal to those specified and approved by the Engineer, will be acceptable.
- C. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition.
 - a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 deg F per minute.
 - b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 deg F.
 - c. Multiple levels of detection sensitivity for each sensor.
 - d. Sensitivity levels based on time of day.

D. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

E. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.7 HEAT DETECTORS

- A. Heat detectors shall be as manufactured by Silent Knight.
- B. Heat detectors as manufactured by Fire-Lite, equal to those specified and approved by the Engineer, will be acceptable.
- C. General Requirements for Heat Detectors: Comply with UL 521.
 1. Temperature sensors shall test for and communicate the sensitivity range of the device.
- D. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- E. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 135 deg F.
 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

- A. Notification appliances shall be as manufactured by System Sensor.
- B. Notification appliances as manufactured by Cooper-Wheelock, equal to those specified and approved by the Engineer, will be acceptable.
- C. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

- D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch high letters on the lens.
 - 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 - 2. Mounting: Wall mounted unless otherwise indicated.
 - 3. Flashing shall be in a temporal pattern, synchronized with other units.
 - 4. Strobe Leads: Factory connected to screw terminals.
 - 5. Mounting Faceplate: Factory finished, white.
- F. Addressable Relay Modules:
 - 1. Provide address-setting means on the module. Store an internal identifying code for control panel use to identify the module type.
 - 2. Allow the control panel to switch the relay contacts on command.
 - 3. Have a minimum of two normally open and two normally closed contacts available for field wiring.
 - 4. Listed for controlling HVAC fan motor controllers.

2.9 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
 - 1. Electromagnets: Require no more than 3 W to develop 25-lbf holding force.
 - 2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
 - 3. Rating: 24-V ac or dc.
- B. Material and Finish: Match door hardware.

2.10 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
 - 1. Mounting: Flush cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.11 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone lines and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

- E. Secondary Power: Integral rechargeable battery and automatic charger.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.13 RADIO ALARM TRANSMITTER

- A. Transmitter shall comply with NFPA 1221 and 47 CFR 90.
- B. Description: Manufacturer's standard commercial product; factory assembled, wired, and tested; ready for installation and operation.
1. Packaging: A single, modular, NEMA 250, Type 1 metal enclosure with a tamper-resistant flush tumbler lock.
 2. Signal Transmission Mode and Frequency: VHF or UHF 2-W power output, coordinated with operating characteristics of the established remote alarm receiving station designated by Owner.
 3. Normal Power Input: 120-V ac.
 4. Secondary Power: Integral-sealed, rechargeable, 12-V battery and charger. Comply with NFPA 72 requirements for battery capacity; submit calculations.
 5. Antenna: Omnidirectional, coaxial half-wave, dipole type with driving point impedance matched to transmitter and antenna cable output impedance. Wind-load strength of antenna and mounting hardware and supports shall withstand 100 mph with a gust factor of 1.3 without failure.
 6. Antenna Cable: Coaxial cable with impedance matched to the transmitter output impedance.
 7. Antenna-Cable Connectors: Weatherproof.
 8. Alarm Interface Devices: Circuit boards, modules, and other auxiliary devices, integral to the transmitter, matching fire-alarm and other system outputs to message-generating inputs of the transmitter that produce required message transmissions.
- C. Functional Performance: Unit shall receive alarm, supervisory, or trouble signal from fire-alarm control unit or from its own internal sensors or controls and shall automatically transmit signal along with a unique code that identifies the transmitting station to the remote alarm receiving station. Transmitted messages shall correspond to standard designations for fire-reporting system to which the signal is being transmitted and shall include separately designated messages in response to the following events or conditions:

1. Transmitter Low-Battery Condition: Sent when battery voltage is below 85 percent of rated value.
2. System Test Message: Initiated manually by a test switch within the transmitter cabinet, or automatically at an optionally preselected time, once every 24 hours, with transmission time controlled by a programmed timing device integral to transmitter controls.
3. Transmitter Trouble Message: Actuated by failure, in excess of one-minute duration, of the transmitter normal power source, derangement of the wiring of the transmitter, or any alarm input interface circuit or device connected to it.
4. Local Fire-Alarm-System Trouble Message: Initiated by events or conditions that cause a trouble signal to be indicated on the building system.
5. Local Fire-Alarm-System Alarm Message: Actuated when the building system goes into an alarm state. Identifies device that initiated the alarm.
6. Local Fire-Alarm-System, Supervisory-Alarm Message: Actuated when the building alarm system indicates a supervisory alarm.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

D. Smoke- or Heat-Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A or Annex B in NFPA 72.
5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

E. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

G. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinkled elevator shafts unless used to for a smoke control function.

H. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

I. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

- J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.
- K. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- L. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that resists 100-mph wind load with a gust factor of 1.3 without damage.

3.3 PATHWAYS

- A. Pathways above recessed ceilings and in non-accessible locations may be routed exposed.
 - 1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.
- B. Pathways shall be installed in EMT.

3.4 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
 - 1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 - 1. Smoke dampers in air ducts of designated HVAC duct systems.
 - 2. Magnetically held-open doors.
 - 3. Electronically locked doors and access gates.
 - 4. Alarm-initiating connection to elevator recall system and components.
 - 5. Alarm-initiating connection to activate emergency lighting control.
 - 6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
 - 7. Supervisory connections at valve supervisory switches.
 - 8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
 - 9. Supervisory connections at elevator shunt-trip breaker.
 - 10. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
 - 11. Supervisory connections at fire-pump engine control panel.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
- D. Perform the following tests and inspections.
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals"

chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for one year.
- C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within one year from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.10 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes soil treatment with termiticide.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the EPA-Registered Label.
- B. Product certificates.
- C. Soil Treatment Application Report: Include the following:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.
- B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Termiticides:

- a. Aventis Environmental Science USA LP; Termidor.
- b. Bayer Corporation; Premise 75.
- c. Dow AgroSciences LLC;.
- d. FMC Corporation, Agricultural Products Group;.
- e. Syngenta; Demon TC.

2.2 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
Delete paragraph below if no soil treatment.
- B. Soil Treatment Preparation: Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

3.2 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed. General Contractor shall coordinate work sequencing to allow treatment.
 2. Foundations: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 3. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 4. Masonry: Treat voids.
 5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application. General Contractor shall coordinate work sequencing to allow treatment.

1.5 MAINTENANCE SERVICE

- A. Continuing Service: Beginning at Substantial Completion, provide 12 months' continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, and terms for agreement period; and terms for future renewal options.

BRR Architecture, Inc.
Project No. 31000541
August 16, 2023

WoodSpring Suites
1010 NW Ward Road
Lee's Summit, MO 64086

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END OF SECTION 313116

TERMITE CONTROL

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