BID DOCUMENTS COVER SHEET

CONTRACT DOCUMENTS

FOR

C-4016 SCIENCE CENTER
CONFERENCE ROOM #241 CONVERSION

AT

CONTRA COSTA COMMUNITY COLLEGE DISTRICT

Consist of the following:

Volume 2

Architect:

SmithGroup, Inc.
301 Battery Street, 7th Floor
San Francisco, CA 94111
415.227.0100

April 11, 2022

SECTION 00007

SEALS PAGE

ARCHITECT:

SMITHGROUP
Chun-Kei J. Wong
301 Battery Street, 7th Floor
San Francisco, Ca 94111
(415) 227-0100

MECHANICAL ENGINEER

INTEGRAL GROUP
John Gautrey
427 13th Street
Oakland, CA 9461
(510) 663-2070

ELECTRICAL ENGINEER

INTEGRAL GROUP
Cirilo P. Marquez
427 13th Street
Oakland, CA 9461
(510) 663-2070

TECHNOLOGY ENGINEER

TEECOM
Larry A. Anderson
1333 Broadway Suite 601
Oakland, CA 94612-1906
(510) 337-2800

Date Sealed
03/10/2022

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements apply to this Section .

1.2 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Salvage of existing items to be reused or recycled.

B. Related Requirements:
   1. Section 00800 "Supplementary and General Conditions" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction, including associated attachments, supports, bracing, etc., and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

E. Predemolition Photographs or Video: Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was

recovered.

G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Owner of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Owner and Owner. Hazardous materials will be removed by Owner under a separate contract.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner.

E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, preconstruction videotapes and templates.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
1. Comply with requirements for existing services/systems interruptions specified in Section 00800 "Supplementary General Conditions."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Section 00800 "Supplementary General Conditions."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 00800 "Supplementary General Conditions."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner.
   5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 050525 - POST-INSTALLED CONCRETE ANCHORS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Post-installed mechanical anchors in concrete, including:
    a. Wedge-type expansion anchors approved for use for seismic applications in cracked and uncracked concrete.
    b. Screw-type drilled-in anchors approved for use for seismic applications in cracked and uncracked concrete.
2. Post-installed adhesive anchors in concrete, approved for use for seismic applications in cracked and uncracked concrete.

1.2 REFERENCES

A. ICC-ES or IAPMO-ES Evaluation Report: Evaluation Report issued by the ICC or IAPMO Evaluation Service demonstrating compliance with provisions of the 2015 International Building Code.

1.3 DEFINITIONS

A. Nominal Embedment Depth: Minimum length from concrete surface to end of anchor following completion of anchor installation. For wedge-type anchors, nominal embedment depth shall be measured following application of installation torque.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Division 01, "Submittal Procedures".

1. Manufacturer's product data.
2. Manufacturer’s installation instructions.
3. ICC-ES or IAPMO-ES Evaluation Reports.

1.5 QUALITY ASSURANCE

A. Certifications: Anchors shall have an active ICC-ES or IAMPMO-ES Evaluation Report in accordance with the following ICC-ES Acceptance Criteria:

1. Mechanical Anchors in Concrete: Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC 193).

2. Adhesive Anchors in Concrete: Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements (AC 308).

PART 2 – PRODUCTS

2.1 MECHANICAL ANCHORS

A. General: Anchors shall be tested and approved for use in cracked and uncracked concrete in accordance with ICC-ES AC 193.

1. Anchors installed through underside of steel deck shall be tested and approved for installation through the soffit of concrete-filled metal deck assemblies in accordance with ICC-ES AC 193.

B. Acceptable Products: Where anchor manufacturer and product are indicated on Drawings, provide designated product.

1. Contractor shall be allowed to substitute products of other manufacturer's, subject to demonstrating equivalent tension and shear strength to specified anchor, under project installation conditions. Product substitutions are subject to DSA review and approval, submitted by Architect as a SSC per IR A-6.
2. Where anchor design is prepared by Trade Subcontractor's Engineer, use product designated by Trade Subcontractor's Engineer, subject to meeting requirements of this Section.

C. Wedge Anchors: Wedge type, torque-controlled expansion anchors approved for use in cracked and uncracked concrete. Size and nominal embedment depth as indicated on Drawings.

1. Material: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating in accordance with ASTM B633, SC1, Type III. As indicated on the Drawings, provide AISI Type 304 or Type 316 stainless steel anchors with manufacturers matching nut and washer.
2. Acceptable Products: Where anchor product and manufacturer are not indicated on Drawings or designated by Trade Subcontractor's Engineer, provide one of the following:

    a. Kwik Bolt TZ, by Hilti, Inc. per ICC ESR-1917.

D. Screw Anchors: Hardened steel, screw-type anchors or rod hangers approved for use in cracked and uncracked concrete. Diameter and nominal embedment depth as indicated on Drawings.

1. Limitations: Anchors shall be used in dry interior environments only.
2. Material: Case hardened low carbon steel, with zinc plating in accordance with ASTM B633, SC1, Type III.
3. Acceptable Products: Where anchor product and manufacturer are not indicated on Drawings or designated by Trade Subcontractor's Engineer, provide one of the following:

    a. Kwik HUS-EZ screw anchor and HUS-EZ1 rod hanger, by Hilti per ICC ESR 3027

2.2 ADHESIVE ANCHORS

A. Adhesive Anchors: Threaded steel rod or inserts complete with nuts and washers, epoxy adhesive injection system, and manufacturer’s installation instructions.

B. General: Anchors shall be tested and approved for use to resist seismic forces (IBC Seismic Design Categories A to F) in cracked and uncracked concrete in accordance with ICC-ES AC 308.

C. Epoxy Adhesive: Two-component, 100% solids, structural epoxy conforming to ASTM C881, Type IV; Grade 3; prepackaged in cartridges for manually or pneumatically operated caulk gun and automatically mixed at nozzle.

1. Where anchor manufacturer and product are indicated on Drawings, provide designated product.
2. Contractor shall be allowed to substitute products of other manufacturer's, subject to demonstrating equivalent tension and shear strength to specified anchor, under project installation conditions.
3. Where anchor design is prepared by Trade Subcontractor's Engineer, use product designated by Trade Subcontractor's Engineer, subject to meeting requirements of this Section.
4. Acceptable Products: Where anchor product and manufacturer are not indicated on Drawings or designated by Trade Subcontractor's Engineer, provide one of the following:

    a. HIT RE500 V3 Epoxy Adhesive Anchoring System, by Hilti, Inc. (ICC ESR-3814)
    b. Set-XP Epoxy Adhesive, by Simpson Strong-Tie Co. (ICC ESR-2508)

D. Acrylic Adhesive: Hybrid Adhesive: Two-component, hybrid adhesive prepackaged in cartridges for manually or pneumatically operated caulk gun and automatically mixed at nozzle. Approved for use in cracked and uncracked concrete in accordance with ICC ES AC308 or ACI 355.4, as demonstrated by an active ICC or IAPMO Evaluation Service Report.

1. Acceptable Products: Where anchor product and manufacturer are not indicated on Drawings or designated by Trade Subcontractor's Engineer, provide one of the following:

    a. HIT -HY 200 Adhesive, Hilti Inc.
    b. AT-XP Adhesive, Simpson Strong-Tie Co

E. Threaded Rod:

1. Material: Unless otherwise indicated on the Drawings, furnish carbon steel threaded rods conforming to ASTM A36 or ASTM A193 Type B7. As indicated on the Drawings, provide Type 304 or Type 316 stainless steel anchors with manufacturers matching nut and washer.
2. Finish: Furnish carbon steel rods with zinc plating in accordance with ASTM B633, SC1, Type III at dry interior locations. Furnish carbon steel rods with hot-dipped galvanized coating complying with ASTM A153 at exterior and damp interior locations.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install anchors in conformance with manufacturer's written instructions.

B. Examination:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Notify Owner's Representative for clarification where reinforcing steel or other embedded items require relocation of anchors or cutting of reinforcement.

2. Notify Owner's Representative for clarification where anchors appear to be located too close to edge of concrete, in particular where edge is not shown on Drawing detail.
3. Notify Owner's Representative for clarification where concrete thickness is inadequate to achieve specified anchor embedment. Minimum concrete thickness shall allow for specified embedment, plus one anchor diameter allowance for overdrilling, plus 3/4 inch minimum cover from end of hole to concrete surface.

C. Drilling:

1. Do not drill holes in concrete mix has achieved full design strength.
2. Drill holes with rotary impact hammer drills using carbide-tipped bits with diameter as recommended by anchor manufacturer. Reduce impact as hole approaches concrete surface as necessary to prevent cracking and spalling. Use core bits only with approval of Owner's Representative and only for mechanical anchors.
3. Holes shall be drilled perpendicular to the concrete surface, unless otherwise shown on Drawings. Anchors shall be drilled to within 5 percent of specified alignment.
4. Exercise care in drilling to avoid damaging existing reinforcing, conduits and other embedded items.

D. Wedge Anchors:

1. Drill holes designated nominal embedment depth plus one anchor diameter minimum. End of hole shall be 3/4 inch minimum clear from concrete surface.
2. Remove dust and debris with pressurized air, in accordance with manufacturer's instructions.
3. Set anchors to designated nominal embedment depth, plus an allowance for withdrawal during torque tightening.
4. Tighten using a torque wrench to manufacturer's recommended installation torque. Following attainment of 10% of recommended torque, achieve 100% of designated torque within 5 or fewer turns of the nut. If torque is not achieved, the anchor shall be removed and replaced unless otherwise directed by the Owner's Representative.

E. Screw Anchors:

1. Take particular care to achieve proper hole diameter. Use only sharp bits with diameter recommended by manufacturer. Use drilling equipment and methods to prevent enlargement of holes by wobble.
2. Remove dust and debris with pressurized air, in accordance with manufacturer's instructions.
3. Install the anchor in accordance with manufacturer's instructions with an impact wrench. Take care not to overtighten anchor; note that manufacturer's maximum installation torque is not the torque intended to be achieved during proper installation.

F. Adhesive Anchors:

1. Drill holes to diameter recommended by manufacturer with rotary impact hammer drills using carbide-tipped bits; core bits shall not be permitted.
2. Thoroughly clean holes by brushing and blowing with compressed air in accordance with manufacturer's instructions. Clean immediately prior to anchor installation under observation of Special Inspector.
3. Inject adhesive into 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. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole.
4. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

3.2 REPAIR OF DEFECTIVE WORK

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

3.3 FIELD QUALITY CONTROL

A. Testing Agency will:

1. Review manufacturer's recommended installation and inspection procedures, as contained in Evaluation Service Report.
2. Special Inspect installation for conformance with Contract Documents, manufacturer's recommendations, and requirements of the applicable ES report. Verify that anchors are being installed by trained installers.
    a. Periodically inspect installation of mechanical anchors.
    b. Continuously inspect installation of adhesive anchors during hole cleaning and anchor installation.
3. Test anchors in accordance with requirements of CBC Section 1910A.5, including testing frequency and method for adhesive anchors.
    a. Test Loads: As shown on Drawings, or as otherwise designated by Owner’s Representative, in conformance with test load requirements CBC Section 1910A.5.4.
    b. Testing Frequency, Structural Applications: 100 percent, except frequency can be reduced in accordance with CBC Section 1910A.5.3.
    c. Testing Frequency, Equipment and Component Anchorage: 50 percent or alternate bolts in a group, including at least one-half of the anchors in each group shall be tested.

END OF SECTION

tSECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Wood furring.

1.3 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NLGA: National Lumber Grades Authority.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 QUALITY ASSURANCE

A. Manufacturer Quallifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Provide the following upon request:

1. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
2. Evaluation Reports: For the following, from ICC-ES:

a. Wood-preservative-treated wood.
b. Fire-retardant-treated wood.
c. Power-driven fasteners.
d. Powder-actuated fasteners.
e. Expansion anchors.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2[for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground].

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
2. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
3. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.[Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.]

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat items indicated on Drawings, and the following:

1. Roof-related construction.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
   1. Hem-fir; WCLIB or WWPA.
   2. Spruce-pine-fir (south); WCLIB, or WWPA.
   3. Western woods; WCLIB or WWPA.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
   1. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
   2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
   3. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated.

1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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, and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

C. Do not splice structural members between supports unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners; or.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

I. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally at 24 inches o.c.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.
   3. Penetrations in smoke barriers.

1.3 ACTION SUBMITTALS

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

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
   1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Installation Responsibility: Assign installation of penetration firestopping and fire-resistive joint systems to a single qualified firestop contractor.

D. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
   1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
   a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
   b. Classification markings on penetration firestopping correspond to designations listed by one of the following:
      1) UL in its "Fire Resistance Directory."
      2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
      3) FM Global in its "Building Materials Approval Guide."

E. Provide the following upon request:

1. Qualification Data: For qualified Installer.
2. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
3. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify District's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A/D Fire Protection Systems Inc.
2. Hilti, Inc.
3. Specified Technologies Inc.
4. 3M Fire Protection Products.
5. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is 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. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls,and fire partitions, as occur.
   2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies, as occur.
   2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
   3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-wool-fiber or rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.

5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. 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, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming 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 firestopping.

C. Install fill materials for firestopping 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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. District will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under "Firestop Systems."

C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

END OF SECTION

SECTION 078443 - JOINT FIRESTOPPING AND FIRESAFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

B. Provide the following upon request:

1. Qualification Data: For Installer.
2. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
        1) UL in its "Fire Resistance Directory."
        2) Intertek Group in its "Directory of Listed Building Products."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.

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. Rockwool (formerly Roxul Inc.).
b. Thermafiber, Inc.; an Owens Corning company.
c. Tremco, Inc.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide mineral wool joint firestopping systems with rating determined per ASTM E 2307; minimum density of 4 lbs per cu. ft..

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. Rockwool (formerly Roxul Inc.).
b. Thermafiber, Inc.; an Owens Corning company.
c. Tremco, Inc.

2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

D. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg .

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. Rockwool (formerly Roxul Inc.).
b. Thermafiber, Inc.; an Owens Corning company.
c. Tremco, Inc.

2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1. Sealant shall have a VOC content of 250 g/L or less.

F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: District will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under product category Firestop Systems.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants.
5. Acoustical joint sealants.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for sealing joints in fire-resistance-rated construction.
2. Section 088000 "Glazing" for glazing sealants.
3. Section 092900 "Gypsum Board" for acoustical sealing of perimeter joints.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by CM.
2. Conduct field tests for each application indicated below:
   a. Each kind of sealant and joint substrate indicated.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
   1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

A. Submittal Compliance Form: If Basis-of-Design products are provided, Submittal Compliance Form may be submitted in lieu of required Product Data submittal.

B. Product Data: For each joint-sealant product indicated.

F. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

B. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

C. Field-Adhesion Test Reports: For each sealant application tested.

1.6 QUALITY ASSURANCE

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

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
   2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Provide the following upon request:
   1. Qualification Data: For qualified Installer and testing agency.
   2. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
   3. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
   4. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer[or are below 40 deg F].
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

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

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those 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.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 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 joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: [As indicated by manufacturer's designations] [Match Architect's samples] [As selected by Architect from manufacturer's full range].

2.2 SILICONE JOINT SEALANTS

A. Sealant JS-S1 - Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
1. Products: Subject to compliance with requirements, provide products from the following table that has a validation certificate from the Sealant, Waterproofing and Restoration Institute (SWRI).

Manufacturer	Product	Manufacturer Rated Movement Capability (CLASS)	Substrate Primer Required: Yes/No/Test			
			Mortar *	Anod. Alum.	Uncoated Glass	Other**
Dow Corning	791	± 50%	Yes	Test	No	Test
Dow Corning	795	± 50%	No	Yes	No	Test
Momentive Performance Materials, Inc.	Silpruf SCS2000	± 50%	Yes	Test	No	Test
Momentive Performance Materials, Inc.	Silpruf NB SCS 9000	± 50%	Yes	Test	No	Test
Pecora Corporation	864	± 50%	Yes	Test	No	Test
Pecora Corporation	895	± 50%	Yes	Test	No	Test
Tremco Incorporated	Spectrum 3	± 50%	Yes	Test	No	Test
Tremco Incorporated	Dymonic 100	± 50%	No	Yes	No	Test

Table Notes:

* Indicates substrates with a cement component, such as concrete, that require use of a primer.

** Indicates that other substrates shall be tested for adhesion to determine if a primer will be required.

B. Sealant JS-S2 - Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide products from the following table that has a validation certificate from the Sealant, Waterproofing and Restoration Institute (SWRI).

Manufacturer	Product	Manufacturer Rated Movement Capability (CLASS)	Substrate Primer Required: Yes/No/Test			
			Mortar *	Anod. Alum.	Uncoated Glass	Other**
Dow Corning	790	+ 100/- 50%	No	Yes	No	Test
Momentive Performance Materials, Inc.	Silpruf LM SCS2700	+ 100/- 50%	Yes	Test	No	Test
Pecora Corporation	890	+ 100/- 50%	Yes	Test	No	Test

Manufacturer	Product	Manufacturer Rated Movement Capability (CLASS)	Substrate Primer Required: Yes/No/Test			
			Mortar *	Anod. Alum.	Uncoated Glass	Other**
Tremco Incorporated	Spectrum 1	+ 100/- 50%	Yes	Test	No	Test

|Table Notes:

* Indicates substrates with a cement component, such as concrete, that require use of a primer.

** Indicates that other substrates shall be tested for adhesion to determine if a primer will be required.

2.3 WEATHER BARRIER SEALANTS

A. Sealant JS-W1 - Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT; tested and marketed specifically for sealing air barrier and vapor retarder sheets to common building materials, such as aluminum, vinyl, PVC, powder coat, paint and fluoropolymer coatings; UV resistant..

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Dow Corning Corporation; 758.

2.4 URETHANE JOINT SEALANTS

A. Sealant JS-U1 - Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type M, Grade P, Class 25, for Use T and I.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. LymTal International, Inc.; Iso-Flex 880 GB.
   b. May National Associates, Inc.; Bondaflex PUR 2 SL.
   c. Tremco Incorporated; Vulkem 445SSL or Vulkem 45SSL.

B. Sealant JS-U2 - Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. BASF Building Systems; MasterSeal NP 2.
   b. Pecora Corporation; Dynatred.
   c. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.
   d. Tremco Incorporated; Vulkem 227.

2.5 LATEX JOINT SEALANTS

A. Sealant JS-L1 - Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. BASF Building Systems; Sonolac.

b. Bostik, Inc.; Chem-Calk 600.
c. Pecora Corporation; AC-20 + Silicone.
d. Tremco Incorporated; Tremflex 834.

2.6 MILDEW-RESISTANT JOINT SEALANTS

A. Sealant JS-M1 - Mildew-Resistant, Single-Component, Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Omniplus.
b. Dow Corning Corporation; 786 Mildew Resistant.
c. GE Advanced Materials - Silicones; Sanitary SCS1700.
d. Pecora Corporation; 898.
e. Tremco Incorporated; Tremsil 200 Sanitary.

2.7 ACOUSTICAL JOINT SEALANTS

A. Sealant JS-A1 - Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product 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. Products: Subject to compliance with requirements, provide one of the following:

a. Accumetric LLC; BOSS 826 Acoustical Sound Sealant.
b. GE Construction Sealants; RCS20 Acousticsl.
c. Grabber Construction Products; Acoustical Sealant GSC.
d. Pecora Corporation; AC-20 FTR or AIS-919.
e. Tremco, Incorporated; Tremco Acoustical Sealant.
f. USG Corporation; SHEETROCK Acoustical Sealant.

2.8 PREFORMED JOINT SEALANTS

A. Sealant JS-P1 - Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 123 Silicone Seal.
b. GE Construction Sealants; UltraSpan US1100.
c. Pecora Corporation; Sil-Span.
d. Tremco Incorporated; Spectrem Simple Seal.

2.9 JOINT SEALANT BACKING

A. General: Provide sealant backings of material 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.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin)Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.10 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 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
      d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 or primer 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

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

C. Do not extend exterior sealants and primers into building interior (that is, inside the weatherproofing system) unless first verifying compliance with VOC requirements.

D. Install sealant backings of kind 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.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. 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.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs 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. Water-based tooling agents are unacceptable.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

H. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

J. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919, manufacturer's written recommendations, and section 092900 “Gypsum Board.”

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. 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.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces; Type JS-U1.
1. Joint Locations:
    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Other joints as indicated.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces; Type JS-S1, JS-S2, or JS-P1.
1. Joint Locations:
    a. Construction joints in cast-in-place concrete.
    b. Joints between plaster edge material and adjacent materials.
    c. architectural concrete units.
    d. Control and expansion joints in unit masonry.
    e. Joints between metal panels.
    f. Joints between different materials listed above.
    g. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    h. Control and expansion joints in ceilings and other overhead surfaces.
    i. Other joints as indicated.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior weather barrier joints; Type JS-W1.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces; Type JS-U1 JS-U2.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in tile flooring.
      c. Other joints as indicated.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces; Type JS-L1.
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Wall tile control and expansion joints.
      d. Vertical joints on exposed surfaces of walls and partitions.
      e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
      f. Other joints as indicated.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces; Type JS-M1.
   1. Joint Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
      c. Other joints as indicated.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Acoustical sound-rated joints; Type JS-A1.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:

1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow-metal frames.

3. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
4. Section 099600 “High-Performance Coatings” for epoxy coatings on hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

C. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.

7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

D Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 QUALITY ASSURANCE

A. Provide the following upon request.

1. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Amweld International, LLC.
2. Ceco Door; ASSA ABLOY.
3. Curries Company; ASSA ABLOY.

4. Door Components, Inc.
5. Steelcraft; an Allegion brand.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and 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 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

3. Frames:

a. Materials: Uncoated, steel sheet, minimum thickness of 0.053 inch.
b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Full profile welded.
d. Locations: Typical.

4. Exposed Finish: Primed for field coating.

2.5 BORROWED LITES

A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch.

B. Construction: Full profile welded.

1. Exposed Finish: Primed for field coating.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. 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 hollow-metal frames of type indicated.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

J. Glazing: Comply with requirements in Section 088000 "Glazing."

K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Four anchors per jamb from 60 to 90 inches high.
        2) Five anchors per jamb from 90 to 96 inches high.
    b. Compression Type: Not less than two anchors in each frame.
    c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
8. Terminated Stops: Terminate stops 6 inches above finish floor with a 45 -degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with [butted] [or] [mitered] hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow-metal work.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Field-Applied Finish: Finish hollow metal doors and frames in accordance with Section 099600 “High-performance Coatings.”

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.10 ACCESSORIES

A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.

B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

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 embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.

8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
    1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with painted faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 081113 "Hollow-Metal Doors and Frames" for frames in which to install wood doors.
2. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction[, louvers,] and trim for openings. Include factory-finishing specifications.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

1.4 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification or WI Certified Compliance Program certificates.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program or is a licensee of WI's Certified Compliance Program.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
   2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Ampco.
2. Eggers Industries.
3. Graham Wood Doors; an Assa Abloy Group company.
4. Marshfield-Algoma.
5. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

1. Provide AWI Quality Certification or WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.
2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Regional Materials: Flush wood doors shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

C. Certified Wood: Flush wood doors shall be certified as "FSC Pure"or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

D. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

E. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.
2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets and exits, unless indicated to be hollow metal.

H. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
2. Particleboard: Straw-based particleboard complying with ANSI A208.1, Grade LD-2 or M-2, except for density.
3. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
4. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

I. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf.
b. Screw Withdrawal, Edge: 400 lbf.

J. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated asneeded to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

a. Screw-Holding Capability: 550 lbf per WDMA T.M.-10.

2.3 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom.
2. Faces: MDO, Hardboard or MDF.

a. Apply MDO to standard-thickness, closed-grain, hardwood face veneers or directly to high-density hardboard crossbands.
b. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).
c. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.

3. Exposed Vertical and Top Edges: Any closed-grain hardwood.
4. Core: Particleboard, except for through-bolt locations. Mineral core at fire rated openings.
5. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Species compatible with door faces.

2. Profile: Recessed tapered beads.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber[, rabbeted,] meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.6 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099123" Interior Painting."

2.7 FINISHING

A. General: Comply with referenced quality standard for finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Opaque Finish:

1. Finish: Paint according to Section 09 9123 "Interior Painting."
2. Color: As indicated on Finish Schedule.
3. Sheen: As indicated by gloss level in paint schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware." Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

B. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.

4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Door Frames”.
2. Division 08 Section “Flush Wood Doors.”

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Section 00800. Special warranties 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.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
1. Seven years for heavy duty cylindrical (bored) locks and latches.
2. Five years for exit hardware.
3. Ten years for manual surface door closer bodies.
4. Fifteen years for manual surface door closer bodies.
5. Twenty five years for manual surface door closer bodies.
6. Twenty five years for manual surface door closer bodies.
7. Twenty five years for manual surface door closer bodies.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Cam Lift Hinges: Where specified provide hinges that move the door up and then lower it to create a tight seal when the door is closed.

6. Manufacturers:

   a. Bommer Industries (BO).
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

B. Pivots: ANSI/BHMA A156.4, Grade 1, certified. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and

thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

1. Manufacturers:

    a. Architectural Builders Hardware (AH).
    b. Rixson Door Controls (RF).

2.3 POWER TRANSFER DEVICES - NOT USED

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Door Controls International (DC).
    c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Door Controls International (DC).
    c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Hiawatha, Inc. (HI).

c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Match Facility Restricted Keyway.

C. Permanent Cores: Facility standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Permanent Cores: Match Facility standard Schlage Everest Primus.

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
2. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware. Provide removable core (small or large format) as specified in Hardware Sets.

E. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Key locks to Owner's existing Primus system.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

G. Construction Keying: Provide temporary keyed construction cores.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

I. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

J. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into “Key Wizard” software.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

2. Locks are to be non-handed and fully field reversible.

3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.

4. Manufacturers:

a. Sargent Manufacturing (SA) – 10 Line.
b. Schlage (SC) – ND Series.

2.7 WIRELESS ACCESS CONTROL LOCKS - NOT USED

2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Manufacturers:

   a. LCN Closers (LC) - 4040XP Series.
   b. Norton Door Controls (NO) – 9500 Series.

2.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor

stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Hiawatha, Inc. (HI).
    c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Rixson Door Controls (RF).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Sargent Manufacturing (SA).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: 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 UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements. Maximum opening force 5lb max for interior doors and 15lbs max. for fire rated and exterior doors.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality. Refer to drawings for Hardware Set.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

END OF SECTION

SECTION 088000 – GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, as defined in referenced glazing publications.

B. Glass Fabrication: Using primary glass in the production of single pane glass products such as coated, laminated and heat treated glass. Can be done by either the Glass Manufacturer or the Glazing Product Manufacturer.

C. Glazing Product Manufacturer: Firm that uses fabricated glass in the production of insulating glass (multiple panes of glass).

1. Structural Glazing Product Manufacture: Firm that produces insulating glass for use in a structural glazing system.

D. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

E. Large Glass Lites and Insulating Glass Units: over 55 SF.

F. Interspace: Space between lites of a conventional insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.
2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
3. Probability of Breakage:
    a. For glass surfaces sloped no more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.008 (8 per 1000).
4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than [eight] <Insert number> Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

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

C. Shop Drawings:

1. Submit Shop Drawings of glazing details. Draw details at least full size (twice full size preferred) and indicate dimensions, tolerances and materials.
2. Submit Shop Drawings for structural sealant glazing after review and approval of Shop Drawings by sealant and glass product manufacturers.

G. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

I. Preconstruction adhesion and compatibility test report.

J. Quality Assurance Program (QAP)

1. Glass fabrication: Written QAP including but not limited to reference of applicable ASTM testing methodology, type and frequency of in-line monitoring of glass fabrication, and reporting and documentation. Test sample lite of glass, at GC's expense, for conformance to a) bow and warp, b) localized distortion / roller wave, c) concavity / convexity and d) compression strength.
2. Installation: Written QAP to monitor quality of products such as cleaners, solvents, primers, and sealants; and sealant workmanship including, cleaning, priming, joint opening preparation, and sealant installation.
    a. Include as part of program random adhesion and compatibility testing of production run products.
    b. Do not install sealant work prior to review of program.
    c. Submit quality assurance program to glass and sealant manufacturers for review and approval prior to submission to Architect.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Source Limitations for Glass: Obtain ultraclear float glass, and coated float glass from single source from single manufacturer

E. Source Limitations for Glass: Obtain laminated glass and insulating glass from single source from single manufacturer using primary glass obtained from a single source for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1. All permanent marks and/or labels should be placed in the vicinity of the glass where the label is not obscured by the glass bite, gasket, sealant or other anchoring/glazing material. End text at least 3 mm from all site lines of the fenestration glazing to allow for readability.

I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F. Do not install sealants to wet or frost covered surfaces.

1.10 WARRANTY

A. General: During the warranty period, restore defective Work to the standard of the Contract Documents, including all labor, materials, refinishing and other costs incidental to the Work. Restore Work found to be defective as defined in the Contract Documents.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Includes but not limited to fused ceramic spandrel, low-emissivity, and reflective glass.
2. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Includes but not limited to opacified spandrel glass.
2. Warranty Period: 10 years from date of Substantial Completion.

E. Installation: Glazing systems installation shall be warranted for a period of 5 years against defective materials and workmanship.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide Kind HS heat-treated float glass. For life safety or fire knock-out panel considerations, where fully tempered glass is indicated, provide Kind FT heat-treated fully tempered float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 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 of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

D. Safety Glass

1. CPSC 16 CFR part 1201, testing requirements of ANSI Z97.1, and listed in the SGCC Certified Products Directory with appropriate SGCC certification mark or label permanently affixed.
2. Furnish safety glass for glass occurring in doors and sidelights, and where indicated and further required by authorities having jurisdiction.

2.2 GLASS PRODUCTS

A. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I, complying with other requirements specified and with visible light transmission not less than 91 percent and solar heat gain coefficient not less than 0.87; heat-treated as described below.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Guardian Industries Corp.; Ultrawhite.
   b. Pilkington North America; Optiwhite.
   c. PPG Industries, Inc.; Starphire.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).
4. Limit Kind HS surface compression to upper end of ASTM C 1048 range, 7,500 psi.
5. Distortion Tolerances:
    a. Roller Wave: Maximum 0.003 inch (0.076mm) from peak to valley within the main body of the sheet and maximum 0.008 inch (0.20mm) within 10.5 inches of a leading or trailing edge.
    b. Localized Warp: Maximum 0.03 inch (0.80mm) over any 12 inch (305mm) span, but limited to 0.31 inch (8.00mm).

C. Ceramic-Coated Vision Glass: Heat-treated float glass, Condition C; with ceramic enamel applied by silk-screened process; complying with Specification No. 95-1-31 in GANA's Tempering Division's "Engineering Standards Manual" and with other requirements specified.

1. Glass: Ultraclear float.
2. Ceramic Coating Color and Pattern: As selected by Architect from manufacturer's full range.

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with SentryGlas polymer interlayer as indicated to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear and translucent pattern where indicated.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Listed in the IGCC/IGMA Certified Products Directory with appropriate Certification mark on the spacer or at least one pane of unit.
2. Sealing System: Dual seal, with manufacturer's standard primary and secondary, and with soldered, welded, and/or bent spacer corner construction..
    a. Units for structural sealant glazing: dual seal construction of a polyisobutylene primary seal and silicone secondary seal, and with soldered, welded, and/or bent spacer corner construction.

3. Spacer: Manufacturer's standard thermally-broken spacer material and construction .
4. Desiccant: Molecular sieve or silica gel, or blend of both.
5. Units which will be shipped through or glazed at altitudes of 1520 meters (5000 feet) or more above sea level, fabricated with breather or capillary tubes, to permit air space pressure equalization. Provide same warranty as for non-breather or capillary tube units. Pinch tubes during glazing if required by glass manufacturer.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, compatible with glazing sealants, and made from one of the following:

1. EPDM complying with ASTM C 864.
2. Silicone complying with ASTM C 1115.
3. Thermoplastic polyolefin rubber complying with ASTM C 1115.
4. Compression wedge for dry glazing system: of shape and size to compress the exterior compression gasket a minimum of 25 percent, and as recommended by glazing and sealing systems manufacturer.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Bed gasket for wet glazing system: continuous with pressure sensitive adhesive 1 side, designed to be compressed 25-40 percent in the opening.
2. Compression gasket for dry glazing system: shape as required to be compressed in place a minimum of 25 percent and of one-piece construction with factory-assembled frames with injection-molded, vulcanized corners; produced oversize in opening dimension, as determined by measurements, to insure compression at corners but within limits so that compression does not create a "pucker".
3. Channel gasket: continuous channel of shape and dimensions for application in the opening with specified glazing.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Provide 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. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 790.
    b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    c. May National Associates, Inc.; Bondaflex Sil 290.
    d. Sika Corporation, Construction Products Division; SikaSil-C990.
    e. Tremco Incorporated; Spectrem 1.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 791 or 795.
    b. GE Advanced Materials - Silicones; SilGlaze II SCS2800 .
    c. May National Associates, Inc.; Bondaflex Sil 295.
    d. Sika Corporation, Construction Products Division; SikaSil-C995.
    e. Tremco Incorporated; Spectrem 2 or Spectrem 3.

D. See Division 8 STRUCTURAL-SEALANT-GLAZED CURTAIN WALLS for information on structural sealant.

2.7 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, Type A durometer hardness of 85, plus or minus 5.

1. Each block shall be properly sized for load, as wide or wider than glazing, no less than 4 inches long; profile to permit friction fit, dart insertion into metal chair, or pressure sensitive adhesive one side to fix block in glazing opening.

D. Spacers: Elastomeric blocks or continuous extrusions of 40 to 60 Shore "A" durometer hardness to maintain glass lites in place for installation indicated.

1. Profile to permit friction fit, dart insertion or pressure sensitive adhesive one side to fix shim or spacer in location.

E. Edge Blocks: Elastomeric material of 40 to 60 Shore "A" durometer hardness to limit glass lateral movement (side walking).

1. Each block shall be a minimum 4 inches long, as wide as glazing, placed in the vertical glazing channel, and sized to allow a nominal 1/8-inch clearance between glass edge and installed block; profile to permit friction fit or pressure sensitive adhesive one side to fix block in glazing opening.

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. Open Cell Filter

1. Reticulated flexible polyester urethane foam having 20 pores per inch, sized at least 25 mm (1 inch) larger in dimension than weephole, of cross section to provide 15 to 25 percent compression for friction fit and as manufactured by Foam Division, Scott Paper Co.; H-O Products Corp.; or as approved.

H. Bond Breaker

1. Heavy duty, 0.28-mm (11-mil) minimum thickness, colored, polyethylene or teflon, self-adhesive bond breaker of type recommended by sealant manufacturer and suitable for conditions of usage. Liquid bond breaker is not permitted.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit 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 publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.9 LAMINATED-GLASS TYPES

A. Glass Type IGL-1T: Clear laminated glass with two plies of ultraclear fully tempered float glass.

1. Thickness of Each Glass Ply: 6.0 mm.
2. Interlayer Thickness and Type: 0.060 inch PVB clear.
3. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 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. Ensure approved Quality Assurance Program is implemented.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

1. Locate one quarter of glass width from each corner, but with block edge nearest corner no closer than 150 mm (6 inches) from corner, unless otherwise specified or required by glass manufacturer.
2. Insulating glass used in sloped glazing shall have both panes supported by setting blocks.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND 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. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 090561.13 - MOISTURE VAPOR EMISSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section includes fluid-applied, resin-based, membrane-forming systems that control the moisture-vapor-emission rate of high-moisture, interior concrete to prepare it for floor covering installation.

1.3 DEFINITIONS

A. MVE: Moisture vapor emission.

B. MVER: Moisture vapor emission rate.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Certifications: Furnish written certification that the manufacturer has verified the compatibility between the vapor retarder provided and the flooring product scheduled to be applied, including adhesives and floor leveling materials.

B. Flooring Manufacturer Acceptance of Vapor Retarder Application: Furnish a signed written statement obtained from flooring manufacturer, stating that the water vapor emission levels, after application of vapor retarders, are acceptable and suitable for their flooring application.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Employs factory-trained personnel who are available for consultation and Project-site inspection.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

C. Provide the following upon request:

1. Qualification Data: For Installer and manufacturer.

2. Product Test Reports: For each MVE-control system, for tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency.
3. Preinstallation testing reports.
4. Field quality-control reports.
5. Certification: From manufacturer that product is compatible with lightweight concrete.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating directions for storage and mixing with other components.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Comply with MVE-control system manufacturer's written instructions for substrate and ambient temperatures, humidity, ventilation, and other conditions affecting system installation.

1. Store system components in a temperature-controlled environment and protected from weather and at ambient temperature of not less than 65 deg F and not more than 85 deg F at least 48 hours before use.
2. Maintain ambient temperature and relative humidity in installation areas within range recommended in writing by MVE-control system manufacturer, but not less than 65 deg F or more than 85 deg F and not less than 40 or more than 60 percent relative humidity, for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.
3. Install MVE-control systems where concrete surface temperatures will remain a minimum of 5 deg F higher than the dew point for ambient temperature and relative humidity conditions in installation areas for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.

1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer and Installer agree to repair or replace the applied concrete vapor retarder, the new floor covering or coating, including materials and labor for applied concrete vapor retarder that fails to remain adhered to the substrate or is affected by moisture or alkalinity within the specified warranty period. Manufacturer's warranty requires manufacturer's inspection and written authorization, prior to removal of existing floor covering and applied concrete vapor retarder.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. MVE-Control System Capabilities: Capable of suppressing MVE without failure where installed on concrete that exhibits the following conditions:

1. MVER: Maximum 25 lb of water/1000 sq. ft. when tested according to ASTM F 1869.
2. Relative Humidity: Maximum 100 percent when tested according to ASTM F 2170 using in situ probes.

C. Water-Vapor Transmission: Through MVE-control system, maximum 0.10 permwhen tested according to ASTM E 96/E 96M.

D. Tensile Bond Strength: For MVE-control system, greater than 200 psi with failure in the concrete according to ASTM D 7234.

E. Product shall be compatible with lightweight concrete.

2.2 MVE-CONTROL SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Moisture Control, Inc.
2. ARDEX Americas.
3. Dependable, LLC.
4. Floor Seal Technology, Inc.
5. KOSTER American Corporation.
6. MAPEI Corporation.
7. Schonox HPS North America

B. MVE-Control System: ASTM F 3010-qualified, fluid-applied, two-component, epoxy-resin, membrane-forming system; formulated for application on concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.

1. Substrate Primer: Provide MVE-control system manufacturer's concrete-substrate primer if required for system indicated by substrate conditions.
2. Cementitious Underlayment Primer: If required for subsequent installation of cementitious underlayment products, provide MVE-control system manufacturer's primer to ensure adhesion of products to MVE-control system.
3. Thickness: Minimum continuous layer thickness >11mils (0.011 in.)
    a. Include minimum thickness to include calculations for rough, absorptive, or porous concrete surfaces

2.3 ACCESSORIES

A. Patching and Leveling Material: Moisture-, mildew-, and alkali-resistant product recommended in writing by MVE-control system manufacturer and with minimum of 3000-psi compressive strength after 28 days when tested according to ASTM C 109/C 109M.

B. Crack-Filling Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.

C. Cementitious Underlayment: If required to maintain manufacturer's warranty, provide MVE-control system manufacturer's hydraulic cement-based underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.

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

1. Installation of system indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Preinstallation Testing:

1. Testing Agency: District will engage a qualified testing agency to perform tests.
2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Install MVE-control system in areas where pH readings are less than 7.0 Insert value and in areas where pH readings are greater than 8.5.
3. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Install MVE-control system in locations where concrete substrate MVER exceeds 3 lb of water/1000 sq. ft. in 24 hours.
    b. Internal Relative Humidity Test: Using in situ probes, ASTM F 2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.
4. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum 100-sq. ft. area of MVE-control system to prepared concrete substrate and test according to ASTM D 7234.
    a. Proceed with installation only where tensile bond strength is greater than 200 psi with failure in the concrete.

B. Concrete Substrates: Prepare and clean substrates according to MVE-control system manufacturer's written instructions to ensure adhesion of system to concrete.

1. Remove coatings and other substances that are incompatible with MVE-control system and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by MVE-control system manufacturer. Do not use solvents.
2. Provide concrete surface profile complying with ICRI 310.2R CSP 3 by shot blasting using apparatus that abrades the concrete surface with shot, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
3. After shot blasting, repair damaged and deteriorated concrete according to MVE-control system manufacturer's written instructions.
4. Protect substrate voids and joints to prevent resins from flowing into or leaking through them.
5. Fill surface depressions and irregularities with patching and leveling material.
6. Fill surface cracks, grooves, control joints, and other nonmoving joints with crack-filling material.
7. Allow concrete to dry, undisturbed, for period recommended in writing by MVE-control system manufacturer after surface preparation, but not less than 24 hours.

8. Before installing MVE-control systems, broom sweep and vacuum prepared concrete.

C. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.

3.3 INSTALLATION

A. General: Install MVE-control system according to ASTM F 3010 and manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fish eyes, and voids.

1. Install primers as required to comply with manufacturer's written instructions.

B. Do not apply MVE-control system across substrate expansion, isolation, and other moving joints.

C. Apply system, including component coats if any, in thickness recommended in writing by MVE-control system manufacturer for MVER indicated by preinstallation testing.

D. Cure MVE-control system components according to manufacturer's written instructions. Prevent contamination or other damage during installation and curing processes.

E. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.

F. Install cementitious underlayment over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: District will engage a qualified testing agency to perform installation inspections.

B. Installation Inspections: Inspect substrate preparation and installation of system components to ensure compliance with manufacturer's written instructions and to ensure that a complete MVE-control system is installed without deficiencies.

1. Verify that surface preparation meets requirements.
2. Verify that component coats and complete MVE-control-system film thicknesses comply with manufacturer's written instructions.
3. Verify that MVE-control-system components and installation areas that evidence deficiencies are repaired according to manufacturer's written instructions.

C. MVE-control system will be considered defective if it does not pass inspections.

3.5 PROTECTION

A. Protect MVE-control system from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.

B. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control system membrane.

END OF SECTION

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including manufacturer's height limitation tables.

1.4 QUALITY ASSURANCE

A. Provide the following upon request:

1. Product Certificates: For each type of code-compliance certification for studs and tracks.
2. Evaluation Reports: For embossed steel studs and tracks, firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction
3. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: Refer to manufacturer's standard height limitation tables based on the following deflection criteria:

1. For wall assemblies without claddiing, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft..
2. For wall assemblies with cladding or tiling, limited to 1/360 of the wall height based on horizontal loading of 10 lbf/sq. ft..

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

C. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks.

1. Conventional Steel Studs and Tracks:
    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) CEMCO; California Expanded Metal Products Co.
        2) ClarkDietrich Building Systems.
        3) Steel Network, Inc. (The).
    b. Minimum Base-Metal Thickness: Sized according to manufacturer's published height limitation tables based on horizontal deflection performance requirements indicated.
    c. Depth: As indicated on Drawings.
2. Embossed Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C 645 steel studs and tracks.
    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) CEMCO; California Expanded Metal Products Co.
        2) ClarkDietrich Building Systems.
        3) Steel Network, Inc. (The).
    b. Minimum Base-Metal Thickness: Sized according to manufacturer's published height limitation tables based on horizontal deflection performance requirements indicated.
    c. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch minimum vertical movement.

a. Products: Subject to compliance with requirements, provide one of the following as provided by steel stud manufacturer:

1) CEMCO; California Expanded Metal Products Co.; Deflex Clips.
2) ClarkDietrich Building Systems; FTC3.
3) Steel Network, Inc. (The); VertiClip SLD Series.

2. Single Long-Leg Track System: ASTM C 645 top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
3. Double-Track System: ASTM C 645 top outer tracks, inside track with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: available products that may be incorporated into the Work include, but are not limited to, the following:

1) Blazeframe Industries; Bare Slotted Track (BST/BST 2).
2) CEMCO; California Expanded Metal Products Co.; CST Slotted Deflection Track or SLP-TRK Slotted Deflection Track.
3) ClarkDietrich Building Systems; SLP-TRK Slotted Deflection Track.
4) Steel Network, Inc. (The); VertiClip SLD orVertiTrack VTD.

E. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Blazeframe Industries; Intumescent Framing, Fire Stop System.
b. CEMCO; California Expanded Metal Products Co.; FAS Track.
c. ClarkDietrich Building Systems; BlazeFrame.
d. Fire Trak Corp; Fire Trak System attached to studs with Fire Trak Posi Klip.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: As indicated, but not less than 0.0329 inch to support equipment indicated.

G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: As indicated, but not less than 0.0329 inch.
2. Depth: As indicated on Drawings.

I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, 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 steel stud size.

C. Isolation Strip at Curtain Wall Mullion: Provide the following or Architect approved equal:

1. Product: Mull It Over Products; 55 Classic Sound Barrier Mullion Trim Cap

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754. Install according to Drawings and manufacturer's published height limitation tables.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: As required by horizontal deflection performance requirements, but not greater than 24 inches o.c., unless otherwise indicated.
   2. Multilayer Application: As required by horizontal deflection performance requirements, but not greater than 16 inches o.c., unless otherwise indicated.
   3. Tile Backing Panels: As required by horizontal deflection performance requirements, but not greater than 16 inches o.c., unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
5. Sound-Rated Partitions: Install framing and acoustical joint sealant to comply with sound-rated assembly indicated.
    a. Install isolation strip assembly at end of wall against perimeter wall or curtain wall mullion.

E. Direct Furring:
1. Attach to concrete with stub nails or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:
1. Erect insulation, specified in Section 098100 "Acoustical Insulation," vertically and hold in place with Z-shaped furring members spaced o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Joint tape and compound.
3. Gypsum board accessories.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for acoustical sealant.
2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing that supports gypsum board panels.
3. Section 098100 "Acoustical Insulation" for sound-attenuation blankets installed as part of sound-rated wall and ceiling assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Regional Materials: Products shall be manufactured within 100 milesof Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Basis-of-design Product: Subject to compliance with requirements, provide the following or comparable by Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. American Gypsum.
    b. CertainTeed Corporation.
    c. Georgia-Pacific Building Products.
    d. National Gypsum Company.
    e. United States Gypsum Company; EcoSmart Panels Firecode X (Basis-of-Design).
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

B. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. American Gypsum.
    b. CertainTeed Corporation.
    c. Georgia-Pacific Building Products.
    d. National Gypsum Company.
    e. United States Gypsum Company.
2. Thickness: 1/2 inch or 5/8 inch.
3. Long Edges: Tapered.

C. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. American Gypsum.
    b. CertainTeed Corporation.
    c. Georgia-Pacific Building Products.
    d. National Gypsum Company.
    e. United States Gypsum Company.
2. Core: 5/8 inch, Type X.
3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds requirements.
4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
6. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements according to test in Annex A1.
7. Long Edges: Tapered.
8. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. L-Bead: L-shaped; exposed long flange receives joint compound.
    d. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

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. Fry Reglet Corporation.
    b. Gordon, Inc.
    c. 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: As indicated.
4. Products: Provide the following in locations indicated on Drawings, or Architect approved equal.
    a. WALL TRIM TYPE 1 – Fry Reglet; DRM-50-75 2 PIECE finish power coat color white.
    b. WALL TRIM TYPE 2 – Fry Reglet; DRM-625-50 finish powder coat color white.
    c. WALL TRIM TYPE 3 – Fry Reglet; DRM-SNAP-IN-625 finish powder coat color white.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, 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 setting-type or sandable topping compound.
4. Finish Coat: For third coat, use sandable topping drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound-Attenuation Blankets: As specified in Section 098100 "Acoustical Insulation."

E. Acoustical Sealant: Refer to Section 079200 "Joint Sealants."

F. Firestop Putty Pads for Electrical Boxes: Listed intumescent moldable firestop putty pads. Coordinate locations with fire-rated partition types.
1. Available Products: Subject to compliance with requirements, provide one of the following:
    a. Hilti Corporation; CP 617 6" x 7" Putty Pad or CP 617L 7" x 7" Putty Pad.
    b. Kinetics Noise Control; IsoBacker.
    c. Specified Technologies Inc. (STI); SpecSeal Series SSP Putty Pad.

G. Acoustic Putty Pads for Electrical Boxes: Asbestos-free, putty pads composed of polybutene-butyl and inert fillers. Coordinate locations with sound-rated partition types.
1. Available Products: Subject to compliance with requirements, provide one of the following:
    a. Kinetics Noise Control; IsoBacker.
    b. Specified Technologies Inc. (STI); SpecSeal Series SSP Putty Pad.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant specified in Section 079200 “Joint Sealants.” Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings. Install sound-isolation strips at end of wall against perimeter wall or curtain wall mullion in accordance with Section 092261 “Non-Structural Metal Framing.”

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

K. Install fire rated putty pads in fire-rated walls and acoustical putty pads in sound-rated walls before installing gypsum panels. Install according to putty pad manufacturer’s instructions.

L. Install thermal insolation before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: Typical interior surfaces, except as indicated.
2. Ceiling Type: Ceiling surfaces.
3. Mold-Resistant Type: Non-tiled areas in wet locations as indicated on Drawings and where gypsum board must be installed prior to building being enclosed and conditioned.
1. Impact-Resistant Type: Stairway side of metal-stud-framed stairway enclosures.
4. Glass-Mat Interior Type: Interior-side of exterior perimeter walls.
5. Acoustically Enhanced Type: Acoustically-rated sound control partitions.
6. Tile Backer Board: Either glass-mat-faced or cement backer boards.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. 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 panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

3.4 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Cementitious Backer Units: Comply with manufacturer's written installation instructions and install in accordance with ANSI A108.11.

C. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM AND ACCESSORIES

A. General: 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. Control Joints: Install control joints according to ASTM C 840, in specific locations as follows.

1. Install at changes in backup material.
2. Framed Openings:
    a. Doors: Install above both jambs unless indicated or directed otherwise.
    b. Glazed Openings: Install above and below both jambs unless indicated or directed otherwise.
3. Install at other locations indicated on Drawings.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use where indicated.

D. Aluminum Trim: Install in locations indicated on Drawings in accordance with manufacturer’s instructions.

E. Firestop Putty Pads: Install at electrical boxes located in fire-rated partitions. Install in accordance with pad manufacturer's instructions.

F. Acoustic Putty Pads: Install at electrical boxes located in acoustic-rated partitions. Install in accordance with pad manufacturer's instructions.

3.6 FINISHING GYPSUM BOARD

A. General: 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. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, behind built-in cabinets and equipment, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Panels that are substrate for heavy grade wall coverings.
4. Level 4: Typical at panel surfaces that will be exposed to view, unless otherwise indicated, including panels scheduled to receive flat or eggshell paint finish, or light-grade wall coverings.
    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
5. Level 5: Apply skimcoat and feather out the corners as detailed. Refer to locations indicated on Drawings as follows:
    a. Locations:
        1) At panel surfaces scheduled to receive gloss or semigloss paint finish.
        2) Outer-shell (lobby side) of planetarium enclosure.
        3) Lobby at first, second, and third floor walls and ceilings/soffits.
        4) Other surfaces subject to severe or critical natural or artificial side lighting.
    b. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 095113 - SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Suspended acoustical panels.

3. Suspension systems for interior ceilings.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

A. Submittal Compliance Form: If Basis-of-Design products are provided, Submittal Compliance Form may be submitted in lieu of required Product Data submittal and Samples submittal.

B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.

3. Method of attaching hangers to building structure.
    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:
    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Sprinklers.
    f. Access panels.
    g. Perimeter moldings.
7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

A. Provide the following upon request:
    1. Qualification Data: For structural engineer and field -esting agency.
    2. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency or by a qualified testing agency.
    3. Field quality-control reports.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Suspended ceiling installation has been designed to withstand the effects of earthquake motions determined according to ASCE/SEI 7 as amended by 2016 CBC Section 1616.10.16 and Section 1616A.1.21.

B. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

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-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

2.3 SUSPENDED ACOUSTICAL PANELS AND CLOUDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corporation.
3. Chicago Metallic Corporation.
4. United States Gypsum Company.

B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.4 METAL SUSPENSION SYSTEM

A. Metal Suspension-System Standard: Provide ceiling panel manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 9/16-inch- wide metal caps on flanges as indicated.

1. Structural Classification: Heavy-duty system.

D. Cloud Suspension: Provide manufacturer's standard deck hanging kit, including grippers, hangers, aircraft cable, panel inserts, and fasteners for groups and individual panels to suit condition.

E. Attachment Devices: Provide as indicated in accordance with ASTM C 635. Refer to Drawings for specific requirements and spacing.

1. Anchors: Anchors of type and material indicated.
    a. Product: Refer to Drawings.
        1) Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
2. Power-Actuated Fasteners: Fastener system as indicated.

F. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.
3. Size:
    a. Hanger Wire Size: 0.106 inch (No. 12-gauge) diameter wire.
    b. Seismic Bracing Wire Size: 0.106 inch (No. 12-gauge) diameter wire.

G. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

H. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

I. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

J. Hold-Down Clips: Manufacturer's standard hold-down clip spaced as standard with manufacturer. Provide on ceilings within 20’-0” feet of exterior openings.

K. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.

1. Location and Spacing: As recommended by manufacturer. Refer to Drawings.

L. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

1. Location and Spacing: As recommended by manufacturer. Refer to Drawings.

M. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

1. Location and Spacing: As recommended by manufacturer. Refer to Drawings.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
    a. Provide manufacturer's seismic perimeter clips used with standard nominal 7/8-inch wall angles, with current ICC Evaluation Service Report (ESR) acceptable to authority having jurisdiction.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

B. Edge Moldings and Trim: Provide exposed members as indicated or required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of penetrations through ceiling, to conceal ends of pans and carriers, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching linear metal pans or extruded plastic unless otherwise indicated.

2.6 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 079200 "Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

A. 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 panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions.

1. Seismic Design Requirements: Install in accordance with the following:
    a. ASTM E 580/E 580M for Seismic Design Categories D, E, and F.
    b. ASTM E 580/E580M Section 5 as amended by 2016 CBC Section 1616.10.16 and Section 1616A.1.21.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
    a. When required, do not splay hangers steeper than 1:6 as described in DSA IR 25.2.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install clouds in accordance with manufacturer's instructions.

E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

F. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

G. 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 precise fit.

1. Arrange directionally patterned acoustical panels as follows:
    a. As indicated on reflected ceiling plans.
    b. Install panels with pattern running in one direction parallel to [long] [short] axis of space.
    c. Install panels in a basket-weave pattern.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

6. Install seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.
3. Metal transition strips.

B. Related Requirements:

1. Section 090561.13 "Moisture Vapor Emission Control."

1.3 ACTION SUBMITTALS

B. Product Data: For each type of product.

E. Product Schedule: For resilient base and accessory products.

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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

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

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient base shall comply with requirements of FloorScore certification.

B. Resilient base shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOSET-RUBBER BASE

A. Basis-of-Design Products: Subject to compliance with requirements, provide products as manufactured by Johnsonite; A Tarkett Company, or comparable by one of the following::

1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
2. Flexco.
3. Nora Rubber Products
4. Roppe Corporation, USA.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. RB-1: Straight: Provide in areas with carpet.
b. RB-2, Cove: Provide in public areas and non-carpeted areas.

2. Thickness: 0.125 inch.
3. Height: 4 inches.
4. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
5. Outside Corners: Preformed.
6. Inside Corners: Job formed or preformed.
7. Colors: As indicated by manufacturer's designations.

2.3 RUBBER MOLDING ACCESSORY

A. Description: Rubber carpet edge for glue-down applications nosing for carpet nosing for resilient flooring reducer strip for resilient flooring joiner for tile and carpet transition strips.

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. Johnsonite; A Tarkett Company.
    b. Roppe Corporation, USA.
    c. VPI, LLC, Floor Products Division.
2. Profile and Dimensions: As indicated.
3. Locations: Provide rubber molding accessories in areas indicated.
4. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 METAL TRANSITION STRIPS

A. Metal Edge/Transition Strips: Extruded aluminum with clear anodized finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

1. Product: Subject to compliance with requirements, provide products by one of the following to suit conditions:
    a. Progress Profiles
    b. Schluter Systems

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 resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

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

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

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

3.3 RESILIENT BASE INSTALLATION

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

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

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

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

E. Do not stretch resilient base during installation.

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

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

H. Job-Formed Corners:

1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

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

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

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

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

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

END OF SECTION

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular carpet tile.

B. Related Requirements:

1. Section 090561.13 "Moisture Vapor Emission Control."
2. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

B. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

D. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of edge, transition, and other accessory strips.
9. Transition details to other flooring materials.

F. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

G. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Provide the following upon request:

1. Qualification Data: For Installer.
2. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.8 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.9 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:
    a. More than 10 percent edge raveling, snags, and runs.
    b. Dimensional instability.
    c. Excess static discharge.
    d. Loss of tuft-bind strength.
    e. Loss of face fiber.
    f. Delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings, or Architect approved equal.

C. Color: As indicated by manufacturer's designations.

D. Pattern: Match existing carpets.

E. Pile Height: Not more than 1/2 inch according to CBC Title 24 Chapter 11B.

F. Primary Backing/Backcoating: Manufacturer's standard composite materials.

G. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
    a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

H. Sustainable Design Requirements:

1. Sustainable Product Certification: Silver level certification according to ANSI/NSF 140.
2. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

I. Performance Characteristics:

1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than [0.45 W/sq. cm] [0.22 W/sq. cm] according to NFPA 253.
3. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
4. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Metal Edge/Transition Strips: Refer to Section 096513 "Resilient Base and Accessories."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs:

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
d. If water moisture tests exceed stated limits, apply vapor retarder for moisture vapor emission control as specified in Section 090561.13.

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

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 098100 - ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Acoustical Insulation in sound rated partitions.
2. Acoustical Insulation above suspended ceilings.

1.3 SUBMITTALS

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

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

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Provide the following upon request:

1. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements, and that products contain no asbestos.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in their original containers or packages or bundles bearing label clearly identifying manufacturer's name, brand, grade, UL listing, and other pertinent information.

B. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 ACOUSTICAL INSULATION MATERIALS

A. Batt Insulation - Walls: ASTM C 665, Type I; preformed batt; friction fit, for interior walls, conforming to the following:

1. Material: Inorganic Glass Fiber with acrylic resin binder or Mineral Wool
2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
4. Acoustical Performance: 3.5 inches
    a. NRC: 1.05
    b. STC: 49 minimum, installed in 3-5/8 metal stud wall with 5/8 inch gypsum board on each side.
5. Facing: Unfaced.
6. Manufacturers:
    a. CertainTeed Corporation; CertaPro AcoustaTherm: www.certainteed.com.
    b. Johns Manville Corporation; Sound Control Batts: www.jm.com.
    c. Knauf Insulation; QueitTherm QT: www.knaufinsulation.us.
    d. Owens Corning Corp; QuietZone Acoustic Batts: www.owenscorning.com
    e. Thermafiber SAFB: www.thermafiber.com

B. Batt Insulation - Ceilings: ASTM C 665, Type I; preformed batt; above lay-in suspended ceilings, conforming to the following:

1. Material: Inorganic Glass Fiber or Mineral Wool
2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
4. Thickness: 2 and 3.5 inches, as indicated.
5. Size: 24 inches by 48 inches
6. Facing: Unfaced.
7. Manufacturers:
    a. CertainTeed Corporation; CertaPro AcoustaTherm: www.certainteed.com.
    b. Johns Manville Corporation; Sound Control Batts: www.jm.com.
    c. Knauf Insulation; QueitTherm QT: www.knaufinsulation.us.
    d. Owens Corning Corp; Sonobatts: www.owenscorning.com.
    e. Thermafiber SAFB: www.thermafiber.com

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.

2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.3 ACCESSORIES

A. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be mechanically fastened to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

B. Wire Mesh: Galvanized steel, hexagonal wire mesh.

C. Adhesives - General: Compatible with materials being adhered as instructed by insulation manufacturer for application; maximum VOC content of 50 g/L; GreenSeal GS-36 certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 BATT INSTALLATION

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

B. Install in interior wall and furring spaces without gaps or voids. Do not compress insulation.

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

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation. Insulation shall be tight within spaces in partitions, around cut openings, behind and around electrical and mechanical items within or behind partitions and tight to items passing through partitions.

E. Wall areas above ceiling: At side wall insulation in ceiling cavity, install adhesive-mounted impaling devices with metal caps at 24 inches vertically and at four (4) inches from each side of blankets horizontally. Install blankets with four (4) foot dimension running vertically on spikes, keeping blankets tight to exterior wall without crushing into each other.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

3.3 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings separated by full-height partitions, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

B. Where glass-fiber blankets are indicated for sound attenuation above suspended ceilings with partition below ceiling, fit insulation tightly above ceiling, loose laid. Refer to the suspended ceiling manufacturer's recommendations to ensure proper installation. Extend insulation 48 inches on both sides of partitions below.

3.4 PROTECTION

A. Protect installed insulation from damage due to physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Steel and iron.
3. Wood.
4. Fiberglass.
5. Plastic.
6. Gypsum board.
7. Cotton or canvas insulation covering.
8. ASJ insulation covering.

B. Related Requirements:

1. Section 099600 "High-Performance Coatings" for high-performance epoxy and polyurethane coatings.

1.3 DEFINITIONS

A. MPI Gloss Level 1 (Matte or Flat Finish): Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3 (Eggshell Finish): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 5 (Semi-Gloss Finish): 35 to 70 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

2. Indicate VOC content.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Benjamin Moore & Co.
2. Dunn-Edwards Corporation.
3. Kelly-Moore Paint Company Inc.
4. PPG Paints - PPG Architectural Coatings, Inc.
5. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior Painting Schedule for the paint category indicated.

C. Provide products indicated, or provide MPI-listed equivalent products from listed manufacturer's premium or professional product line.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with South Coast Air Quality Management District (SCAQMD), Rule 1113, effective 07/01/2008:

1. Flat Paints, Coatings, and Primers: 50 g/L.
2. Nonflat Paints, Coatings, and Primers: 50 g/L.
3. Nonflat (High Gloss) Paints, Coatings, and Primers: 50 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Anticorrosive and Anti-Rust Paints Applied to Ferrous Metals: 100 g/L.
6. Clear Wood Finishes, Lacquers: 275 g/L.
7. Clear Wood Finishes, Varnishes: 275 g/L.
8. Dry-Fog Coatings: 150 g/L.
9. Floor Coatings: 50 g/L.
10. High Temperature Industrial Maintenance Coatings: 420 g/L.
11. Industrial Maintenance Coatings: 100 g/L.
12. Pretreatment Wash Primers: 420 g/L.
13. Shellacs, Clear: 730 g/L.
14. Shellacs, Pigmented: 550 g/L.
15. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

C. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Colors: As indicated in the finish schedule on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Wood: 15 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 3.

F. Architecturally Exposed Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP7/NACE No. 4.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

I. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards and switch gear, unless factory-applied finished.
b. Uninsulated metal piping.

2. Paint the following work where exposed in occupied spaces:

    a. Equipment, including panelboards.
    b. Uninsulated metal piping.
    c. Uninsulated plastic piping.
    d. Pipe hangers and supports.
    e. Metal conduit.
    f. Plastic conduit.
    g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIRE-RATED AND SMOKE CONTAINMENT ASSEMBLIES

A. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
2. Be repeated at intervals not exceeding 30 feet measured horizontally along both sides of the wall or partition; and
3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: " X HOUR FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS" or other wording approved or required by AHJ (Authority Having Jurisdiction). Replace “X” with the appropriate designated hourly rating.
4. Apply a minimum one-inch wide bright red horizontal line, both sides of wall, interrupted for approved text, at the required interval.

B. Refer to the Life Safety Plan Drawings for locations of walls and applicable ratings.

3.5 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: District may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by CM, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Do not paint exposed formed architectural concrete, unless otherwise indicated.
2. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:
    a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149 X-Green.
        1) Kelly-Moore AcryShield Interior Wall Primer Undercoat
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: One of the following as directed by Architect:
        1) Latex, interior, institutional low odor/VOC Satin/Egg-shell (MPI Gloss Level 3), MPI #145.
            a) Kelly-Moore 1510 EnviroCoat 100% Acrylic Interior Eggshell Enamel
        2) Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
            a) Kelly-Moore 1520 EnviroCoat 100% Acrylic Interior Semi-Gloss Enamel

D. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 5.1S:
    a. Prime Coat: Primer, rust inhibitive, as recommended by finish coats manufacturer to suit conditions.
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147 X-Green.
        1) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Semigloss Enamel
2. Water-Based Dry-Fall System MPI INT 5.1C:
    a. Prime Coat: Shop primer specified in Section where substrate is specified, or alkyd, quick dry, metal primer as recommended by topcoat manufacturer to suit conditions.
    b. Topcoat: Dry fall, latex, satin (MPI Gloss Level 3), MPI #155.
        1) Kelly-Moore 481 Dry Fog II Satin Latex Maintenance Finish.

E. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 5.4G:

a. Prime Coat: Primer, quick dry, for aluminum as recommended by topcoat manufacturer to suit conditions.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147 X-Green.
    1) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Semigloss Enamel

F. Wood Substrates: Wood Trim, Architectural Woodwork, and Opaque Wood Doors.
1. Institutional Low-Odor/VOC Latex System MPI INT 6.3V:
    a. Prime Coat: Primer, latex, for interior wood, MPI #39.
        1) Kelly-Moore 295 KEL-BOND Acrylic Universal Primer Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    b. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147 X-Green.
        1) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Semigloss Enamel

G. Fiberglass Substrates:
1. Institutional Low-Odor/VOC Latex System MPI INT 6.7J:
    a. Prime Coat: Primer, bonding, water based, MPI #17.
        1) Kelly-Moore 287 KEL-BOND Adhesion Plus.
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147 X-Green.
        1) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Semigloss Enamel

H. Plastic Substrates:
1. Institutional Low-Odor/VOC Latex System MPI INT 6.8F:
    a. Prime Coat: Primer, bonding, water based, MPI #17
        1) Kelly-Moore 287 KEL-BOND Adhesion Plus
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147 X-Green.
        1) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Semigloss Enamel
        2)
        3)

I. Gypsum Board Substrates:
1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:
    a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, as recommended by topcoat manufacturer to suit conditions.
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: One of the following as directed by Architect:
        1) Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143 X-Green.
            a) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Flat Enamel

2) Latex, interior, institutional low odor/VOC Satin/Egg-shell (MPI Gloss Level 3), MPI #145 X-Green.

a) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Eggshell Enamel

3) Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147 X-Green.

a) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Semigloss Enamel

2. High-Performance Epoxy Coating: Refer to Section 099600 High-Performance Coatings.

J. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings

1. Institutional Low-Odor/VOC Latex System MPI INT 10.1D:

a. Prime Coat: Primer sealer, latex, interior, as recommended by topcoat manufacturer to suit conditions.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, low-sheen (MPI Gloss Level 2), MPI #144 X-Green

1) Kelly-Moore 1500 EnviroCoat 100% Acrylic Interior Low Sheen Enamel.

END OF SECTION

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:

1. Exterior Substrates:

a. Steel.
b. Galvanized metal.
c. Non-ferrous metal.

2. Interior Substrates:

a. Steel.
b. Gypsum board.

B. Related Requirements:

4. Section 099123 "Interior Painting" for general interior field painting.

1.3 DEFINITIONS

A. MPI Gloss Level 5 (Semi-Gloss Finish): 35 to 70 units at 60 degrees, according to ASTM D 523.

B. MPI Gloss Level 6 (Gloss Finish): 70 to 85 units at 60 degrees, according to ASTM D 523.

C. MPI Gloss Level 7 (High-Gloss Finish): More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials[, from the same product run,] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: [5] percent, but not less than [1 gal.] of each material and color applied.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Benjamin Moore & Co.
2. Carboline.
3. Devoe Paint Company; Akzo Nobel.
4. PPG Paints - PPG Architectural Coatings, Inc.
5. Sherwin-Williams Company (The).
6. Tnemec Company, Inc.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.

C. Provide products indicated, or provide MPI-approved equivalent products from listed manufacturer's premium or professional product line.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of the South Coast Air Quality Management District (SCAQMD), Rule 1113, effective 07/01/2008 and the following VOC content limits:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
3. Nonflat (High Gloss) Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
4. Anticorrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC content of not more than 100 g/L.
5. Clear Wood Finishes, Varnishes: VOC not more than 275 g/L.

6. Clear Wood Finishes, Lacquers: VOC not more than 275 g/L.
7. Floor Coatings: VOC not more than 50 g/L.
8. Shellacs, Clear: VOC not more than 730 g/L.
9. Shellacs, Pigmented: VOC not more than 550 g/L.
10. Primers, Sealers, and Undercoaters: VOC content of not more than 100 g/L.

C. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Colors: As indicated in finish schedule on the Drawings.

2.3 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning,"

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: District may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by CM, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:

3. Epoxy, Waterborne Over Rust-Inhibitive Primer:

a. Application: Hollow metal doors and frames, and other steel where indicated.
b. Prime Coat: Primer, rust-inhibitive, as recommended by finish coats manufacturer to suit conditions.
c. Intermediate Coat: Waterborne epoxy, matching topcoat.
d. Topcoat: Waterborne epoxy, gloss (MPI Gloss Level 6).

1) AkzoNobel Devoe Tru-Glaze-WB 4438

END OF SECTION

SECTION 101423 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Procurement and Contracting Requirements and Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. General signage requirements for the following:

a. Accessibility signage

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

C. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Provide the following upon request:

1. Qualification Data: For Installer and manufacturer.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL SIGNS, GENERAL

A. Regional Materials: Panel signs shall be manufactured within 100 miles of Project site.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and CBC Title 24 Chapter 11B for signs.

2.3 SIGNS

A. Room-Identification Signs, Wayfinding, and Emergency Signs: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: Match District standards as provided by ASI Sign Systems, Inc.
2. Mounting: Surface mounted to wall with two-face tape or hook-and-loop tape.
3. Text and Typeface: Accessible raised characters and Braille. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.4 PANEL-SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Steel Materials:

1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial or forming steel.
2. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008/A 1008M, commercial steel, Type B, exposed.
3. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529/A 529M or ASTM A 572/A 572M, 42,000-psi minimum yield strength.
4. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

D. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316, stretcher-leveled standard of flatness.

E. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

F. Polycarbonate Sheet: ASTM C 1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), with coating on both sides.

G. Fiberglass Sheet: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.

H. PVC Sheet: Manufacturer's standard, UV-light stable, PVC plastic.

I. Plastic-Laminate Sheet: NEMA LD 3, general-purpose HGS grade, 0.048-inch nominal thickness.

J. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated.

K. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
2. Exposed Metal-Fastener Components, General:
   a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
   b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant spanner-head slots unless otherwise indicated.
3. Sign Mounting Fasteners:
   a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
   b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
4. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.

1. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
2. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.

C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

D. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

E. Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.

F. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish to match sign-background color color unless otherwise indicated.
2. Stainless-Steel Brackets: Factory finish brackets with No. 4 finish unless otherwise indicated.

G. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:

1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Subsequent changeable inserts are by Furnish two blank inserts for each sign for District use.
2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Furnish two blank inserts for each sign for District use.
3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by District .

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 signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

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

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to accessibility standard.

C. Mounting Methods:

1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
2. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips 0.250 inch away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
3. Shim-Plate Mounting: Provide 1/8-inch- thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using <Insert mounting method> method specified above.

D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

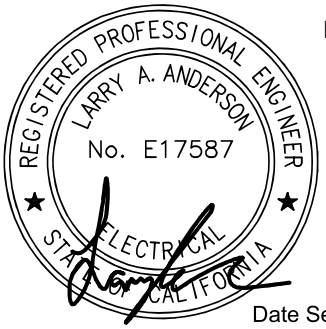
3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by District.

END OF SECTION



Date Sealed
04/11/2022

SECTION 27 00 00 BASIC COMMUNICATIONS REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general administrative and procedural requirements for Division 27, and is intended to supplement, not supersede, the general requirements specified in Division 00.

B. The requirements described herein include the following:

1. References
2. Definitions
3. System Description and Project Conditions
4. Submittals
5. Quality Assurance
6. Delivery, Storage, and Handling
7. Scheduling
8. Warranty
9. Product Substitutions
10. Project Management and Coordination Services
11. Permits and Inspections
12. Field Quality Control
13. Project Closeout and Record Documents

C. Related Items

1. General and Supplementary Conditions: General provisions of the Prime Contract and Divisions 00 and 01 apply to Division 27.
2. Consult other Divisions and Sections, determine the extent and character of related work, and coordinate Work of Division 27 with that specified elsewhere to produce a complete and operable installation.
3. Section 27 05 28, “Communication Building Pathways”
4. Section 27 05 33, “Communication Building Pathways – Conduits and Boxes”
5. Section 27 08 11, “Communication Twisted Pair Testing”
6. Section 271513, “Communication Horizontal Twisted Pair Cabling”

1.2 REFERENCES

A. General

1. Codes, standards, and industry manuals/guidelines listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Consider such codes and/or standards a part of this specification as though fully repeated herein.
2. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
3. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid unless otherwise specifically stated.

B. Codes: Perform work and furnish materials and equipment under Division 27 in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. California Code of Regulations (CCR):
    a. Title 8, “Industrial Relations”
        1) Chapter 3.22, “California Occupational Safety and Health Regulations (CAL/OSHA)”
    b. Title 24, “California Building Standards Code”
        1) Part 1, “California Building Standards Administrative Code”
        2) Part 2, “California Building Code” (CBC)
        3) Part 3, “California Electrical Code” (CEC)
        4) Part 11, “California Green Building Standards Code” (CALGeen)”
2. National Fire Protection Agency (NFPA)
    a. NFPA 75, “Protection of Information Technology Equipment”
3. Code of Federal Regulations (CFR) Title 47 ″Telecommunication″, Chapter I ″Federal Communications Commission (FCC)”
4. Other applicable national, state, and local binding building and fire codes

C. Standards: Perform work and furnish materials and equipment under Division 27 in accordance with the latest editions of the following standards as applicable:

1. Building Industry Consulting Services International (BICSI):
    a. Telecommunications Distribution Methods Manual (TDMM)
    b. Customer-Owned Outside Plant Design Manual
    c. Wireless Design Reference Manual (WDRM)
    d. Network Design Reference Manual (NDRM)
2. EIA testing standards
3. National Electrical Contractors Association (NECA):
    a. ANSI/NECA 1, “Standard Practices for Good Workmanship in Electrical Construction”
4. Telecommunications Industry Association (TIA):
    a. ANSI/TIA-568-C.0, “Generic Telecommunications Cabling for Customer Premises”
    b. ANSI/TIA-568-C.1, “Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements”
    c. ANSI/TIA-568-C.2, “Balanced Twisted Pair Telecommunications Cabling and Components”
    d. ANSI/TIA-568-C.3, “Optical Fiber Cabling Components”
    e. ANSI/TIA-569-B, “Commercial Building Standard for Telecommunications Pathways and Spaces”
    f. ANSI/TIA/EIA-598-B, “Optical Fiber Cable Color Coding”
    g. ANSI/TIA-606-B, “Administration Standard for Telecommunications Infrastructure”
    h. ANSI/TIA-607-C, “Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises”
    i. ANSI/TIA-758-A, “Customer-Owned Outside Plant Telecommunications Infrastructure Standard”
    j. ANSI/TIA-1005, “Telecommunications Infrastructure Standard for Industrial Premises”
5. CCCCD Infrastructure Standard
    a. Districtwide Technology Infrastructure Standard Rev. 02.60, Dated August 2018

1.3 DEFINITIONS

A. The definitions of Divisions 00 and 01 shall apply to Division 27 sections.
B. In addition to those definitions of Divisions 00 and 01, the following list of terms as used in this specification defined as follows:

1. “AFF”: Above Finished Floor
2. “As directed”: As directed or instructed by the Owner, or their authorized representative
3. “AHJ”: Authority Having Jurisdiction
4. “Cabling”: installed media ready for electronic or optical signal circuit use; a complete media connection comprised of cables, termination apparatus (patch panels, blocks, connectors), outlets, connecting media (path cord, crossconnects), labeling
5. “CBC”: California Building Code (CCR Title 24 Part 2)
6. “CCR”: California Code of Regulations
7. “CEC”: California Electrical Code (CCR Title 24 Part 3)
8. “Connect”: To install patch cords, equipment cords, crossconnect wire, etc. to complete an electronic or optical signal circuit
9. “Cord”: a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”
10. “Engineer”: TEECOM
11. “Furnish”: To purchase, procure, acquire, and deliver complete with related accessories
12. “General Contractor”: Successful bidder
13. “Identifier”: A unique code assigned to an element of the Telecommunications infrastructure that links it to its corresponding record
14. “Install”: To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, parts, items, or equipment supplied by contractor or others. Make installation complete and ready for regular operation
15. “IOR”: Inspector Of Record
16. “ISP”: Inside Plant
17. “LED”: Light Emitting Diode
18. “MSDS”: Material Safety Data Sheets
19. “NEC”: National Electrical Code (NFPA 70)
20. “NEMA”: National Electrical Manufacturers Association
21. “NFPA”: National Fire Protection Agency
22. “NIC”: Not In Contract (work or equipment)
23. “OFCI”: Owner-furnished contractor-installed; coordinate the integration of components furnished by the Owner; provide mounting hardware, cable, connectors, etc. to ensure proper integration of OFCI equipment
24. “OFE”: Owner Furnished Equipment
25. “OSP”: Outside Plant
26. “Owner”: Contra Costa College
27. “Owner’s Representative”: Critical Solutions Inc.
28. “PDF”: portable document format (electronic file format / *.pdf)
29. “Pigtail”: a length of cordage having connectors at one end
30. “Provide”: To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation
31. “UL”: Underwriters Laboratories

1.4 SYSTEM DESCRIPTION AND PROJECT CONDITIONS

A. In circumstances where the Specifications and Drawings conflict, the Drawings shall govern quantity and the Specifications shall govern quality.

1.5 SUBMITTALS

A. Submit required submittals to the General Contractor in the quantities and formats as required under the general contract. In the absence of requirements, provide as described in the following with reference to quantity and format.
B. Failure to comply with requirements in part or whole shall constitute grounds for rejection.
C. Resubmittals: For resubmittals, provide a cover letter with the resubmittal that lists the action taken and revisions made to each product in response to the Engineer's submittal review comments. Lack of this actions-taken cover letter shall constitute grounds for non-review and/or rejection of resubmittal packages.
D. Submittal Description: Product Data

1. Obtain written approval from the Engineer for the product data submittal prior to materials and equipment purchase order and prior to installation.
2. Quantity and Media: Submit product data as described in Division 01. In the absence of requirements given, submit product data submittal as directed in writing either as an electronic submittal (preferred) via approved means (e.g., email, e-transmit) or as four printed submittals (not preferred).
3. Format and Organization – Electronic Submittal:

    a. File format shall be PDF, either as a single compiled PDF file or as a PDF portfolio. PDF files should be produced from original electronic media, not scans of printed media. If scans from prints are the only option, annotate electronically, not on the prints prior to scanning.
    b. Pages should be letter size (8.5" x 11")
    c. Organize the Content in the following order:
        1) Cover
        2) Table of Contents (TOC)
        3) Statement of compliance
        4) Product information
        5) Seismic calculations (as required)
    d. Clearly and precisely indicate the submitted product and accessories by part number using an electronic annotation (arrow, rectangle, oval, etc.). Where the product data presents "part number builds", list the exact part number of the submitted products and accessories.
    e. Add page numbers in numerical order with no gaps to each page that correctly correspond to the TOC.

4. Format and Organization – Printed Submittal:

    a. Paper shall be letter size (8.5" x 11").
    b. Package printed submittal using a 3-ring binder, clear-front report cover, or similar.
        1) For 3-ring binders, clearly label the cover and spine of each binder with the required "Cover" information (e.g., insert the cover in the front and spine transparent pockets):
    c. Organize the content in the following order:
        1) Cover
        2) Table of Contents (TOC)
        3) Statement of compliance
        4) Product information
        5) Seismic calculations (as required)
    d. Include tabbed separators for improved navigation through the submittal.

e. Clearly, precisely, and permanently indicate the submitted product and accessories by part number using an arrow stamp or other permanent indicator. Where the product data presents “part number builds”, indicate the exact part number of the submitted products and accessories.

5. Content:

a. Cover: Include a cover that clearly displays the following information:

1) Owner name
2) Project name and address
3) Submittal name (e.g., “Product Data Submittal for Telecommunications Equipment Rooms”)
4) Project submittal number
5) Contractor’s submittal number (discretionary)
6) Submittal date; format: Month Day, Year (e.g., “January 1, 2019”)
7) Specification section numbers included in the submittal (e.g., “Section 271100”)
8) Contractor name and contact information

b. Table of Contents (TOC): Include a TOC that lists materials by section number, article and paragraph number. Add a brief product description (what it is, size or color or other optional features), manufacturer and part number. List the submittal page number per product. Example heading for TOC:

Section	Article	Paragraph	Description	Manufacturer	Part #	Page #

c. Statement of Compliance: Include a “Statement of Compliance” letter or memorandum on the submitter’s company letterhead from the highest ranking employee assigned to this project stating the submittal has been reviewed (quality control check) and is in full compliance with the requirements of the contract documents, and listing the submittal’s contents. Wet sign (and stamped, if applicable) the letter.

d. Product Information: Include manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary) that clearly describe the product’s characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color and finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements. Include products listed in the specifications, at a minimum. Include relevant products that will be installed, which are not listed in the specifications.

E. Submittal Description: Shop Drawings

1. Prior to the start of work, submit shop drawings and obtain written approval from the Engineer for the shop drawings submittal.
2. Quantity and Media: Submit shop drawings as described in Division 01. In the absence of requirements given, submit shop drawings as directed in writing either an electronic submittal (preferred) via approved means (email, e-transmit, FTP upload) or four printed and bound sets on bond.
3. Format:

a. Use the same sheet size as the contract drawings.
b. Use the same title block as the contract drawings, modified to include contractor information.
c. Text: 3/32” - 1/8” high when plotted at full size.
d. Use identical symbols as those in the contract drawings.
e. Screen background information.

f. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
g. Scaling:
    1) Scale floor plans and reflected ceiling plans at 1/8”=1’-0”
    2) Scale enlarged room plans at 1/4”=1’-0”
    3) Scale wall elevations at 1”=1’-0”
    4) Scale rack elevations at 1”=1’-0”

F. Submittal Description: As-Built Drawings

1. Quantity and Media: Submit as-built drawings as described in Division 01. In the absence of requirements given, submit as-built drawings as directed in writing as electronic files via approved media (or four printed and bound sets on bond, if approved).
2. Format:
    a. Use the same sheet size as the contract drawings.
    b. Use the same title block as the contract drawings, modified to include contractor information.
    c. Text: 3/32” - 1/8” high when plotted at full size.
    d. Use symbols identical to the symbols shown on the contract drawings.
    e. Screen background information.
    f. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
    g. Electronic files shall be native format and plotted PDF files. The file names shall include the sheet number.
3. Content:
    a. Submit as-built drawings that fully represent actual installed conditions and that incorporate modifications made during the course of construction.
    b. Symbols List
    c. Diagrams, such as (but not limited to) point-to-point diagrams, block diagrams, riser diagrams, line diagrams, and other diagrams that conceptually describe the system
    d. Floor Plans and Reflected Ceiling Plans: Scale plans at 1/8”=1’-0”. Plans shall show:
        1) Locations and identifiers of telecommunications outlets
        2) Routes, types, sizes, and quantities of pathways (such as cable trays, conduits, hangers, and other pathways)
    e. Enlarged Rooms Layouts: Applicable rooms: Entrance facilities, BDF, IDFs. Room drawings shall show:
        1) Floor layouts – scaled at either 1/4”=1’-0”, showing dimensioned placement of equipment cabinets/frames, rack bays, etc.
        2) Overhead layouts – scaled at either 1/4”=1’-0”, showing dimensioned placement of overhead cable support (e.g., cable tray, cable runway, conduit sleeves, etc.)
        3) Rack elevations – scaled at 1”=1’-0”, showing placement of termination apparatus and other equipment installed onto rack bays
        4) Wall Elevations – scaled at 1”=1’-0”, showing dimensioned placement of termination apparatus (e.g., termination/crossconnect blocks)

G. Submittal Description: Operation and Maintenance (O&M) Manual

1. Quantity and Media: Submit O&M Manual as described in Division 01. In the absence of requirements given, submit one packaged O&M Manual set.
2. Format and Organization:
    a. Include contents in a 3-ring binder with front cover and spine clear pockets for insertion of the cover information.
    b. Cover shall include the following information:
        1) Owner name
        2) Project name and address
        3) Manual name (e.g., “Operation and Maintenance Manual for Telecommunications Cabling System”)
        4) Date; format: Month Day, Year (e.g., “January 1, 2014”)
        5) Contractor name and contact information
    c. Include a ToC at the beginning that lists the contents.
    d. Include tabbed separators for improved navigation through the manual.
3. Content:
    a. Instructions on making a warranty claim during the warranty period
    b. Contact information during the warranty period
    c. Contact information beyond the warranty period for maintenance and related service
    d. As-built drawings, as described above, printed on tabloid size (17”x11”) paper and as electronic files – both native files and plotted PDF files
    e. Product catalog/technical information sheets for each component provided under applicable section (typically, this is the {or similar to} the accepted product data submittal), printed on letter size (8.5” x 11”) paper and as electronic files in PDF format
    f. Warranty certificate from the manufacturer and the contractor, printed on letter size (8.5” x 11”) paper, wet signed as applicable
    g. Manufacturer’s instructions for system or component use
    h. Instructions and requirements for proper maintenance (according to the manufacturer) and as to maintain warranty

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications
1. Five continuous years, minimum, design and manufacture of the materials and equipment specified herein.
2. Manufacturer(s) of products and equipment specified herein shall demonstrate that they have a quality assurance program in place to assure that the specifications are met. Include in the program, at a minimum, provisions for:
    a. Incoming inspection of raw materials
    b. In-process inspection and final inspection of the cable product
    c. Calibration procedures of test equipment to be used in the qualifications of the product
    d. Recall procedures in the event that out of calibration equipment is identified.
3. Conform to government standards on quality assurance for applications within these specifications.

B. Contractor Qualifications:
1. A current, active, and valid and C7 or C10 California State Contractors License
2. Five, minimum, continuous years of experience

3. Five, minimum, completed projects similar to scope and cost
4. Evidence of technicians qualified for the work

C. Materials

1. Materials, support hardware, equipment, parts comprising units, etc., shall be new, unused, without defects and of current manufacturer, materials
2. Use specified products and applications, unless otherwise submitted and approved in writing.

D. Regulatory Requirements

1. Work and materials shall conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and shall conform to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Work under Division 27 shall confirm to the most stringent of the applicable codes.
2. Provide the quality identified within these specifications and drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The contract documents address the minimum requirements for construction.

E. Drawings

1. Follow the general layout shown on the drawings except where other work may conflict with the drawings.
2. Drawings for the work within this division are essentially diagrammatic within the constraints of the symbology applied.
3. The drawings do not fully represent the entire installation. Drawings indicate the general route for pathways and cables, and show general locations of outlets. The drawings might not expressly show every conduit, sleeve, hanger, etc., but a complete system is required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Do not deliver products to the site until protected storage space is available.
2. Coordinate materials delivery with installation schedule to minimize storage time at jobsite.
3. Deliver materials in manufacturer's original, unopened, undamaged packaging and containers with identification labels (name of the manufacturer, product name and number, type, grade, UL classification, etc.) intact.
4. Immediately replace equipment damaged during shipping at no cost to the Owner, so as not to impact the construction schedule.

B. Storage and Protection

1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.
2. Comply with manufacturer's storage requirements for each product. Comply with recommended procedures, precautions or remedies as described in the MSDS as applicable.
3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
4. Storage outdoors covered by rainproof material is not acceptable.

5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling

1. Handle materials and equipment in accordance with manufacturer's written instructions. Handle with care to prevent damage, breakage, denting, and scoring.
2. Do not install damaged materials and equipment. Replace damaged equipment at no cost to the Owner.

1.8 SCHEDULING

A. Unless otherwise specified, the construction schedules of the Sections within Division 27 may be combined into a single, overall schedule.
B. Do not proceed without written approval from the Owner or Owner's Representative for schedule of this Work.

1.9 PROJECT MANAGEMENT AND COORDINATION

A. Project Management and Coordination Services

1. Provide a project manager for the duration of the project to coordinate this Work with other trades. Coordination services, procedures and documentation responsibility include, but are not limited to, the items listed in this section.
2. Review of Shop Drawings Prepared by Other Subcontractors:

a. Obtain copies of shop drawings for equipment provided by others that require telecommunication service connections or interface with work.
b. Thoroughly review other trades' shop drawings to confirm compliance with the service requirements contained in the Division 27 contract documents. Document discrepancies or deviations as follows:

1) Prepare memo summarizing the discrepancy
2) Submit a copy of the specific shop drawing, indicating via cloud, the discrepancy

c. Prepare and maintain a shop drawing review log indicating the following information:

1) Shop drawing number and brief description of the system/material
2) Date of the review
3) Name of the individual performing the review
4) Indication if follow-up coordination is required

3. Should existing conditions prohibit construction progress as submitted and approved, coordinate the adjusted installed locations with the other contractors (AV, electrical, etc).

B. Concurrent Installation

1. The network will be installed concurrent with the work of Division 27. Coordinate your work with the Owner's/network integrator's work. For example, coordinate scope and dates for rack and cabling (terminations) readiness to allow the network integrator to plan and schedule installation of the network equipment (for example, access switches).

C. Role of the Engineer

1. The Owner has retained the Engineer's services through construction. During construction, the Engineer will work with and assist the Contractor as follows (in general):

a. Review product data and shop drawings submittals for general compliance with the contract drawings and specifications.
b. Provide interpretation and clarification of project contract documents
c. Reply to (and 'process') relevant Requests for Information (RFIs)
d. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
e. Interpret field problems for Owner, and translate between Owner and Construction Team.
f. Review the testing procedures to confirm compliance with industry-accepted practices.
g. Observe the work for general compliance with the contract documents and to ensure that the installation meets the design intent of the system, and report progress to the Owner.

D. Use of Electronic Drawing Files

1. Should the Contractor require the Engineer's electronic files to produce shop drawings and/or as-built drawings, the Engineer will require the Contractor sign a file release agreement.

1.10 WARRANTY

A. As a minimum, warrant products and labor provided will, under normal use and service, be free from defects and faulty workmanship for period of 1 year from the date of acceptance. During the warranty period the entire system shall be kept in operating condition at no additional material or labor costs to the Owner. Also refer to specific sections for additional warranty requirements that supersedes the project's minimum warranty.
B. Render service within 24 hours of system failure notification. Note deviations or improvements to this service at the time of bid and obtain written acceptance from the Owner, or Owner's Representative.
C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. Provide complete replacement parts within 24 hours during the warranty period.
D. Conformance to certain government standards on quality assurance may be required for some applications outlined in these specifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.
B. Product numbers are subject to change by the manufacturer without notification. In the event a product number is invalid or conflicts with the written description, notify the Engineer in writing prior to ordering the material and performing installation work.

2.2 PRODUCT SUBMITTAL AT TIME OF BID

A. At the time of bid, include a list of major products in the Contract documenting the intended cabling system solution, AV equipment, etc.

2.3 SUBSTITUTIONS

A. Conform to the substitutions requirements and procedures outlined in Division 01
B. Only one substitution for each product specified will be considered.
C. Where products are noted as "or equal", a product of equivalent design, manufacture, and performance will be considered. Submit product data (product information, catalog cuts, pertinent test data, etc.) to substantiate that the product is in fact equivalent to that specified. The burden of proof that the substituted product is equivalent to the specified product rests with the Contractor. Whenever material, process or equipment is specified in accordance with an industry specification (ANSI, TIA, etc), UL rating, or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit supporting test data to substantiate compliance.
D. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the contract documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of the Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when “or equal” follows the manufacturers' names or model number(s).
E. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.
F. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from provisions of the specifications.
G. Pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, subcontractor's or other Contractor's work.

PART 3 - EXECUTION

3.1 PERMITS AND INSPECTIONS

A. Obtain and pay for permits and inspections required for the work.
B. Furnish materials and execute workmanship for this work in conformance with applicable legal and code requirements.
C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.
D. Arrange and pay for review/inspection from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

3.2 EXAMINATION

A. Verify existing conditions, stated under other sections, are acceptable for installation in accordance with manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman to supervise the crew performing the work and who is present at the job site at times work is being performed.
B. Construction Meetings: Participate in construction coordination meetings throughout the course of construction to review the progress and to resolve issues and conflicts. Prepare and distribute meeting agenda for telecommunication issues prior to, and meeting notes after meetings, in a format acceptable to the Owner. Publish meeting notes within 3 business days following the meeting.
C. Scheduling: Perform the work within the approved construction schedule. Keep the construction schedule current, based on the results of the construction meetings. At minimum, schedule shall document critical due dates, tasks, and milestones. Submit revised schedules for approval within 3 business days whenever there are modifications.
D. Inspection: Inspect the work after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion ready for inspection. Document completion and inspection as required.

3.4 INSTALLATION

A. Complete work in a neat, high-quality manner, relative to common industry practices, and in accordance to NECA “Standard of Installation”.
B. Complete work in conformance to applicable federal, state and local codes, and telephone standards.
C. Coordinate the entire installation throughout the construction team (general contractor and subcontractors).
D. Manufacturer's Instructions: Comply with manufacturer's published installation instructions, product data, product technical bulletins, product catalog, and other instructions for installation. Maintain a file on the jobsite of MSDSs for each product delivered to jobsite packaged with an MSDS.
E. Adjusting: Make changes and revisions to systems to optimize operation for final use. Make changes to systems such that defects in workmanship are corrected and completed systems pass the minimum test requirements.
F. Protection: Protect installed products and finish surfaces from damage during construction.
G. Repair/Restoration: Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement. Repair defects prior to system acceptance.

3.5 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Remove unused, excess, and left over products, debris, spills, or other excess materials. Remove installation equipment.
B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.
C. Repair or replace damaged installed products.
D. Legally dispose of debris.
E. Clean installed products in accordance with manufacturer's instructions prior to Owner's, or Owner’s Representative’s, punch walk.

3.6 PUNCH WALKS AND PUNCH LISTS

A. Punching the Work of individual Sections of Division 27 may be combined when noted so.
B. Execute a punch walk with the Engineer and the Owner or Owner’s Representative to observe Work.
C. Develop a punch list for items needing correction. Issue this punch list to Engineer.
D. Correct the Work as noted on punch list.

E. Execute follow up punch walk with the Engineer and the Owner or Owner’s Representative to verify punch list items have been corrected.

3.7 SYSTEM ACCEPTANCE

A. Complete corrections (punch list items) prior to submitting acceptance certificate.
B. On completion of the acceptance test, submit system acceptance certificate to the Owner or Owner’s Representative requesting their signature and return of the certificate. Issue copies of the signed certificate back to the Owner or Owner’s Representative with copy to the Engineer.

3.8 TRAINING

A. After acceptance, schedule a time convenient with the Owner, or Owner's Representative, for instruction in the configuration, operation, and maintenance of the system.
B. Refer to individual sections within Division 27 for additional training requirements.

END OF SECTION

PART 4 - PRODUCT SUBSTITUTION SCHEDULE

Use this schedule only if your proposal is not based on the specified products.

Your proposal is assumed to be based upon the specified products if this schedule is not included in the proposal.

If this substitution schedule is not included in the proposal and products are substituted during product data submittals, than the contractor may be liable for additional costs incurred to process these product substitutions.

Section	Article	Product Description	Product Substitution (Manufacturer, Product No.)

Copy this page as necessary to completely list product substitutions.

Date Sealed
04/11/2022

SECTION 27 05 28 COMMUNICATIONS BUILDING PATHWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Pathway systems within buildings to support low voltage systems: namely cable hangers and rated sleeves.
B. Related Sections

1. Comply with the Related Sections paragraph of Section 270000.
2. Section 26 05 33, “Raceways and Boxes for Electrical Systems”
3. Section 27 05 33, “Communications Conduits and Boxes”

1.2 REFERENCES

A. Comply with the References requirements of Section 270000.
B. In additional to those codes, standards, etc., listed in 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. Underwriters Laboratories (UL)

   a. UL 5, “Standard for Surface Metal Raceways and Fittings”
   b. UL 5A, “Nonmetallic Surface Raceways and Fittings”
   c. UL 5C, “Standard for Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits”

2. Underwriters Laboratories (UL)

   a. UL 467, “Grounding and Bonding Equipment”

1.3 DEFINITIONS

A. Definitions of Section 27 00 00 apply to this Section.
B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this Section defined as follows:

1. “Cable Hanger”: A cable support component often shaped (section view) similar to the letter J (thus gaining the nickname “J hanger”), metallic (most often steel) or non-metallic (most often thermoplastic); available in different sizes (to support different quantities of cables) and with different attachment hardware suiting multiple installation methods (e.g., wire support, beam flange clip, etc.).
2. “Cable Strap”: A flexible cable support that generally ‘wraps’ around cables and ‘latches’ into a fixed position, most often textile, available in different sizes (to support different quantities of cables) and with different attachment hardware suiting multiple installation methods (e.g., wire support, beam flange clip, etc.).
3. “Enclosure”: The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage.
4. “J Hanger” and “J Hook”: nickname for cable hanger
5. “NEC”: National Electrical Code (NFPA 70)
6. “NFPA”: National Fire Protection Agency
7. “UL”: Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

A. Base Bid Work:

1. The Work of this section includes planning and coordination with General Contractor (and other trades) of inside plant pathway systems and components, furnishing necessary materials, and labor and associated services required to install pathways.

B. Cable Hanger Systems

1. Provide a complete cable hanger system compliant with requirements of the CEC (in particular, compliant with the requirements of Article 300.11), in accordance with NECA's "Standards of Installation" (pertaining to general electrical installation practices), compliant with applicable portions of NFPA 70B, in accordance with manufacturer's instructions, and in accordance with recognized industry practices. A "complete system" shall include cable hangers, supports, anchors, fasteners, and other required accessories.
2. Provide cable hangers between primary pathways (or telecommunications rooms) and work area pathways and/or outlet locations at intervals up to 48 inches on center per a given route, at transitions downward/upward, and within 24 inches of an outlet stub/outlet location.
3. Supports:
    a. Provide dedicated supports for cable hangers. Do not support cable hangers on ceiling grid support wires. Do not share supports with other trades. Do not support hangers from ductwork, piping, or other equipment hangers.
    b. Support Wires:
        1) Support wires shall consist of #12 drop wire (or as approved) with integral clip and fastener (such as power-actuated deck pin, beam flange, or other fastener appropriate for the use).
        2) Secure support wires at both ends in accordance with CEC.
    c. Support Rods:
        1) Support rods shall consist of 1/4 inch (6.3mm) or 3/8 inch (9.5mm) threaded or smooth rod and concrete anchor or beam flange clip or angled flange clip (as required for attachment to the building structure).
4. Clearances (minimum):
    a. From fluorescent light fixtures, or other EMI sources = 6 inches
    b. From any motor = 48 inches
    c. From flue, hot water, steam line or other non-insulated heat sources = 12 inches

C. Fire Rated Sleeves

1. Provide complete fire rated sleeve systems where shown on the drawings and where cables penetrate rated walls, in accordance with ASTM E814 (UL1479). Complete shall include sleeves, brackets, frames, plates, etc, and other required accessories necessary for a complete installation according to UL System drawings.
2. Provide complete fire rated sleeve systems equal to (or greater than) the F rating of the barrier in which the device is installed.
3. Provide a system label at each penetration instance.

D. Surface Raceway

1. Provide a complete surface raceway system in accordance with NEC Article 386 and or NEC Article 388 where required by manufacturer's installations. Complete shall include base and cover straight sections, couplers, corners, 'T' junctions, feed connectors, compartment dividers, end caps, and hardware required for a fully enclosed pathway system that fully houses and conceals cables and wires. Refer to Drawings for locations and routes.
2. Surface raceway shall be mechanically and electrically continuous. Bond surface raceway system to approved electrical ground in accordance with NEC Article 250 and ANSI/TIA-607-C. Provide bonding straps where necessary to assure electrical continuity.
3. Surface raceway shall have a minimum two inch radius control at all bend points.
4. Coordinate raceway lengths with building walls, counter, and other actual field conditions. Raceways mounted above benches and counters shall align with each end of bench or counter, within 1/16-inch tolerance.
5. Finish:
    a. Paint surface raceway system to match existing walls.
    b. Touch-up any marks, blemishes or other finish damage suffered during installation.

E. Spiral Wrap

1. Provide spiral wrap to support and dress cables from feed pathways to the point where the cables enter the furniture system.

1.5 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 270000.
B. Quantity: Furnish quantities of each submittal as noted in Section 270000.
C. Submittal Requirements Prior to the Start of Construction:

1. Product Data Submittal, showing product dimensions, fabrications materials, fabrication details, knockout sizes and locations, capacities, finishes, and accessories
2. Shop Drawings Submittal, consisting of proposed changes to pathways (routes, types, sizes, etc.) compared to the contract documents

D. Submittal Requirements at Close Out:

1. As-Built Drawings, showing the routes/locations, dimensions, types, sizes, quantities, etc., of pathways/pathway devices.
2. O&M Manual, including as-builts, a parts list, repair information, and detailing ongoing maintenance requirements

E. Substitutions

1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 270000.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 27 00 00.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of section 27 00 00.

1.8 WARRANTY

A. Comply with Warranty requirements of section 27 00 00.

PART 2 - PRODUCTS

2.1 HANGERS AND STRAPS

A. Application: Suitable for indoor installation within ceiling space for the support of communications cables.
B. Hanger shall be rated for use in air handling space.
C. Hangers shall contain a closing loop, retainer, or latch to prevent cables from falling off the hanger.
D. Manufacturer:
    1. Eaton B-Line
        a. #BCH21-W2; for drop wire installation
        b. #BCH32-W2; for drop wire installation
        c. #BCH21; for wall installation
        d. #BCH32; for wall installation
    2. Erico
        a. #CAT12 (or variation per installation method); cable hanger
        b. #CAT21 (or variation per installation method); cable hanger
        c. #CAT32 (or variation per installation method); cable hanger
        d. #CAT425 (or variation per installation method); cable strap
    3. Panduit
        a. #JMJH2-X20
    4. Or equal

2.2 DROP WIRE

A. Application: Suitable for indoor installation within ceiling space into structure above (e.g., deck or slab) for the support of cable supports such as cable hangers.
B. Listings: UL 2043, for use in air handling spaces
C. Drop wire shall be equipped with pre-mounted ceiling clip, fastening pin, and pre-tied wire. Pin shall be 7/8". Wire shall be 12 gauge.
D. Manufacturers:
    1. Hilti #CC27 X-AL-H22P8T x ft. PT (100); drop wire assembly, "x" for length
    2. Armstrong #7891
    3. Dottie #CWC
    4. Garvin Industries
    5. Oregon Wire Products
    6. Or Equal

2.3 DROP ROD

A. Application: Suitable for indoor installation within ceiling space into building structure above (e.g., deck or slab) for the support of cable supports such as cable hangers.

B. Listings: UL 2043, for use in air handling spaces
C. Zinc plated for corrosion resistance
D. Manufacturers:
    1. CEAS #01014801; “Stiffy” straight rod, 1-1/4” power-actuated pin, 48 inches (or configured as required per instance)
    2. Or equal

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 270000.

3.2 EXAMINATION AND PREPARATION

A. Prior to starting the work of this section, examine areas to receive pathways systems to verify conditions are ready for work and to verify conformance with manufacturer and specification tolerances. Notify the Owner’s Representative in writing of conditions that would adversely affect the installation, or subsequent utilization, of the system. Do not proceed with installation until unsatisfactory conditions are corrected.
B. Prior to installation, plan routes and locations of pathway systems and coordinate with other trades (ductwork, plumbing, electrical raceways, wall construction, ceilings, etc.). Pathway systems shall not unnecessarily cross other trade’s work, shall not prevent removal of ceiling tiles or panels, and shall not block access to mechanical or electrical equipment. Provide offsets as required to avoid obstruction of pathway systems with other trades.

3.3 INSTALLATION

A. Hangers and Straps
    1. Install hangers so they are accessible through the ceiling grid and are not blocked by other building infrastructure.
    2. Install hangers above ceiling grid to result in cables sag 6 to 12 inches (150 to 300 mm), minimum, above ceiling grid. Cables shall not rest on the ceiling grid and/or ceiling tiles.
    3. Where hangers have loops/retainers, close loop/retainer (latch after cable installation).

3.4 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.
B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION

Date Sealed
04/11/2022

SECTION 27 05 33 COMMUNICATIONS BUILDING PATHWAYS – CONDUITS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Pathway systems within buildings consisting of conduit and boxes (outlet, device, pull, and other boxes) to support low voltage systems
B. Related Sections
   1. Comply with the Related Sections paragraph of Section 27 00 00.

1.2 REFERENCES

A. Comply with the References requirements of Section 27 00 00.
B. In additional to those codes, standards, etc., listed in 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. American National Standards Institute (ANSI)
      a. ANSI C80.1, “Specifications for Rigid Steel Conduit, Zinc Coated”
      b. ANSI C80.3, “Specifications for Electrical Metallic Tubing”
      c. ANSI C80.6, “Electrical Intermediate Metal Conduit”
   2. ASTM International
      a. ASTM A123, “Standard Specification of Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”
      b. ASTM A653, “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
      c. ASTM D1654, “Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments”
   3. International Electronic Committee (IEC)
      a. ANSI/IEC 60529, “Degrees of Protection Provided by Enclosures (IP Code)”
   4. National Electrical Manufacturer Association (NEMA)
      a. NEMA 250, “Enclosures for Electrical Equipment (1000 volts maximum)”
      b. NEMA FB 1, “Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable”
      c. NEMA OS 1, “Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports”
      d. NEMA OS 2, “Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports”
      e. NEMA OS 3, “Selection and Installation Guidelines for Electrical Outlet Boxes”
      f. NEMA TC 2, “Electrical Polyvinyl Chloride (PVC) Conduit”
      g. NEMA TC 3, “Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing”
      h. NEMA TC 7, “Smooth-Wall Coilable Electrical Polyethylene Conduit”
   5. Underwriters Laboratories (UL)
      a. UL 1, “Flexible Metal Conduit”
      b. UL 6, “Electrical Rigid Metal Conduit -Steel”
      c. UL 50, “Enclosures for Electrical Equipment, Non-Environmental Considerations”

d. UL 360, “Liquid-Tight Flexible Steel Conduit”
e. UL 467, “Grounding and Bonding Equipment”
f. UL 514A, “Metal Outlet Boxes”
g. UL 514B, “Conduit, Tubing, and Cable Fittings”
h. UL 514C, “Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
i. UL 651, “Schedule 40 and 80 Rigid PVC Conduit”
j. UL 797, “Electrical Metallic Tubing - Steel”
k. UL 1242, “Electrical Intermediate Metal Conduit - Steel”
l. UL 2024, “Signaling, Optical Fiber and Communications Raceways and Cable Routing Assemblies”

1.3 DEFINITIONS

A. Definitions of Section 27 00 00 apply to this Section.
B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this Section defined as follows:

1. “Backbox”: A box [*see* “Box”] used to house cable terminations, to house devices, and to interface with cords/equipment; a backbox is installed with walls (such as within the cavities of framed walls and/or cast-in-place within concrete walls) such that the outlet/device finish (e.g., the coverplate/faceplate) is flush with the wall finish
2. “Box”: A box (often 5-sided with 1 side open) manufactured of sheet metal with welded corners, drawn metal, cast metal, or nonmetallic material (thermoplastic) in accordance with NEMA OS 1 or NEMA OS 2 and installed in accordance with NFPA 70 Article 314; available in different sizes (volumes) and modular design configurations (gangable) that may be field assembled, one to another, to accommodate multiple devices; boxes may be used as outlet boxes, device boxes, backboxes, junction boxes, or pull boxes, depending on their intended use, and handhole enclosures.
3. “CEC”: California Electrical Code (California Code of Regulations, Title 24 Part 3)
4. “Device Box”: A box [*see* “Box”] with provisions for attaching and housing electrical devices (switches, receptacles, or similar wiring devices) manufactured in accordance with NEMA OS 1 and NEMA OS 2 and installed in accordance with NFPA 70 Article 314; available in different sizes (volumes) and modular design configurations (gangable) that may be field assembled, one to another, to accommodate multiple devices
5. “EIMC”: Electrical Intermediate Metal Conduit – see “IMC”
6. “EMT”: Electrical Metallic Tubing type conduit, as defined in ANSI C80.3 and NFPA 70 Article 358 An unthreaded thinwall raceway, generally made of steel (ferrous) with protective coatings or aluminum (nonferrous), of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed utilizing appropriate fittings (per NEC Article 358)“FMT: Flexible Metal Tubing type conduit, as defined in NFPA 70 Article 360
7. “Floor Box”: A box [*see* “Box”] used to house cable terminations, to house wiring devices, and to interface with cords/equipment; a floor box is a special purpose box installed with floors (such as cast-in-place within concrete) such that the box finish (e.g., the coverplate) is flush with the floor finish
8. “HDPE: High Density Polyethylene type conduit, as defined in NFPA 70 Article 353
9. “Innerduct”: A continuous cylindrical pipe fabricated of extruded thermoplastic, available in corrugated, smooth, or other wall types and in different sizes (to support different quantities of cables), generally to provide a separate pulling channel and physical protection for fiber, coaxial, and metallic cables in telecommunications and other networks, and used in multiple applications such as the following:

   a. within conduit to compartmentalize or create ‘sub-ducts’
   b. in cable tray to create an isolated pathway
   c. by itself as a pathway system

10. “IMC”: Intermediate Metal Conduit type conduit, as defined in ANSI C80.6 and NFPA 70 Article 342
11. “Junction Box”: A box used to join different runs of raceway (such as conduit) or cables, or both, and to provide space for the connection and branching of the enclosed conductors; most boxes can be used solely as junction boxes as long as they are used with an appropriate cover and with appropriate (code-required) access
12. “MaxCell”: a textile subduct product (also, fabric innerduct)
13. “LFMC”: Liquidtight Flexible Metal Conduit type conduit, as defined in NFPA 70 Article 353
14. “Outlet Box”: A box [*see* “Box”] used to house cable terminations (connectors, modular jacks, receptacles, or similar wiring interfaces) and to interface with cords/equipment
15. “NEC”: National Electrical Code (NFPA 70)
16. “NEMA”: National Electrical Manufacturers Association
17. “NFPA”: National Fire Protection Agency
18. “Pull Box”: A box used in a conduit-based pathway system to allow access to and enclose conduit ends for placing cables and to house the interface between duct banks segments
19. “RMC”: Rigid Metal Conduit type conduit, as defined in NFPA 70 Article 344 and ANSI C80.1
20. “RNC”: Rigid Nonmetallic Conduit type conduit, as defined in NFPA 70 Article 352 and as manufactured to NEMA TC 2 specifications
21. “Textile Subduct”: A continuous enclosed assembly fabricated of polymer-coated nylon fabric used in conduit to compartmentalize or create ‘sub-ducts’, available in different sizes and ‘cell’ counts (to support different quantities of cables); an example of textile subduct includes “Maxcell”
22. “UL”: Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

A. The scope of work of this section includes planning and coordination with General Contractor and other trades of inside plant conduit pathway systems, furnishing necessary materials, and labor and associated services required to install these pathway systems. The scope of work includes innerduct/subducting within conduit.

B. The drawings do not explicitly show on plans each and every conduit run needed for the project. Apply the guidelines described in this section and on the drawings to support the cabling described in Division 27 and shown on the low voltage drawings, and provide reasonably inferred standard conduits, fittings, and products required to complete the conduit installation to meet the design intent.

C. The scope of work includes conduit, boxes, and related construction materials that may not be expressly specified herein or expressly called out on the drawings, such as: 1- and 2-hole straps, nail straps, clamps and clamp backs, strut clamps, U-bolts, pipe hangers, clip-in and bolted hangers, bushings, ground bushings, service entrance cap/weatherhead, pull rope/tape, etc.

D. The scope of work includes basic construction materials that may not be explicitly specified herein or called out on the drawings, such as: concrete anchors, inserts, and/or expansion bolts; concrete fasteners; powder-actuated pins; construction channel/strut; threaded rod; wood fasteners (lag screws); beam clamps; purlin clips; stud box supports/brackets; floor-mount box supports; T-bar ceiling box support bar; channel-mount box supports; bonding pigtails; drywall ring (for ring & string); etc.

E. Conduit Systems, including Pull Boxes

1. Provide conduit systems in accordance with CEC (Chapter 3 and Article 250), UL listing information, manufacturer's instructions, and compliant to local inspections and seismic restraint requirements. Conduit systems shall conform to ANSI/TIA-569-B standard and BICSI TDMM guidelines. Complete shall include all reasonably inferred conduits, fittings, connectors, couplers, straps, pull boxes, supports, etc., necessary for a complete installation to meet the intended application whether noted, indicated or specified in the Contract Documents or not. Duct bank routes and pull and junction box locations and elevations shown on the Drawings are diagrammatic in nature. Field verify route prior to installation.
2. Provide pull boxes as necessary to facilitate proper cable placement, including the following:
    a. no more than 180 degrees bend between placement points
    b. no more than 150-200 feet conduit length (depending on the total bend between end points)
    c. to meet AHJ requirements
3. Seismic Bracing: Provide seismic bracing to conduit system (duct banks, pull boxes, etc).
4. Seismic Joints: Provide seismic joints to conduit at building seismic joints. Seismic joint configurations shall be approved by a structural engineer licensed in the state of California.
5. Expansion Joints/Fittings: Provide expansion joints and/or fittings to conduit where necessary. Expansion joints/fittings shall be approved by a structural engineer licensed in the state of California.
6. Conduit systems shall be mechanically and electrically continuous throughout. Where EMT and associated fittings are used as part of equipment grounding system, provide a bonding type locknut where hub type fitting terminates into a threadless opening and provide compression ring type fittings for terminating and coupling.
7. Minimum Conduit Size: Refer to drawings. If not noted on the drawings, the minimum conduit size shall be 1.25".
8. When cast in concrete floors and/or walls, adhere to structural design requirements. Unless otherwise noted on the drawings, the largest trade size conduits shall not exceed 1/3 the floor or wall thickness, and conduits shall be spaced a minimum of three conduit diameters apart.
9. Bend radii for conduit trade sizes 2" and larger shall be 10 times the conduit outside diameter (OD) and bend radii for conduit trade sizes smaller than 2" shall be 6 times the conduit OD.
10. Provide transition couplings where dissimilar conduit types are joined.
11. Conduit bodies or 'condulets' (LBs, etc.) are prohibited for telecommunications and audiovisual cables.
12. For type EMT conduits:
    a. Provide steel (preferred) zinc plated or die cast set screw (or compression fittings). For set screw fittings, provide single screw fittings (e.g., 1-screw connectors and 2-screw couplers) for 1.5" and smaller conduits and provide double screw fittings (e.g., 2-screw connectors and 4-screw couplers) for 51mm (2") and larger conduits.
    b. When cast in concrete, embedded masonry, or installed in dry locations (as defined by CEC, provide compression fittings and couplings.
    c. When installed in damp locations (as defined by CEC), provide rain-tight type fittings and couplings.
13. When attaching to concrete ceilings, provide vibration and shock resistant bases.
14. Conduit Straps: Provide steel straps – for interior applications, provide straps without spacers
15. At conduits entering into building from outside, provide duct plugs per duct.

16. For unused conduits, provide a mechanical-type seal/cap for protection and to keep the conduit free from debris.
17. Provide a pull tape into each conduit/duct between pull points.
    a. Where boxes are exposed in damp or wet locations or located in hazardous areas, provide cast metal boxes with gasketed cast metal cover plates.
    b. Provide supports for pull (and junction) boxes independently of conduit system and directly to the structure above. Provide seismic bracing for pull boxes.
18. Labeling:
    a. Provide permanent labels on conduit ends and pull box lids.
19. Conduit Application
    a. At interior concealed or exposed applications, 4" and smaller, provide EMT type conduit, unless otherwise note. EMT is the he preferred conduit type.
    b. In cast-in-place concrete, RNC and EMT types will be allowed for telecommunications and other low voltage systems.
    c. IMC and RMC will be allowed for telecommunications and other low voltage systems with written approval from the Engineer.
    d. LFMC is allowed for telecommunications (and other low voltage systems) only for short spans requiring flexible connections. When used, upsize LFMC 1 full trade size (to allow for a derating of the fill capacity).
    e. FMC is not allowed for telecommunications (and other low voltage systems) without written approval from the Engineer.

F. Clearances (minimum):

1. From fluorescent light fixtures, or other EMI sources = 6 inches
2. From any motor, transformer = 48 inches
3. From flue, hot water, steam line or other non-insulated heat sources = 12 inches
4. No conduit and/or supports shall encroach into ceiling height, head room of walkways, and/or doorways.

G. Penetrations:

1. When penetrating partitions and other construction assemblies, use approved methods.
2. When penetrating concrete walls (including shear walls) and/or floors, scan the area to be penetrated and core openings using methods approved by the structural engineer and by the AHJ. Obtain written approval for locations and means when not using methods included in the contract documents.
3. When penetrating fire rated assemblies, provide UL Classified and FM Approved fire rated systems in accordance with ASTM E814 (UL1479). Provide labels at both sides of the penetration. Refer to drawings for approved systems per application.
4. When penetrating acoustic rated assemblies, provide sealant to fill gaps, cavities, etc, to fully seal penetration.

H. Innerduct / Subducting

1. Provide innerduct/subducting within backbone conduits in accordance with CEC and the UL listing information.
2. Refer to drawings for routes requiring innerduct/subducting and innerduct/subducting sizes and types.

I. Duct Plugs

1. Provide duct plugs at conduit ends at building entrances.

2. Provide simplex plugs for each fiber optic cable within innerduct at each building entrance. Size the plug depending upon the inside diameter of the innerduct and the outside diameter of the cable.

J. Outlet Boxes

1. Provide outlet boxes and covers/rings (raised and/or flat) in accordance with CEC Article 314 and NEMA OS 3. Ground and bond metal outlet boxes in accordance with NEC Article 250, Parts I, IV, V, VI, VII, and X.
2. Provide support for outlet boxes. Outlet boxes for telecommunications and audiovisual may share a support bracket (such as a stud span bracket) with electrical outlet boxes.

K. Poke-Thrus

1. Coring: Refer to section 03 82 13 for concrete core drilling requirements.
2. Provide poke-thrus, covers, and related products in accordance with CEC Article 314 and NEMA OS 3. Bond metal devices to ground in accordance with applicable portions of CEC Article 250 (such as Parts I, IV, V, VI, VII, and X).
3. At poke-thrus shared with power service, provide separation means in accordance with CEC.

L. Floor Boxes

1. Provide floor boxes, covers, and related products in accordance with CEC Article 314 and NEMA OS 3. Bond metal boxes to ground in accordance with applicable portions of Article 250 (such as Parts I, IV, V, VI, VII, and X).
2. At floor boxes shared with power service, provide separation means in accordance with CEC.

1.5 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 27 00 00.
B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.
C. Submittal Requirements Prior to the Start of Construction:

1. Product Data: Submit product data showing manufacturer, part numbers, listings, fabrication materials, dimensions, capacities, finishes, knockout sizes and configuration, accessories, etc.
2. Shop Drawings: Submit shop drawings consisting of the following:

    a. Conduit layout/routes, supports locations, support details
    b. Highlight proposed changes to pathways (routes, types, sizes, etc.) compared to the contract documents
    c. Clearance variations and/or requests for exceptions
    d. Seismic bracing details (also see “Seismic Calculations” below)
    e. Instances of penetrations through fire and smoke rated barriers, including calling out firestopping type/UL System, size, quantity, and other relevant information

D. Submittal Requirements at Close Out:

1. As-Built Drawings, showing the routes, types, sizes, quantities, dimensions, etc., of pathways (backbone pathways, primary pathways, conduit – required; secondary such as hangers – not necessary)
2. O&M Manual, including as-built drawings, parts list (essentially final approved product data submittal), repair information, and maintenance requirements

E. Substitutions

1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 27 00 00.
B. CEC Compliance: Comply with CEC, as applicable to construction and installation of conduit and boxes.
C. NFPA Compliance: Comply with NFPA 70B, “Recommended Practice for Electrical Equipment Maintenance” pertaining to conduit and boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of section 27 00 00.

1.8 WARRANTY

A. Comply with Warranty requirements of section 27 00 00.

PART 2 - PRODUCTS

2.1 ELECTRICAL METALLIC TUBING (TYPE EMT) CONDUIT AND FITTINGS

A. Application: Products and assembled system shall be suitable for indoor applications, in accordance with the NEC Article 358
B. Type EMT Conduit:
    1. Type EMT conduit shall be formed of cold rolled strip steel, electrical-resistance welded continuously along the longitudinal seam, and zinc coated after welding. Type EMT conduit bore shall be smooth and free of blisters, nicks or other imperfections which could mar cables.
    2. Type EMT conduit shall be listed by a nationally recognized testing laboratory to UL 797, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent. Type EMT conduit shall meet ANSI C80.3 specifications.
    3. Type EMT conduit shall be recognized as a bonding conductor per NEC Article 250.118
    4. Factory elbows and bends minimum bend radius shall be 48”.
    5. Manufacturers – Type EMT Conduit:
        a. Allied Tube and Conduit Co (Electrical Group) “E-Z Pull” EMT conduit
        b. Cal Conduit Products “CalBrite” EMT conduit
        c. Republic Conduit
        d. Western Tube and Conduit Corp
        e. Or equal
C. Fittings for EMT:
    1. Fittings (connectors, couplers, straps, accessories, etc.) shall be listed by a nationally recognized testing laboratory to UL 514B, and shall bear the UL label (stamped or molded - such markings shall be permanent).
    2. Fittings shall be manufactured compliant to ANSI/NEMA FB 1.

3. Standard Set-Screw Fittings: fabricated of steel with zinc electro-plated finish. Die cast zinc / cast malleable iron fittings not acceptable. Set-screws shall be case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
4. Compression Fittings: gland and ring compression type construction; fabricated of steel zinc plated or cast malleable iron; UL Listed as raintight and suitable for concrete
5. Manufacturers – Fittings for EMT

    a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
    b. Thomas & Betts Corp
    c. Or equal

D. Deflection/Expansion Sleeve:

1. Application: Deflection/expansion sleeve shall compensate for movement in any direction between two conduit ends and shall withstand occasional vibration transmitted to conduit by rotating equipment or vehicular traffic.
2. Deflection/expansion sleeve shall be listed by a nationally recognized testing laboratory to UL 514B and UL 467, and shall bear the UL label (stamped or molded - such markings shall be permanent).
3. Deflection/expansion sleeve shall be fabricated of an inner sleeve, bonding braid, a neoprene outer sleeve with internal flexible stainless steel braid and outer stainless steel bands, ended with couplings (for connection to conduits).
4. Deflection/expansion sleeve shall accommodate 0.75 inch (19mm) deflection, expansion, contraction, or parallel misalignment in any direction, shall allow up to 30 degree angular deflections, and shall be raintight.
5. Manufacturer – EMT Expansion/Deflection Sleeve:

    a. Cooper Crouse-Hinds XD series
    b. O-Z Gedney (Emerson Electric Co) DX series
    c. Or equal

E. Expansion Sleeve:

1. Application: Expansion sleeve shall compensate for parallel movement between two conduits.
2. Expansion sleeve shall comply with UL514.B and NEMA FB-1.
3. Expansion sleeve shall be fabricated of an inner steel sleeve with an oversized outer sleeve sealed with slip bushings, configured such that the outer sleeve can move over the inner sleeve. Sleeve shall come equipped with internal or external bonding braid and be ended with couplers suitable to connect to conduit ends.
4. Manufacturers – EMT Expansion Sleeve:

    a. Cooper Crouse-Hinds XJG-EMT series
    b. O-Z Gedney (Emerson Electric Co) TX series
    c. Or equal

2.2 PULL STRING

A. Application: For use with manual or power fishing systems for light duty cable or tape pulling applications
B. Description: round, woven, polypropylene line

1. Packaged in storage container with easy, quick, and tangle-free dispensing
2. UV resistant, and resistant to rot and mildew
3. Low elongation

C. Manufacturers:

1. Ideal Industries Inc Powr-Fish® or Valu-Line™ poly pull line
2. Klein Tools #56110 poly pull line
3. Or equal

2.3 PULL BOXES

A. Application: For use indoors as cable placement point (pull box) for low voltage cabling and wiring within a conduit raceway system.

B. Compliances:

1. Pull boxes shall meet the requirements of UL 50 and NEMA Type 1.
2. Pull boxes shall be listed by a nationally recognized testing laboratory for the purpose.

C. Material and Finish:

1. Thickness: 16 gauge, minimum
2. Material: the following materials are acceptable for pull boxes

    a. Pre-galvanized steel (ASTM A653), then formed
    b. Mild steel formed, then hot-dipped galvanized (per ASTM A123)
    c. Mild steel formed, then painted (polyester or epoxy powder coat, meeting ASTM D1654)

D. Size: pull box size shall comply with CEC 314.28

E. Configuration: pull boxes shall --- Covers shall be secured by machine screws at 6 inches intervals.

F. Manufacturers:

1. Cooper B-Line (Eaton)
2. Hoffman (Pentair)
3. Hubbell Wiegmann (SC Series enclosures, as an example)
4. Or equal

2.4 STEEL OUTLET BOXES AND COVERS

A. Application: For use indoors as outlet box, backbox, and/or junction box of low voltage systems to house wiring, cabling, terminations, and connectors; may also house and support components.

1. Outlet boxes shall permit access to conductors for maintenance
2. Outlet boxes shall come with knock-outs or punch-outs for easy creation of holes to accept conduit connectors.

B. Compliances:

1. Outlet boxes shall meet the requirements of CEC Article 314.
2. Outlet boxes shall be listed by a nationally recognized testing laboratory to UL 514A for Class 2 and Class 3 power-limited circuits (such as data and signal) providing bonding without the use of bonding jumpers, for remote control circuits, and for telecommunications circuits in accordance with NEC Article 314.
3. Outlet boxes shall be manufactured compliant to NEMA: FB-1 and OS-1.
4. Outlet boxes shall be fire resistant and suitable for use in rated spaces (reference: UL Fire Resistance Directory / “Orange Book”).

C. Material and Finish:

1. Material: hot rolled, pre-galvanized steel, minimum spangle, AISI C-1008
2. Thickness: CEC 314.40(B) / 0.0625in, minimum
3. Finish: G60 hot dip zinc galvanized (0.60 oz/sq ft), meeting ASTM A123, or pre-galvanized (continuous sheet galvanizing) meeting per ASTM A653
4. Finish Thickness: ~0.0005 inches

D. Square Box and Covers/Rings – 5”

1. Dimensions: 5 in square x 2.875 in deep
2. Volume: 64 in3
3. Outlet box shall come equipped with integrated cable management/slack support.
4. Manufacturers:

a. Randl Industries

1) #T-55017; “5 Square” outlet box, knockouts: one 1” + one 1-1/4” per side, one 1/2” per back
2) #T-55018; “5 Square” outlet box, knockouts: one 1/2", + one 3/4” + one 1” per side, one 1/2” per back
3) #T-55019; “5 Square” outlet box, knockouts: one 1/2", + two 1” per side, one 1/2” per back
4) #T-55057; “5 Square” outlet box with side mounting bracket, knockouts: one 1” + one 1-1/4” on 3 sides, one 1/2” per back
5) #T-55058; “5 Square” outlet box with side mounting bracket, knockouts: one 1/2", + one 3/4” + one 1” on 3 sides, one 1/2” per back
6) #T-55059; “5 Square” outlet box with side mounting bracket, knockouts: one 1/2", + two 1” on 3 sides, one 1/2” per back
7) #R-55000; blank cover for “5 Square” outlet box
8) #N-54000; 4”-sq cover for “5 Square” outlet box, flat
9) #N-54012; 4”-sq cover for “5 Square” outlet box, 1/2" raised
10) #N-54058; 4”-sq cover for “5 Square” outlet box, 5/8" raised
11) #N-54034; 4”-sq cover for “5 Square” outlet box, 3/4" raised
12) #N-54010; 4”-sq cover for “5 Square” outlet box, 1" raised
13) #N-54114; 4”-sq cover for “5 Square” outlet box, 1-1/4" raised
14) #N-54112; 4”-sq cover for “5 Square” outlet box, 1-1/2" raised
15) #D-51G000; one gang cover for “5 Square” outlet box, flat
16) #D-51G012; one gang cover for “5 Square” outlet box, 1/2" raised
17) #D-51G058; one gang cover for “5 Square” outlet box, 5/8" raised
18) #D-51G034; one gang cover for “5 Square” outlet box, 3/4" raised
19) #D-51G010; one gang cover for “5 Square” outlet box, 1" raised
20) #D-51G114; one gang cover for “5 Square” outlet box, 1-1/4" raised
21) #D-52G000; two gang cover for “5 Square” outlet box, flat
22) #D-52G012; two gang cover for “5 Square” outlet box, 1/2" raised
23) #D-52G058; two gang cover for “5 Square” outlet box, 5/8" raised
24) #D-52G034; two gang cover for “5 Square” outlet box, 3/4" raised
25) #D-52G010; two gang cover for “5 Square” outlet box, 1" raised
26) #D-52G114; two gang cover for “5 Square” outlet box, 1-1/4" raised

b. Or equal

2.5 BOX SUPPORT ACCESSORIES

A. Box accessories shall comply with UL standards and shall be listed by a nationally recognized testing laboratory.

B. Stud-Mount Single-Box Bracket

1. Erico #SGBS16A; stud-mount bracket, for 1-1/2” or 2-1/8”D box, fits 16” stud spacing

2. Erico #SGBS24A; stud-mount bracket, for 1-1/2” or 2-1/8”D box, fits 24” stud spacing
3. Garvin #BMB16218; stud-mount bracket, for 2-1/8”D box, fits 16” stud spacing
4. Garvin #BMB16350; stud-mount bracket, for 3-1/2”D box, fits 16” stud spacing
5. Garvin #BMB24218; stud-mount bracket, for 2-1/8”D box, fits 24” stud spacing
6. Garvin #BMB24350; stud-mount bracket, for 3-1/2”D box, fits 24” stud spacing
7. Garvin #BMB16SL; stud-mount bracket, ‘sliding’ position for 1-1/2” or 2-1/8” D box, fits 16” stud spacing
8. Garvin #BMB24SL; stud-mount bracket, ‘sliding’ position for 1-1/2” or 2-1/8” D box, fits 24” stud spacing
9. Raco #9004; fixed stud-mount bracket, for 2-1/8”D box, fits 16” stud spacing
10. Raco #9006; fixed stud-mount bracket, for 2-1/8”D box, fits 24” stud spacing
11. Raco #9013; adjustable stud-mount bracket, for 2-1/8”D box, fits 10-3/8” to 18” stud spacing
12. Raco #9015; adjustable stud-mount bracket, for 2-1/8”D box, fits 15” to 26” stud spacing

C. Stud-Mount Multi-Box Bracket

1. Erico #RBS16; stud-mount bracket, 3 positions for 4S and/or 4-11/16”S box, fits 16” stud spacing
2. Erico #RBS24; stud-mount bracket, 4 positions for 4S and/or 4-11/16”S box, fits 24” stud spacing
3. Garvin #BMB4S3P; stud-mount bracket, 3 positions for 4S and/or 4-11/16”S box, fits 16” stud spacing
4. Raco #9002; stud-mount bracket, 3 positions for 4S and/or 4-11/16”S box, fits 16” stud spacing
5. Raco #9002; stud-mount bracket, 4 positions for 4S and/or 4-11/16”S box, fits 24” stud spacing

D. Floor-Mount Box Mounting Bracket

1. Erico #FMBS18; floor mount support bracket for box, puts box at 18.5” above wall footer
2. Garvin #KP4-12; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 12” above wall footer
3. Garvin #KP4-18; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 18” above wall footer
4. Garvin #KP4-24; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 24” above wall footer
5. Raco #9009; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 12” above wall footer
6. Raco #9010; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 18” above wall footer

E. T-Bar Bracket

1. Erico #510HD; bracket for outlet box, attaches to T-bar ceiling grid

F. T-Bar Support

1. Erico #4ACS; adapter/support for outlet box, attaches to T-bar ceiling grid

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.2 EXAMINATION AND PREPARATION

A. Prior to installation, plan routes and locations of pathway systems and coordinate with other trades and building systems (ductwork, plumbing, electrical raceways, wall construction, ceilings, etc.). Pathway systems shall not unnecessarily cross other trade's work, shall not prevent removal of ceiling tiles or panels, and shall not block access to mechanical or electrical equipment. Provide offsets as required to avoid obstruction of pathway systems with other trades/systems.

B. Prior to installation, examine areas to receive pathways systems to verify conditions are ready for work and to verify conformance with manufacturer and specification tolerances. Notify the Owner's Representative in writing of conditions that would adversely affect the installation, or subsequent

3.3 INSTALLATION

A. Secure raceway/pathway systems to building structures using approved support methods and components (fasteners, anchors, clamps, hangers, etc) and complaint to the CEC.

B. Conduit Systems, including Pull Boxes

1. Run conduit in groups/banks in the most direct route possible, parallel to building lines, and at elevations that avoid unnecessary offsets. Do not route conduit through areas in which flammable material may be stored, or over or adjacent to boilers, incinerators, hot water lines, or steam lines. Completed conduit systems installation shall not encroach into the ceiling height headroom of walkways or doorways.
2. Trapeze Supported Conduit Runs
    a. Support conduit runs using "trapeze" hangers fabricated from construction channel and threaded steel rods anchored to building structures. Fasten conduit to construction channel using standard conduit clamps or equivalent.
    b. Seismically brace trapeze supports compliant to applicable codes.
3. Surface-Mounted Conduit Runs
    a. Single Conduit Runs: Support single conduit runs to building structure using construction channel with approved anchors and hardware or using 2-hole (preferred) or 1-hole conduit straps (or similar support apparatus). Where installed in damp or wet locations, support conduit to building structure using conduit clamp such that clamp backs add space between conduit and mounting substrate.
    b. Multiple Conduit Runs: Support multi-conduit runs to building structure using construction channel with approved anchors and hardware. Select anchors based on installation substrate. Fasten conduit to construction channel using standard conduit clamps or equivalent.
    c. Install vibration control apparatus as required to meet isolation requirements.
4. Install conduit free from dents, bruises or deformations. Remove and replace damaged conduits with new undamaged material.
5. Install metallic conduit so as to not be in contact with other dissimilar metal pipes (e.g., plumbing) to minimize galvanic corrosion.
6. Make bends and offsets using standard conduit bending hand tool and/or machines or use factory fittings. The use of any item not specifically designed for bending conduit is strictly prohibited.
7. When routing conduit within concrete:

a. Place conduits at a depth as required by the project's structural engineer. In lieu of no direction, place conduits in the middle of the concrete's depth.
b. Do not place conduits between reinforcing steel and the bottom of floor slabs.
c. Space conduits a minimum of three conduit diameters apart unless otherwise noted on the drawings.
d. Avoid crossing conduits (to minimize displacement of concrete). Obtain written approval/detail from structural engineer for crossing and for instances not adhering to general structural details.
e. Only use compression fittings. Fully wrap fittings with duct tape.

8. For conduits that turn up and protrude from finished concrete, extend conduits 25mm – 75mm (1" to 3") above the surface of the floor, unless conditions require other extension lengths.
9. Pull Boxes: Install pull boxes and junction boxes at locations that are accessible. Install pull boxes and junction boxes at locations that are concealed, unless as noted on drawings; pull boxes and junction boxes may be exposed in electrical rooms, utility rooms, storage areas, or when installed in 'open' spaces (such as no ceilings). Adjust locations and installation as coordinated with construction conditions and as required for seismic bracing. Within ceiling space (e.g., above ceiling grid), do not install higher than 1m (~3') above grid.
10. Ream conduit ends cut in the field (non-factory) to eliminate sharp edges, burrs, etc.
11. Clean completed conduits of foreign matter and/or moisture (e.g., pull a bristle mandrel through).
12. Secure pull strings/mule tapes at conduit ends or within boxes to prevent recoiling back into duct.
13. After installation of conduit system and during ongoing general construction, protect conduits and tightly cover/seal open ends.
14. Leave no unused openings in any pull or junction box. Install close-up plugs as required to seal openings.
15. Label each conduit end in a clear manner by designating the location of the other conduit end (i.e. room name, junction box number, etc.). Indicate conduit length on the label.
16. For connections to equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission, use short length (maximum of 6ft) of the FMC or LFMC conduit. For installation in exterior locations, or humidity-laden atmosphere, corrosive atmosphere, water hose or spray wash down operations, and locations subject to seepage or dripping of oil, grease or water, use LFMC. Provide a green ground wire with FMC or LFMC conduit.
17. Terminations, Connections and Joints

    a. Securely connect conduits to boxes, cabinets, wireways, etc., using conduit connectors suitable for the application and one (or two) locknuts and, where required, an insulating bushing or insulated connectors. Torque threaded items to proper tightness.
    b. Where conduits are bonded to ground, securely attach grounding bushings and route bonding jumpers in as short of a path as possible to grounding point.
    c. Where joints and/or connections cannot be made tight, use a bonding jumper to maintain electrical continuity through the connection.
    d. Where terminations are subject to vibration, use a bonding bushing or wedge to maintain electrical continuity through the connection. Where subject to vibration or dampness, use insulating bushings to protect conductors.
    e. Vibration/Movement Isolation: At connections/terminations subject to vibration, movement, misalignment, and/or noise transmission, transition duct bank conduit to a short length (maximum of 2-3 feet) of LFMC. Secure conduit to structure immediately prior to the transition.

C. Outlet Boxes / Back Boxes

1. Install boxes plumb and square. Match heights of surrounding outlets (e.g., an adjacent electrical receptacle). Adjust locations and heights as required to suit coordination requirements of construction conditions.
2. Install boxes flush with walls, ceilings and floors except where exposed work is called for on the drawings, required, or appropriate.
3. Do not make unused openings in boxes (such as knocking out fabricated knock-outs without using the opening for a conduit connector). Replace boxes containing inadvertent or unused openings.
4. Framed Walls, both Fire Rated and Non-Rated
    a. Install outlet boxes and covers/raised rings during rough-in such that the finished condition is flush with wall finishes.
    b. Do not install outlet boxes back-to-back (outlet boxes facing opposite sides of a wall). At framed walls not fire rated, install boxes with at least 6" separation. At fire rated framed walls, install boxes with at least 24" and 1 framing stud separation.
    c. Patch/repair openings in wall (plaster, drywall, and/or plasterboard) around boxes and/or raised rings to eliminate visible gaps after outlet gets finished, in accordance with CEC 314.21.
5. Ceilings
    a. At ceilings, install boxes, supports (such as T-bar support bracket), and cover/ring such that the finished condition is flush with ceiling finishes, except where noted otherwise and where conditions prevent a flush installation
    b. At non-accessible ceilings, install service conduit continuous to an accessible location
6. Concrete Cast-In-Place Walls and Floors
    a. Set boxes in place within forms (for walls) and casting volume (for floors) such that the finished condition is flush with wall and floor finishes. Ensure proper concrete cover, according to structural requirements.
7. Masonry Walls
    a. Adjust position of outlet boxes to suit masonry course lines. Coordinate cutting of masonry walls to achieve neat openings for boxes.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

3.5 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.
B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION

Date Sealed
04/11/2022

SECTION 27 08 11 COMMUNICATIONS TWISTED PAIR TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Testing of Communications Twisted Pair Cabling (both Backbone and Horizontal Cabling subsystems).
B. Related Sections

1. Comply with the Related Sections paragraph of Section 27 00 00.
2. Section 27 15 13 - Communication Horizontal Twisted Pair Cabling

1.2 REFERENCES

A. Comply with the References requirements of Section 27 00 00.
B. In addition to the References of Section 27 00 00, the following references apply to this specification:

1. ANSI/TIA-1152, “Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling”

1.3 DEFINITIONS

A. Refer to Definitions of Section 270000, Section 27 13 13, Section 27 13 14, and Section 27 15 13.
B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:

1. “CAT6”: Shall mean Category 6 cabling, per ANSI/TIA-568-C.2
2. “CAT6A”: Shall mean Augmented Category 6 cabling, per ANSI/TIA-568-C.2
3. “Channel”: Shall mean a testing configuration which includes the Permanent Link and the line cord (at the workstation), the equipment cord, and, if a full crossconnection is implemented, a patch cord and the crossconnect termination/connecting apparatus.
4. “Connect”: Shall mean install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
5. “Cord”: Shall mean a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”.
6. “Permanent Link”: Shall mean the ‘permanent’ portion of the Horizontal cabling to each outlet with the test cords de-embedded from the measurements; this includes cable, consolidation point (if used), termination/connecting apparatus in the IDF and the connector at the outlet.
7. “System Cord”: Shall mean the cord used in the operating transmission circuit.
8. “Test Cord”: Shall mean the cord certified for use in testing, as described in this section.

1.4 SYSTEM DESCRIPTION

A. Refer to Section 270000, Section 27 15 13 for addition system description information.
B. Work Provided Under Other Sections

1. Horizontal twisted pair cabling

C. Base Bid Work

1. Testing of a completed communication infrastructure cabling system, which includes:

a. Submittals
b. Testing of the twisted pair cabling as follows:

Table 270811-1.1: Tests For UTP Cabling

Subsystem	Type	Test	Configuration	Notes
Horizontal	CAT6A	Category 6A	Permanent Link	Per TIA-568-C.2, 6.3
Horizontal	CAT6A	Category 6A	Channel	Per TIA-568-C.2, 6.2

c. Record Documents, including test results.

1.5 SUBMITTALS

A. Comply with the Submittal requirements of Section 27 00 00.
B. Submittal Requirements at Start Of Construction:

1. Testing Procedures Submittal, describing step-by-step procedures used by the field technicians.
2. Product Submittal, including cut sheets of testing equipment to be used (note all software/ firmware versions as applicable).
3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27.

C. Submittal Requirements at Closeout:

1. Record Documents:

a. Submit one hard copy and one soft copy of test reports, including all tested parameters. This may be combined with the reports of Section 27 08 21.
b. Submit one hard copy of warranty certificate.

2. Format – Hard Copy:

a. Prints of test reports, on 8.5”x 11” paper, color or black & white, one cabling link per page
b. Assemble prints into a 3-ring binder
c. Clearly label the cover of each test reports binder with the following information:

1) Client Name
2) Project Name and Address
3) Binder Name (e.g., “Test Reports for Horizontal Cabling System”)
4) Date of Submittal – date format: month day, year (e.g., “January 1, 2020”)
5) Contractor Name

d. Include a Table Of Contents at the beginning that lists the contents
e. Organize the test reports by Backbone Cabling / Horizontal Cabling, by building, by floor, and by IDF.
f. Sort reports in ascending cable ID order
g. Include tabbed separators for improved navigation through the manual

3. Format – Soft Copy:

a. “Burn” onto one CD-ROM test report files as native data format (for example, an *.FLW file from a Fluke tester); if not possible to submit in native format, then issue test results as an exported Microsoft Excel compatible format.
b. Include onto CD-ROM ‘Viewer’ software necessary to view, sort, filter, and print individual and summary test results from test results native format.
c. Clearly label the CD-ROM with the following information:

1) Client Name
2) Project Name and Address
3) CD-ROM Name (e.g., “Test Reports for Horizontal Cabling System”)
4) Date of Submittal – date format: month day, year (e.g., “January 1, 2020”)
5) Contractor Name

1.6 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 27 00 00.
B. Under no circumstances shall any cable’s and/or conductor’s test results be substituted for another’s. If an instance of falsification is confirmed, the Contractor is liable for a complete retest of the cabling system at no additional cost to the Owner. This includes the retaining the services of a neutral party to observe all retesting.

1.7 WARRANTY

A. Warrant the validity of the test results.

PART 2 - PRODUCTS

2.1 CATEGORY 6A HORIZONTAL CABLE TESTER

A. Equipment shall be independently verified to meet ANSI/TIA-1152 requirements, including Level IIIe minimum accuracy. Equipment shall meet ISO/IEC Class C, D, E, and F.
B. Test Standards (minimum): ANSI/TIA-568-C.2 Category 6A; ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, 1000Base-T, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5
C. Areas of Test Measurement (minimum): test areas listed under ANSI/TIA568-C.2, 6.3
D. Equipment:
    1. Fluke Networks
        a. #DTX-1800; “CableAnalyzer” test kit (main unit, remote unit, CAT6A permanent link adapters, CAT6A channel adapters, accessories), loaded with the latest firmware version.
        b. “LinkWare” reporting and latest version of documentation software

PART 3 - EXECUTION

3.1 SCHEDULING

A. Prepare a construction schedule based on the schedule developed in sections 27 15 13 for the testing activities. Update testing schedule when changes in the cabling schedules occur.

3.2 FIELD QUALITY CONTROL

A. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day’s testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.

B. Ensure test equipment and test cords are clean and undamaged during testing activities. Per the Engineer's discretion, halt testing activity and clean testing equipment, test cords, and related apparatus.

3.3 HORIZONTAL CATEGORY 6A TESTING PROCEDURES

A. Precautions

1. Adhere to the equipment manufacturer's instructions during all testing.
2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).
3. Fully charge power sources before each day's testing activity

B. Test Equipment Set Up

1. Set up the tester to perform a full CAT6A test, as a Permanent Link configuration.
2. If the tester has cable-specific test parameters pre-loaded, set up the tester as product-specific setting. If not, set as generic CAT6A.
3. Set the tester to save the full test results (all test points, graphs, etc.).
4. Save the test results with the associated cable link identifier.
5. Calibrate the test set per the manufacturer's instructions.

C. Acceptable Test Result Measurements

1. Overall Test Results:
    a. The Owner shall accept only individual test results that result in a Pass.
    b. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail.
    c. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.
    d. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.
2. Wire Map: Correctly terminate all pairs of the cabling link at both ends. Provide only continuous pairs. No exceptions.
3. Length: Ninety-four meters is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.
4. Insertion Loss: The acceptable insertion loss measurements for any CAT6A cabling link is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
5. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
6. Power Sum NEXT Loss: The acceptable power sum PS-NEXT loss for any CAT6A cable is that which is no greater than that as listed in ANSI/EIA-568-C.2, 6.3.
7. Worst Pair-to-Pair ELFEXT and FEXT Loss: The acceptable worst pair-to-pair ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
8. Power Sum ELFEXT and FEXT Loss: The acceptable PS-ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
9. Alien Near End CrossTalk (ANEXT) Loss: The acceptable ANEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
10. Alien Far End CrossTalk (AFEXT) Loss: The acceptable AFEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

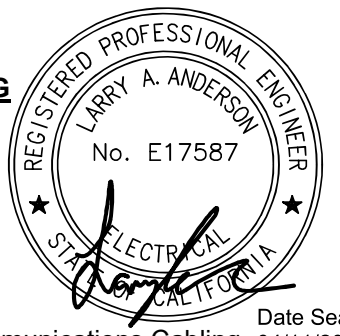
11. Return Loss: The acceptable return loss measurements for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
12. Propagation Delay and Delay Skew: The acceptable propagation delay and delay skew measurements for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

D. Record Documents:

1. Permanently record test results.
2. Export all of the numerical test results to a single spreadsheet in Microsoft Excel® 2003 (*.xls) or 2007 (*.xlsx) file format.
3. Submit test results at the conclusion of the testing to the Engineer for approval. Engineer will check these test reports for a format acceptable to the Owner, or Owner's Representative.
4. For each Horizontal CAT6A test, record the following information:

    a. Project name and address
    b. Testing Company's and Operator's name
    c. Date of measurement
    d. Test equipment, including the following:
        1) Manufacturer, model, and serial number
        2) Date and time of last calibration
    e. Identification number of cable
    f. Overall test result

END OF SECTION



Date Sealed
04/11/2022

SECTION 27 15 13 COMMUNICATIONS HORIZONTAL TWISTED PAIR CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Horizontal Twisted Pair Cabling (subsystem of Telecommunications Cabling Infrastructure)
B. Related Sections
   1. Comply with the Related Sections requirements of Section 27 00 00
   2. Section 27 08 11, “Communication Twisted Pair Testing”

1.2 REFERENCES

A. Comply with the References requirements of Section 27 00 00.
B. In addition to the codes and standards listed in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. National Fire Protection Agency (NFPA)
      a. NFPA 255, “Standard Method of Test of Surface Burning Characteristics of Building Materials”, 2006
      b. NFPA 259, “Standard Test Method for Potential Heat of Building Materials”, 2003
      c. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”, 2007
   2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
      a. UL 444, “Communications Cables”
      b. UL 497, “Protectors for Paired-Conductor Communication Circuits”
      c. UL 1581, “Reference Standard for Electrical Wires, Cables, and Flexible Cords”
      d. UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts”
      e. UL 1863, “Communications-Circuit Accessories”
      f. UL 2024A, “Optical Fiber Cable Routing Assemblies”
   3. Insulated Cable Engineers Association (ICEA):
      a. ANSI/ICEA S-90-661-2008, “Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems”
      b. ICEA S-102-700-2004, “ICEA Standard For Category 6 Individually Unshielded Twisted Pair Indoor Cables (With Or Without An Overall Shield) For Use In Communications Wiring Systems Technical Requirements”
      c. ANSI/ICEA S-107-704-2012, “Standard For Broadband Buried Service Wire, Filled, Polyolefin Insulated, Copper Conductor Technical Requirements”
   4. Telcordia
      a. GR-111, “Generic Requirements for Thermoplastic Insulated Riser Cable”

1.3 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.
B. In addition, define the following list of terms as used in this specification as follows:

1. "CAT6A": Category 6 Augmented [UTP] performance grade
2. "Channel": End to end transmission path; e.g., the entire portion of the horizontal cabling to each outlet consisting of the Permanent Link, line cord (at the workstation), patch cord, and, if a full crossconnection is implemented, the crossconnect termination/connecting apparatus and equipment cord.
3. "CMP": Communications Media Plenum [NEC plenum rating]
4. "CMR": Communications Media Riser [NEC riser {non-plenum} rating]
5. "FEP": Fluorinated Ethylene Propylene
6. "FTP": Foiled Twisted Pair
7. "PE": Polyethylene
8. "Permanent Link": Test configuration for a horizontal cabling link excluding patch cords, equipment cords, and line cords; e.g., the 'permanent' portion of the horizontal cabling to each outlet consisting of cable, consolidation point (if used), termination/connecting apparatus in the telecommunications and the connector at the outlet.
9. "PVC": PolyVinyl Chloride
10. "UTP": Unshielded Twisted Pair

1.4 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections

1. Pathways: The communications pathways (basketway, conduits, stubs, etc.) work will be covered under another Section. Refer to the contract drawings for size/capacity and route information.
2. Rooms: Build out (e.g., backboards, overhead and vertical cable runway, etc.) of the telecommunications rooms will be covered under another Section. Refer to the contract drawings for build out information.
3. Connecting Media: Patch cords in the IDFs between horizontal field and network equipment (e.g., access switch.) , patch/line cords at the work areas between outlet and user equipment (e.g., phone, computer, etc)

B. Base Bid Work

1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working communications Horizontal Twisted Pair Cabling System installation described in this Section and shown on related drawings. Consider Horizontal Cabling as shown on contract drawings as base bid work, unless otherwise noted. This includes terminations at both ends.
2. In general, the base bid work includes:

   a. Submittals
   b. Horizontal cables, terminations, and outlets
   c. Cable management
   d. Patch cords and crossconnections
   e. Cable identification tags and system labeling
   f. Record Documents
   g. Warranty

C. Jack Wiring: T568A per CCCC Infrastructure standard 2.6.

1.5 SUBMITTALS

A. Comply with the Submittals article of Section 270000 for procedural, quantity, content, and format requirements.
B. Substitutions
    1. Conform to substitutions requirements and procedure in Section 270000.
C. Submittal Requirements at Start Of Construction:
    1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
    2. Sample Submittal, consisting of the following components:
        a. Type “A” Outlet Sample – one fully configured outlet including faceplate, modular jacks, and label
        b. Cable Label Sample
    3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for 27xxxx series Sections
    4. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations
D. Submittal Requirements at Closeout:
    1. As-Built Drawings
    2. Cable ID –to– Office Number Key: Submit a “cable ID-to-Office number key” as an electronic file in an MS-Excel spreadsheet file format containing a list of every cable identifier associated with the final office number
    3. Crossconnection records/cut sheets
    4. O & M Manuals
E. Posted Documentation
    1. Post one full size plot of as-built drawings, specifically the floor plans and (as applicable) reflected ceiling plans, within TRs such that show the TR’s serving area. Coordinate location with Owner.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 270000.
B. Contractor Qualifications
    1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Contractor shall be certified by the manufacturer to provide the cabling system (proposed, submitted, and approved) and to provide an extended warranty. Submit satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Delivery, Storage and Handling requirements of Section 27 00 00.

1.8 WARRANTY

A. The horizontal cabling system, as specified in this section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA/EIA-568-C performance criteria for horizontal cabling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Belden cabling system

2.2 SUBSTITUTIONS

A. Project must match existing cabling plant; no substitutions shall be accepted.

2.3 HORIZONTAL CABLE – CAT6A PLENUM (CMP) RATED

A. Application: Suitable for indoor installation, within ceiling space in primary and secondary pathways, within access/raised floor space.
B. Conductors:
   1. Insulated Conductors: 23 AWG solid copper, fully insulated with a flame retardant thermoplastic material (material = FEP, or equivalent).
   2. Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair) with individually color-coded twisted pairs to industry standards (ANSI/ICEA Publication S-80-576-1994, and EIA-230).
C. Cable Sheath:
   1. Outer Jacket: seamless outer jacket (material = LS-PVC, or similar) applied to and completely cover the internal components (twisted pairs).
   2. Flame Rating: NEC (Article 800) rated as CMP, and UL listed as such.
D. Electrical Performance: Meet or exceed TIA/EIA-568-C.2, ISO 11801 Class E Edition 2.1, and IEEE Std. 802.3an channel requirements for supporting 10GBASE-T.

2.4 MODULAR CONNECTOR / 8-POSITION JACK – CAT6A RATED

A. Application: Modular connectors (jacks) for termination of 4-pair UTP cables; modular connectors shall be compatible with the 4-pair cables specified herein this section both electrically and physically.
B. Mechanical Performance: Modular jacks shall be 8-position, compliant to ANSI/TIA-568-C.2.
C. Electrical Performance: Each jack shall meet or exceed TIA/EIA-568-C.2 and ISO/IEC 11801 requirements for CAT6A UTP cabling.
D. Manufacturer:
   1. Belden
      a. #AX104156; CAT6A 8-position “10GX KeyConnect” jack, blue
      b. #AX102282; CAT6A 8-position “10GX KeyConnect” jack, white

2.5 WORK AREA OUTLETS

A. Faceplates for Standard Flush-Mount Outlets

1. Application: Faceplates shall be suitable for indoor installation for standard 1-gang and 2-gang flush-mount devices.
2. Faceplates shall have 2, 3, 4, or 6 ports, and shall include required accessories, such as icons, blank inserts, label windows and labels.
3. Color: White.
4. Manufacturer:

    a. Belden

2.6 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Horizontal Cables

1. Adhesive backed labels and self-laminating feature.
2. Fit the horizontal cables listed above (i.e., shall fully wrap around the cable's jacket).
3. Size: 2"x.05" printable area, minimum
4. Color: Per CCCC Infrastructure Standard 2.6, Color Coding standard for patch cables and jacks:

    a. Voice - white cable and jacks
    b. Data in Administrative Areas and Offices - blue cable and jacks
    c. Data in Instructional Areas - yellow cable and jacks
    d. Emergency Speakers – orange cable and jacks
    e. Wireless Access Points - green cable and jacks
    f. Security – black cable and jacks

5. Manufacturer:

    a. Panduit

        1) #S100X150YAJ; labels for cable diameters 0.16"-0.32", white, desktop printer (laser or ink jet)

    b. Or equal

2.7 MISCELLANEOUS COMPONENTS

A. Velcro Cable Ties

1. Width: .75".
2. Manufacturers:

    a. Panduit "Tak-Ty" series cable ties
    b. Panduit

        1) #HLS-15R-0; black, 15' roll, cut to length.

    c. Or Equal

B. Plenum Cable Ties

1. Application: for use in plenum or air handling spaces
2. Color: maroon or other distinctive non-white color

3. Manufacturer:
   a. Panduit
      1) #PLT1M-xxxx
      2) #PLT2S-xxxx
      3) #PLT3S-xxxx
   b. Or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.2 EXAMINATION AND PREPARATION

A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the horizontal cables and terminations.
B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, “True Tape” the conduits).
C. Cable Integrity: Prior to installation, verify the cable’s integrity – both sheath and conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.3 INSTALLATION

A. Cable Installation and Routing
   1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
   2. Place cables within designated pathways, such as cable tray, basketway, cable hangers, etc. Do no fasten (such as with cable ties) or attach cables to other building infrastructure (such as ducts, pipes, conduits, etc), other systems (such as ceiling support wires, wall studs, etc), or to the outside of conduits, cable trays, or other non-approved pathway systems.
   3. Place and suspend cables and conductors during installation and termination in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination at no additional cost.
   4. Maintain minimum cable length of 15 meters from the termination in the IDF to the termination at the user’s faceplate (permanent link).
   5. No cable length shall exceed 90 meters from the termination point in the IDF to the termination point at the work area (permanent link).
   6. Route cables at 90-degree angles, allowing for bending radius, along corridors for ease of access.
   7. Do not exceed manufacturer's limits for pulling tension.
   8. Do not use cable-pulling compounds for indoor installations.
   9. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.

10. Route cables under building infrastructure (such as ducts, pipes, conduits, etc); Do not route cables over building infrastructure. The installation shall result in easy accessibility to the cables in the future.
11. Place cables 6", minimum, away from power sources to reduce interference from EMI.
12. Place a pull string along with cables where run in pathways and spare capacity in the pathway remains. Tie off ends of the pull string (to prevent the string from falling into the conduit).
13. Neatly dress and organize cables using designated cable routing facilities, and fasten to support devices via tie wraps or Velcro-type straps.
14. When exiting the primary pathway (such as basketway or cable tray) to the work area, exit via the top of the pathway. Secure the cables to the pathway using an approved cable tie.

B. Cable Routing and Dressing within the IDF

1. Place cables within the overhead cable support and, when routing vertically, fasten the cables onto wall-mounted vertical cable support every 24 inches on-center using cable ties.
2. At the rack bay, route cables into the back of the vertical management sections (do not route cables into the front as this space is reserved for patch cords only). Divide the cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination. Dress and cut cables to length required to reach the designated termination point with no excess cable and slack left in the horizontal cable manager, vertical cable manager, and overhead cable support.
3. Provide 10-15 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack in the overhead cable support.

C. Termination in the IDF

1. Provide termination apparatus and accessories required for a complete installation. Install and assemble termination apparatus, accessories and associated management apparatus according to the manufacturer’s instructions.
2. Cables must terminate in a data room (TR) on the same floor
3. Properly strain relieve cables to and at termination points per manufacturer’s instructions.
4. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and ANSI/TIA-568-C.0 standard installation practices. Terminate cable pairs onto the termination apparatus. Terminate twisted pairs compliant to ANSI/TIA-568-C.0 and wired per 1.04 System Description.
5. Modular Patch Panels and Horizontal Management Panels

    a. Provide quantity of modular patch panels to support termination of cables served from respective IDF. Provide quantity of horizontal management panels based on the quantity of patch panels.
    b. Install and assemble modular patch panels and horizontal management panels according to the manufacturer’s instructions.
    c. Install the patch panels and the horizontal management panels as shown on the contract drawings. If configuration is not shown, install the patch panels in association with the horizontal management panels such that a management panel is mounted above and below given patch panel.

D. Cable Routing and Dressing at the Work Areas

1. Provide 2-4 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack within ceiling space neatly on a cable hanger.

E. Termination at the Work Areas

1. Provide device components, connectors, and accessories required for a complete installation. Install and assemble connectors, jacks, adapters, termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
2. Provide six inches, minimum, sheathed cable slack behind each workstation outlet faceplate. Coil the slack cable inside the raceway, within the wall, or in the junction box (if used), per the cabling manufacturer's installation standards.
3. Type "A" Wall-Mount Faceplates
    a. Install devices at heights shown on the contract drawings. If no heights are shown, install at 24" AFF on center (+/- 3").
    b. Mount faceplates plumb, square, and at the same level as adjacent device faceplates.
    c. Patch gaps around faceplates so that faceplate covers the entire opening.
4. Type "C" Furniture-Mount Faceplates
    a. Coordinate installation of faceplate adapters with the furniture contractor, including color.
    b. Mount faceplate adapters into the designated opening for telecommunications cabling.
5. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and ANSI/TIA-568-C.0 standard installation practices. Terminate twisted pairs compliant to ANSI/TIA-568-C.0 and wired per 1.04 System Description.

3.4 LABELING

A. General Requirements

1. Labeling, identifier assignment, and label colors shall conform to ANSI/TIA/EIA-606-A Administration Standard and as approved by the Owner before installation.
2. Permanent labels with machine-generated text (hand written labels will not be accepted).
3. All labeling shall be done with typed inserts, typed on adhesive labels, or pre-stamped jack usage indicators for patch panels. For cabling the labeling shall be printed heat shrink labels or typed adhesive labels specifically designed for cabling.
4. Update and post one full size plot (42x30) of as-built drawings, specifically the floor plans, and (as applicable) reflected ceiling plans, within TRs such that show the TR's serving area. Coordinate location of posting with Owner.
5. Submit a "cable ID-to-Office number key" as an electronic file in an MS-Excel spreadsheet file format containing a list of every cable identifier associated with the final office number.

B. Label Formats

1. Horizontal Cable Labels
    a. Text Attributes: Black, 1/8" high, minimum, or #12 font size.
    b. Install labels on both ends of cables no more than 4" from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.
2. Patch Panel Labels
    a. Use modular patch panel labels included in the product packaging. Request approval by the Engineer for other labels.
    b. Use a label color for the respective field type, per TIA/EIA-606.
    c. Text Attributes: Black, 3/32" high, minimum, or #10 font size.

3. Outlet Labels

   a. Use outlet labels included in the product packaging. Any deviation from this requirement must be approved in writing by the Owner.
   b. Label Background: White.
   c. Text Attributes: Black, 1/8” high, minimum, or #12 font size.
   d. Install label in the top label window. Leave the bottom label window blank.

C. Identifier Assignment

1. General: Separate label fields of the identifier with a period.
2. Horizontal Cables

   a. Destination Work Area Room # . Outlet # . D for Data or V for Voice followed by Jack #

   b. Example: 235.02.D1

3. Individual Ports at the Outlets

   a. Data Room of Origin . Destination Work Area Room # . Outlet # . D for Data or V for Voice followed by Jack #

   b. Example: 243.235.02.D1

4. Individual Ports at Patch Panels

   a. Coordinate colors and function requirements with owner prior to final installation.

3.5 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 270000.
B. Remove cables and replace with new those failing to meet the indicated standards and not passing the testing requirements of Section 270811 with no impact to cost and schedule. The Owner, will not accept the installation until testing has indicated a 100% availability of all cables and conductors. Any deviation from this requirement must be approved in writing by the Owner.
C. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION