

District of Columbia Courts

Capital Projects & Facilities Management Division

616 H Street, NW, Sixth Floor, Suite 622
Washington, DC 20001

H. Carl Moultrie I Courthouse

500 Indiana Avenue NW
Washington DC, 20001

Interior Improvements for:
Indiana Avenue Level | Resource Center

PROJECT MANUAL

PERMIT SUBMISSION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Polymer-modified, self-leveling, hydraulic cement underlayment for application below interior floor coverings.

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. Sustainable Design Submittals:
 - 1. Product Data: For coatings, indicating VOC content.
 - 2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
 - 1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 HYDRAULIC CEMENT UNDERLAYMENTS

- A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of 1/4 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corp. - Construction Chemicals.
 - b. Bonsal American, an Oldcastle company.
 - c. LATICRETE SUPERCAP, LLC.
 - d. MAPEI Corporation.
 - 2. Cement Binder: ASTM C150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C219.
 - 3. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C109.
 - 4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
- B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.
 - 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- C. Water: Potable and at a temperature of not more than 70 deg F.
- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
 - 1. VOC Content: Provide coating with VOC content of 100 g/L or less.
- E. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance of the Work.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
 - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 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 F1869: Proceed with installation only after substrates do not exceed a 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 F2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement, or as recommended by hydraulic cement underlayment manufacturer.
- C. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces according to manufacturer's written instructions.
- D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
 - 1. Apply a final layer without aggregate to product surface.
 - 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Apply surface sealer at rate recommended by manufacturer.
- G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

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

END OF SECTION 03 5416

SECTION 05 5000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel tube reinforcement for low partitions.
3. Steel framing and base plates for supporting miscellaneous assemblies.
4. Steel framing and supports for A/V equipment.
5. Steel framing and supports for mechanical and electrical equipment.
6. Steel framing and supports for applications where framing and supports are not specified in other Sections.

- B. Related Requirements:

1. Section 01 8113.13 "Sustainable Design Requirements – LEED for New Construction and Major Renovations."

1.3 LEED BUILDING – GENERAL REQUIREMENTS

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves,

concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

A. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Included statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit IEQ 4.2: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Small-Scale Environmental Chambers."

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for countertops.
2. Steel framing and supports for A/V equipment.
3. Steel tube reinforcement for low partitions.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding Certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.7 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code – Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code – Aluminum."
 3. AWS D1.6/D1.6M, "Structural Welding Code – Stainless Steel."

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Post-consumer recycled content plus one-half of pre-consumer recycled content of the highest percentage possible, but not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36 / A 36M.
- D. Stainless Steel Sheet, Strip, and Plate: ASTM A 240 / A 240M or ASTM A 666, Type 304.
- E. Stainless Steel Bars and Shapes: ASTM A 276, Type 304.
- F. Steel Tubing: ASTM A 500 / A 500M, cold-formed steel tubing.
- G. Steel Pipe: ASTM A 53 / A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- H. Slotted Channel Framing: Cold-formed metal box channels (studs) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
 - 2. Material: Hot-rolled steel, ASTM A 1011A / 1011M, commercial steel, Type B structural steel, Grade 33 0.0528-inch minimum thickness.
 - 3. Material: Hot Dip galvanized steel, ASTM A 653 / A 653M, commercial steel, Type B structural steel, Grade 33, with G90 coating; nominal thickness.
- I. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- J. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanized or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488 / E 488M, conducted by a qualified independent testing agency.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Shop Primers: Provide primers that comply with Section 09 9123 Interior Painting."
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer or primer specified in Section 09 9600 "High-Performance Coatings" where indicated.

2.6 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.7 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning." requirements indicated below:
 - 1. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Primers Specified in Section 09 9600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.8 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.4 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Division 01 Section 01 7419 "Construction Waste Management and Disposal." Provide documentation of compliance.

END OF SECTION 05 5000

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SECTION 06 1053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Framing with dimension lumber.
- 2. Wood blocking and nailers.
- 3. Utility shelving.
- 4. Plywood backing panels.

- B. Related Requirements:

- 1. Section 01 8113.13 "Sustainable Design Requirements – LEED For New Construction And Major Renovations."

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.

6. WWPA: Western Wood Products Association.

1.5 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.
- B. LEED Submittals:
 1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
 2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
 3. Laboratory Test Reports for Credit IEQ 4: For adhesives and plywood, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.6 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 1. Fire-retardant-treated wood.
 2. Power-driven fasteners.
 3. Power-actuated fasteners.
 4. Expansion anchors.
 5. Metal framing anchors.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction

that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.8 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. Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. 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.
 - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 15-percent for 2-inch nominal thickness or less, 19-percent for more than 2-inch nominal thickness, unless otherwise indicated.

2.2 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. 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.

3. 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.
- 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 testing and inspecting agency acceptable to authorities having jurisdiction.
 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat all miscellaneous carpentry unless otherwise indicated.
 1. Framing for raised platforms.
 2. Concealed blocking.
 3. Plywood backing panels.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Furring.
 3. Utility shelving.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.
- C. For utility shelving, 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; NeLMA, NLGA, WCLIB, or WWPA.
- D. For concealed boards, provide lumber with 15 percent maximum moisture content and the following species and grades:
 1. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
- E. 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.
- F. 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.

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

2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- 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 below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit 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. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. 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.

- 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 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 AWP A 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 carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- 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.

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.

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 and vertically 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 miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

3.5 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Division 01 Section 01 7419 "Construction Waste Management And Disposal." Provide documentation of compliance.

END OF SECTION 06 1053

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SECTION 07 8413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

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. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

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

1.7 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."

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, 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.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Construction Solutions.
 - c. Hilti, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one 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: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
 - 1. Sealant shall have a VOC content of 250 g/L or less.
- F. 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 system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- D. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. 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.
- G. 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.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system 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: Before installing penetration firestopping systems, clean out openings immediately 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 materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping 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 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 penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- 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.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 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. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. 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. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration 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 fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system 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 systems are 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 material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Penetration Firestopping Systems with No Penetrating Items FS-#1:
 1. UL-Classified Systems: C-AJ-0011.
 2. F-Rating: 2 hours.
 3. T-Rating: 2 hours
- C. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing FS-#2:
 1. UL-Classified Systems: C-AJ-1111
 2. F-Rating: 2 hours.
 3. T-Rating: 0 hour

D. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing FS-#3:

1. UL-Classified Systems: C-BJ-2009.
2. F-Rating: 2 hours.
3. T-Rating: 2 hours.
4. Type of Fill Materials: As required to achieve rating.

E. Penetration Firestopping Systems for Electrical Cables FS-#4:

1. UL-Classified Systems: C-AJ-3038.
2. F-Rating: 2 hours.
3. T-Rating: 1 hour.
4. Type of Fill Materials: As required to achieve rating.

F. Penetration Firestopping Systems for Insulated Pipes FS-5:

1. UL-Classified Systems: C-AJ- 5008.
2. F-Rating: 2 hours.
3. T-Rating: 1/2 hours.
4. Type of Fill Materials: As required to achieve rating.

G. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants FS-#6:

1. UL-Classified Systems: C-AJ-6012.
2. F-Rating: 2 hours.
3. T-Rating: 0 hour.

H. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants FS-#7:

1. UL-Classified Systems: C-AJ-7006
2. F-Rating: 2 hours.
3. T-Rating: 2 hours.
4. Type of Fill Materials: As required to achieve rating.

I. Penetration Firestopping Systems for Groupings of Penetrants FS-#8:

1. UL-Classified Systems: C-AJ-8009.
2. F-Rating: 2 hours.
3. T-Rating: 1/2 hour.
4. Type of Fill Materials: As required to achieve rating.

END OF SECTION 07 8413

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SECTION 07 9213 – INTERIOR JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Mildew-resistant joint sealants.
 - 2. Latex joint sealants.
- B. This Section includes sealants for the following:
 - 1. Interior joints in vertical surfaces and horizontal non-traffic surfaces.
 - a. Vertical joints on exposed surfaces of walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors.
 - c. Horizontal joints between integral cove base and walls.
 - d. Horizontal joints between hard ceilings and walls.
 - e. Joints and gaps/openings associated with electrical boxes, devices and plates.
 - f. Joints between plumbing fixtures and surrounding surfaces and materials.
 - g. Wall and ceiling penetrations.
 - h. Joints between miscellaneous assemblies and walls.
 - i. All crevices, spaces, gaps and openings to ensure sealing of any space that will allow insect infestation, vermin or bacterial growth.
- C. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED For New Construction And Major Renovations."

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Sustainable Design Submittals:
 - 1. Product Data for Credit IEQ 4.1: For sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in ½-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.
- D. Preconstruction Laboratory 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 are needed for adhesion.

- E. 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.
- F. Field-Adhesion-Test Reports: For each sealant application tested.
- G. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.8 FIELD 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.
 - 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.

1.9 WARRANTY

- A. Special Installer's Warranty: 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: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Ten 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 stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from 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 JOINT SEALANTS, 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:
 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
- C. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, non-sag, plus 25 percent and minus 25 percent movement capability, non-traffic use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 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; 786 Mildew Resistant.
 - b. GE Advanced Materials - Silicones; Sanitary SCS1700.
 - c. Tremco Incorporated; Tremsil 200 Sanitary.

2.3 LATEX JOINT SEALANTS

- A. Siliconized Latex Sealant: Comply with ASTM C 834, Type P, Grade NF, manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Tremco; Tremflex 834.
 - b. Silicones Unlimited: SU3000 Siliconized Latex Caulk.
 - c. AllPro Corporation; PRO 40 Siliconized Latex Sealant.
2. Joint Movement: Minimum +/- 10% of manufacturers recommended minimum joint width.
3. Color (Painted Applications): White, do not paint sealant until thoroughly inspected and accepted.
4. Color (Non-Painted Applications): Clear.
5. Joint Locations: In interior vertical surfaces and horizontal non-traffic surfaces.
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter interior joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of concrete walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - f. Other joints as indicated.

2.4 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining 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. Pecora Corporation; AC-20 FTR.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 2. Color: As selected from manufacturing standard.
 3. Joint Locations: In interior vertical surfaces and horizontal non-traffic surfaces.
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.

2.5 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer.

2.6 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: Non-staining, 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 performance of the Work.
- 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.
 - 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. 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.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Non-sag 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.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.

3.4 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.

3.5 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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management And Disposal." Provide documentation of compliance.

END OF SECTION 07 9213

SECTION 08 1213 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes
 - 1. Interior standard hollow-metal frames for doors and windows (clearstories).
 - 2. Interior ballistic resistant hollow metal frame.
- B. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED for New Construction and Major Renovations."
 - 2. Section 08 1416 "Flush Wood Doors" for wood doors installed in hollow-metal frames including ballistic resistant wood doors.

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDIA250.8.

1.5 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.

1.6 PREINSTALLATION MEETINGS

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

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, fire-resistance ratings, and finishes.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Include the following:
 - 1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 2. Locations of reinforcement and preparations for hardware.
 - 3. Details of each different wall opening condition.
 - 4. Details of anchorages, joints, field splices, and connections.
 - 5. Details of moldings, removable stops, and glazing.
 - 6. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: Prepare Samples to demonstrate compliance with requirements for quality of materials and construction. Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- F. 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.

1.8 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.9 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 non-vented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- 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 unit to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door; ASSA ABLOY.
 - 2. Curries Company; ASSA ABLOY.
 - 3. Steelcraft; an Ingersoll-Rand company.
- 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.

2.3 INTERIOR FRAMES FOR DOORS

- A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Frames: SDI A250.8, Level 2. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level B according to SDI A250.4.
 - 2. Materials: Metallic-coated steel sheet, minimum thickness of 0.053-inch.
 - 3. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
 - 4. Construction: Full profile welded at CMU partitions and knocked down at gypsum board partitions.
 - 5. Exposed Finish: Prime.
- C. Borrowed Lites and Frames:
 - 1. Fabricate of metallic-coated steel sheet, minimum thickness of 0.053 INCH.
 - 2. Construction: Knocked down.
 - 3. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater

- thickness as metal as frames.
4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.4 BALLISTIC RESISTANT FRAME ASSEMBLIES

- A. Ballistic Resistant Frame Assemblies: Provide ballistic resistant frame assemblies that comply with the following, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project:
 1. Security Grade: Assemblies pass testing requirements in ASTM F 1450 for security grades specified.
 - a. Bullet Resistance: Level 3 rated when tested according to UL 752.
 - b. Tool-Attack Resistance: Small-tool-attack-resistance rated when tested according to UL 437 and UL 1034.
 - c. Materials: Metallic-coated steel sheet, minimum thickness of 0.053-inch, lined with UL listed Bullet Resistant Fiberglass.
 - d. Construction: Full profile continuously welded.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042-inch thick, with corrugated or perforated straps not less than 2-inches wide by 10-inches long; or wire anchors not less than 0.177-inch thick.
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042-inch thick.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- 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.

2.6 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer 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. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. 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.
- G. Grout: ASTM C 476, except with a maximum slump of 4-inches, as measured according to ASTM C 143/C 143M.
- H. Glazing: Comply with requirements in Section 08 8100 "Interior Glazing".
- I. 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.

2.7 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.
- B. 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. Door Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16-inches from top and bottom of frame. Space anchors not more than 32-inches o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60-inches high.
 - 2) Three anchors per jamb from 60 to 90-inches high.
 - 3) Four anchors per jamb from 90 to 120-inches high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24-inches or fraction thereof above 120-inches high.
 - b. 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) Three anchors per jamb up to 60-inches high.
 - 2) Four anchors per jamb from 60 to 90-inches high.
 - 3) Five anchors per jamb from 90 to 96-inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24-inches or fraction thereof above 96-inches high.
 - c. Compression Type: Not less than two anchors in each frame.
 - d. Post-installed 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.
- C. 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 frames to receive nontemplated, mortised, and surface-mounted hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- D. 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. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on secure side of interior frames.
 4. Provide loose stops and moldings on inside of hollow-metal work.
 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 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. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.
 1. Color and Gloss: As indicated by manufacturer's designations.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. 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 frames to receive non-templated, mortised, and surface-mounted 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 post-installed expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of post-installed 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 post-installed 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 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.
- C. Glazing: Comply with installation requirements in Section 08 8100 "Interior 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: 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. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

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

3.5 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Division 01 Section 01 7419 "Construction Waste Management And Disposal." Provide documentation of compliance.

END OF SECTION 08 1213

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SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
 - 4. Ballistic resistant solid-core doors with wood-veneer faces.
- B. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED for New Construction And Major Renovations."
 - 2. Section 08 7100 "Door Hardware" for door hardware.

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 2. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no ureaformaldehyde.
- 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.
- D. Samples for Initial Selection: For factory-finished doors.
- E. Samples for Verification:
1. Factory finishes applied to actual door face materials, approximately 8 by 10-inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
 2. Corner sections of doors, approximately 8 by 10-inches, with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
 3. Frames for light openings, 6-inches, for each material, type, and finish required.

1.6 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.7 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.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.9 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 ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. 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.

1.10 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, provide products by the following:
 - 1. Basis-of-Design Product: Provide product by the following:
 - a. Marshfield Door Systems, Inc
 - 2. Or comparable product by one of the following:
 - a. Algoma Hardwoods.
 - b. Eggers Industries.
 - c. Mohawk Flush Doors, Inc.; a Masonite company

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

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Standards and WDMA I.S.1-A, "Architectural Wood Flush Doors."
 - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
- B. Regional Materials: Flush wood doors shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 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. Extra Heavy Duty, unless otherwise indicated.
- F. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 4. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 - 5. Pairs: Provide formed-steel edges and astragals with intumescent seals.
- G. 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.
- H. 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 as needed 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: 475 lbf per WDMA T.M.-10.

- I. Bullet Resistant Fiberglass: UL 752 Level 3; N.I.J. Level III. Provide 7/16-inch thick bullet resistant fiberglass panels consisting of hydraulically hot pressed, mechanically injected woven roving ballistic grade fiberglass cloth with thermosetting polyester resin. Material shall provide controlled internal delamination to permit the encapture of a penetrating projectile. Unlisted bullet resistant fiberglass products are not acceptable.

1. Product/Manufacturer: Subject to compliance with requirements, bullet resistant fiberglass panels by one of the following;

- a. Armortex OF 300 by Safeguard Security Services, Ltd.
 - b. ShotGard. BB3 by North American Bullet Proof, Inc

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade AA faces.
2. Species:
 - a. Corridor Doors: Red Oak; Plain Sliced.
 - b. Interior doors within offices: Cherry; Quarter Sliced.
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces: Center-balance match.
5. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
6. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
7. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Section 06 4023 "Interior Architectural Woodwork."
8. Exposed Vertical Edges: Same species as faces or a compatible species - edge Type A.
9. Core: Either glued wood stave or structural composite lumber.
10. 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 hotpress.
11. Factory Finish: Stain transparent finish to match Architect sample. Coordinate with "Finish Schedule."
 - a. Corridor doors; doors shall receive transparent stain finish to match Marshfield Toast 28-95
 - b. Interior doors within offices; doors shall receive transparent stain finish to match Architect sample.

B. Interior Mineral-Core Fire rated Doors

1. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2. Veneer Grade: Premium, with Grade AA faces.
3. Wood Veneer Species: For locations refer to "Door Schedule" on drawings.
 - a. Corridor Doors: Red Oak; Plain Sliced.
 - b. Interior doors within offices: Cherry; Quarter Sliced.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
7. Blueprint Match: Where indicated, provide doors with faces produced from same flitches.
8. Exposed Vertical Edges: Same species as faces.
9. Finish: As specified for solid core doors.

2.4 LIGHT FRAMES AND LOUVERS

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 1. Wood Species: Same species as door faces.
 2. Profile: Flush rectangular 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.
- C. 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 08 8000 "Glazing."

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory 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. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors that are indicated to receive transparent finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish or System 11, catalyzed polyurethane.
3. Staining: Custom match to Haworth Medium Cherry VC-U.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

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 08 7100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
1. Install fire-rated doors according to NFPA 80.
 2. Install smoke- and draft-control doors according to NFPA 105.
- C. 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.
 - a. Comply with NFPA 80 for fire-rated doors.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

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.

3.4 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management and Disposal."
 - 1. Provide documentation of compliance.

END OF SECTION 08 1416

SECTION 08 7100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for door hardware specified in other Sections.
 - 3. Electrified door hardware.
- B. Security Access System: This section does not include Security Access System. Security system to match Owner requirements shall be provided by Owner's Vendor.
- C. Related Sections:
 - 1. Section 08 1416 "Flush Wood Doors".
- D. Products furnished, but not installed, under this Section include the products listed below. Coordinating and scheduling the purchase and delivery of these products remain requirements of this Section.
 - 1. Permanent lock cores to be installed by Owner.

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Wiring Diagrams: For power, signal, and control wiring and including the following:
 - a. Details of interface of electrified door hardware and building safety and security systems.
 - b. Schematic diagram of systems that interface with electrified door hardware.
 - c. Point-to-point wiring.
 - d. Risers.
 - e. Elevations doors controlled by electrified door hardware.
 - 2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Samples for Verification: For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule. Submit Samples before, or concurrent with, submission of door hardware schedule.
 - 1. Sample Size: Full-size.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Other Action Submittals:
 - 1. 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.
 - a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - b. 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.
 - c. Content: Include the following information:
 - 1) Type, style, function, size, label, hand, and finish of each door hardware item.
 - 2) Manufacturer of each item.
 - 3) Fastenings and other pertinent information.
 - 4) Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for hardware.
 - 7) Door and frame sizes and materials.

- d. 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, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
2. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying systems explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.
- B. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- C. Warranty: Special warranty specified in this Section.

1.6 REFERENCES

- A. Publications listed herein are part of this specification to extent referenced.
- B. American National Standards Institute:
 1. ANSI A156 Series.
 2. ANSI A115W Wood Door Hardware Standards; Hardware Preparation.
 3. ANSI A115 Specifications for Steel Door and Frame Preparation for Hardware.
 4. ANSI A117.1 Accessible and Usable Buildings and Facilities.
 5. ANSI A250.6 Hardware on Steel Doors (Reinforcement – Applications).
- C. Americans with Disabilities Act Accessibilities Guidelines (ADAAG)
- D. Door and Hardware Institute:
 1. DHI Publication – Abbreviations and Symbols
 2. DHI Publication – Basic Architectural Hardware
 3. DHI Publication – Hardware for Labeled Fire Doors (with supplements)
 4. DHI Publication – Hardware Reinforcements on Steel Doors and Frames
 5. DHI Publication – Installation Guide for Doors and Hardware
 6. DHI Publication – WDHS-1 Template Book Criteria for Wood Doors
 7. DHI Publication – WDHS-3 Recommended Hardware Locations for Wood Flush Doors
 8. DHI Publication – For Processing Hardware Schedules and Templates
- E. National Fire Protection Association:
 1. NFPA 70: National Electrical Code
 2. NFPA 80 Standard for Fire Doors and Windows

3. NFPA 101 Life Safety Code
4. NFPA 105 Recommended Practice for the Installation of Smoke-Control Door Assemblies
5. NFPA 252 Standard Methods of Fire Tests of Door Assemblies

F. Steel Door Institute:

1. SDI-109 Hardware for Standard Steel Doors and Frames

G. Underwriters Laboratories, Inc.

1. UL Standard 10C Positive Pressure Fire Tests of Door Assemblies
2. UL Standard 1784 Air Leakage Tests of Door Assemblies
3. UL Building Materials Directory

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Door Hardware

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each type of door hardware from a single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- C. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

- D. Means of Egress Doors: Latches do not require more than 15-lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5-lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5-lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2-inch high.
 - 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3-inches from the latch, measured to the leading edge of the door.
- F. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Inspect and discuss preparatory work performed by other trades.
 - 3. Review required testing, inspecting, and certifying procedures.

1.10 CLOSEOUT SUBMITTALS:

- A. Closeout Submittals:
 - 1. Operation and Maintenance:
 - a. Provide operation and maintenance data for hardware consisting of technical information as follows:
 - 1) Maintenance instructions for each item of hardware
 - 2) Catalog pages for each product
 - 3) Parts list for each product
 - 4) Copy of final hardware schedule
 - 5) Copy of final keying schedule
 - b. Include a copy of operational and maintenance descriptions in Operation and Maintenance Data Manual.
 - 2. Warranties:
 - a. Submit Special warranties specified in this Section.
 - 3. Keying Schedule:
 - a. Prepare and submit a keying schedule using keyset symbols referenced in DHI manual Keying Systems and Nomenclature. Include schematic keying diagram

and index each key set to unique door designations.

- 1) Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - b. Provide one complete bitting list of key cuts.
 - c. Keying schedule shall be prepared by or under supervision of supplier, detailing Owner's final keying instructions for locks.
 - d. Submit 4 copies of keying schedule.
4. Deliver keys and bitting list to the Owner by registered mail or overnight package service.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.12 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.13 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal

weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

- a. Manual Closers: 10 years from date of Substantial Completion.

1.14 MAINTENANCE

A. Maintenance Materials:

1. Furnish 3 dozen extra screws and other fasteners if each size, type and finish used with the hardware items provided.
2. Extra materials shall be stored on-site as directed by Owner.

B. Maintenance Service:

1. Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of door hardware installer.
 - a. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as needed for proper door hardware operation.
 - b. Provide parts and supplies as used in manufacture and installation of original products.
2. 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. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated on Drawings "Hardware Schedule" Article. Products are identified by using door hardware designations.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings schedule:
 - a. Stanley Commercial Hardware; Div. of The Stanley Works
2. Other Acceptable Manufacturers: Subject to compliance with requirements, products by one of the following:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. PBB, Inc.

2.3 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
- C. Lock Backset: 2-3/4-inches, unless otherwise indicated.
- D. Lock Trim:
 1. Description: As indicated on Drawings.
 2. Levers: Wrought.
 3. Escutcheons (Roses): Wrought.
 4. Dummy Trim: Match lever lock trim and escutcheons.
 5. Operating Device: Lever with escutcheons (roses).
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 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: Manufacturer's special strike box fabricated for aluminum framing.
 4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- F. Bored Locks: BHMA A156.2; Grade 1; Series 4000.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings schedule:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group Company.

2.4 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings schedule:
 - a. IVES Hardware; an Ingersoll-Rand company.

2.5 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 1. Manufacturer: Same manufacturer as for locking devices.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are; face finished to match lockset.
- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction masterkeys.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 1. Master Key System: Change keys and a master key operate cylinders.
 2. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
 3. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.
 4. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
 - b. Re-key Owner's existing master key system into new keying system.
 5. Keyed Alike: Key all cylinders to same change key.
- B. Keys: Nickel silver.
 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."
 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.
 - d. Great-Grand Master Keys: Five.

2.7 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.

2.8 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings schedule or comparable product by one of the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - b. LCN Closers; an Ingersoll-Rand company.
 - c. Norton Door Controls; an ASSA ABLOY Group company.

2.9 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.

- 3) Closers to doors and frames.
- b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
- 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
- 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
- 5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.10 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's 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. Do not install surface-mounted items until finishes have been completed on substrates involved.
1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30-inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Replace construction cores with permanent cores as directed by Owner.
 2. Furnish permanent cores to Owner for installation.
- E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- G. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

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.
1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion,

Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management And Disposal."
 - 1. Provide documentation of compliance.

END OF SECTION 08 7100

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SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
 - 3. Grid suspension systems for gypsum board ceilings.
- B. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED For New Construction And Major Renovations."

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For dimpled steel studs and runners and firestop tracks, from ICC-ES.

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, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer 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, G40, hot-dip galvanized unless otherwise indicated.
- C. Manufacturers: Provide steel studs, tracks, clips and related accessories from single source (manufacturer), unless otherwise specified.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Clark Dietrich Building Systems.
 - b. Marino\WARE. Division of Ware Ind.
 - c. The Steel Network, Inc. (TSN)
- D. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
 - 2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness:
 - b. Depth: As indicated on Drawings.
- E. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges in

- thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12-inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner 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.
- F. Firestop Top Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the 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, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak PosiKlip.
 - b. Grace Construction Products; Flame Safe Flow Trak System.
 - c. Metal-Lite, Inc.; The System.
- G. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: As indicated on Drawings.
- H. Cold-Rolled Channel Bridging: Steel, 0.053-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.
- I. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: As indicated on Drawings.
 2. Depth: As indicated on Drawings.

2.3 SUSPENSION SYSTEMS

- A. 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.
- B. Hanger Attachments to Concrete:
1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16-inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16-inch by length required for elevation of suspended ceiling assembly.

- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053-inch and minimum 1/2-inch-wide flanges.
 - 1. Depth: 2-1/2-inches, unless otherwise indicated on Drawings.
- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4-inch deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0269-inch.
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8-inch deep.
 - a. Minimum Base-Metal Thickness: 0.0329-inch.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corporation.
 - c. United States Gypsum Company.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal 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. 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.

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.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24-inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. 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: 16-inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16-inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 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 (runners) 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 penetrating 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 runner 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 to comply with sound-rated assembly indicated.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6-inches o.c.
- E. 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.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 1. Hangers: 48-inches o.c.
 2. Carrying Channels (Main Runners): 48-inches o.c.
 3. Furring Channels (Furring Members): 16-inches 24-inches Insert spacing o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

- a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8-inch in 12-feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.6 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management And Disposal."
1. Provide documentation of compliance.

END OF SECTION 09 2216

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SECTION 09 2900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
- B. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED For New Construction And Major Renovations."
 - 2. Section 09 2216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by

- weight that is considered regional.
3. Product Data for Credit IEQ 4.1: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 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.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, 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, those that are moisture damaged, and those that are 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.

2.2 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 50- percent.
- B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Georgia-Pacific Building Products.
 - 2. National Gypsum Company.
 - 3. USG Corporation.
 - 4. Continental Building Products
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.
- E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 3.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D3274.
- F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and

mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D3274.

2.4 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. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of 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: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 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.

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 drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use compound.
- D. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. 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.
- D. Sound Attenuation Blankets: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. Recycled Content of Blankets: Formaldehyde free with postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25-percent.
- E. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pecora Corporation; AC-20 FTR.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 - c. Tremco Commercial Sealants; Acoustical Sealant.
 2. Color: As selected from manufacturing standard.
 3. Joint Locations: In interior vertical surfaces and horizontal nontraffic surfaces
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.

4. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- 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, except floors. 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. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets 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. Wallboard Type: Vertical surfaces unless otherwise indicated.
 - 2. Type X: Where required for fire-resistance-rated assembly. Vertical surfaces unless otherwise indicated.
 - 3. Ceiling Type: As indicated on Drawings.
 - 4. Abuse-Resistant Type: As indicated on Drawings.
 - 5. Glass-Mat Interior Type: As indicated on Drawings.
- 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 vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize endjoints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3. 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. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLING TRIM 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 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated.
 - 4. U-Bead: Use at exposed panel edges where indicated.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.5 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, rounded or beveled edges, 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, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 9123 "Interior Painting."
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.6 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.

3.7 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management And Disposal."

1. Provide documentation of compliance.

END OF SECTION 09 2900

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SECTION 09 5113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED For New Construction And Major Renovations."
 - 2. Section 09 5123 "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
 - 2. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement

of VOC content.

- C. Samples: For each exposed product and for each color and texture specified, 6-inches in size.
- D. Samples for Initial Selection: For components with factory-applied color finishes.
- E. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.6 INFORMATIONAL SUBMITTALS

- A. 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. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical panels.
 - 4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 5. Perimeter moldings.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2-percent of quantity installed.

2. Suspension-System Components: Quantity of each exposed component equal to 2-percent of quantity installed.

1.9 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup of typical ceiling area as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages 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.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in anyway.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, 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 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 2. Smoke-Developed Index: 50 or less.
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Source Limitations:
 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 2. Suspension System: Obtain each type from single source from single manufacturer.
- C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- D. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 70-percent.
- E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.
 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4-inches away from test surface according to ASTM E795.
- F. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING (ACT-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated:
 1. Armstrong World Industries, Inc. - Cirrus Tegular, fine texture - Item #589HRC
 - a. or a comparable product by one of the following:
 - 1) CertainTeed Corp. – Cashmere High NRC – Item # CM-450 NRCP
 - 2) USG Interiors, Inc. - Eclipse ClimaPlus – Item #76975.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern with not less than 75-percent recycle contents and as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 1, nodular.
2. Pattern: E (lightly textured).
3. LR: Not less than 0.86.
4. NRC: Not less than 0.70.
5. CAC: Not less than 35.
6. Finish Color: White.
7. Edge/Joint Detail: Reveal beveled tegular, sized to fit flange of exposed suspension system members.
8. Thickness: 3/4-inch
9. Modular Size: 24 by 24-inches
10. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Post-installed expansion or post-installed bonded anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so 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 provide not less than 0.135-inch-diameter wire.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING (ACT-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated:
 1. Armstrong World Industries, Inc. - Item # 9/16-inch Silhouette XL Bolt Slot or a comparable product by one of the following:
 - a. CertainTeed Corp. – Item 9/16-inch Smoothline Bolt-Slot
 - b. USG Interiors, Inc. – Item # Finline DXF

- B. Narrow-Face, Uncapped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized, to produce structural members with 9/16-inch wide faces.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. Face Design: With 1/4-inch wide, slotted, box-shaped flange.
 - 3. Face Finish: Painted white.
 - 4. Reveal Finish: Painted white.
- C. Shadow Molding; Armstrong Item 7873

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated:
 - 1. Armstrong World Industries, Inc.; or a comparable product by one of the following:
 - a. CertainTeed Corp
 - b. USG Interiors, Inc.
- B. 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. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 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.

2.9 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed Joints:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; AC-20 FTR or AIS-919.
 - b. Henkel Corp.; OSI SC-175 Acoustical Sealant
 - c. USG Corporation; SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant for Concealed Joints:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Tremco Inc.; Acoustical Sealant
- C. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Non-sag, paintable, non-staining latex sealant.
 2. Concealed Joints: Nondrying, nonhardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant.
 3. Color: As selected from manufacturing standard.
 4. Joint Locations: In interior vertical surfaces and horizontal nontraffic surfaces
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.
- D. Acoustical Sealant shall have a VOC content of 250-g/L or less when calculated according to 40CFR 59, Subpart D (EPA Method 24).

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, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- 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, counter-splaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with location of hangers at spacing 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 either to structures 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 structure to which hangers are attached and 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. 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.
 7. Space hangers not more than 48-inches on center along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8-inches from ends of each member.
 8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. 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 on center and not more than 3-inches from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12 feet Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 2. 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.
 3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 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. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.1 WASTE DISPOSAL

1. Waste Management: Disposal and recycling of waste shall comply with requirements of

Section 01 7419 "Construction Waste Management And Disposal." Provide documentation of compliance.

END OF SECTION 09 5113

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SECTION 09 6513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient thermoset rubber base (B-3, B-4)
- B. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED For New Construction And Major Renovations.

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
 - 2. Product Data for Credit IEQ 4.3: For adhesives, documentation including printed statement of VOC content.
- C. Samples: For each exposed product and for each color and texture specified, not less than 12-inches long.
- D. Samples for Initial Selection: For each type of product indicated.

- E. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12-inches long.
- F. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 5-percent of, color, pattern, and size of resilient product installed.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.

1.7 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.

1.8 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. Floor Score Compliance: Resilient base shall comply with requirements of Floor Score certification.

- B. Low-Emitting Materials: Flooring system 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."

2.2 THERMOSET-RUBBER BASE (B-3, B-4)

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Roppe Corp.: Pinnacle.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
 - 2. Thickness: 0.125 inch.
 - 3. Height: 4-inches.
 - 4. Lengths: Coils in manufacturer's standard length.
 - 5. Outside Corners: Preformed.
 - 6. Inside Corners: Preformed.
 - 7. Colors: As indicated by manufacturer's designations on drawings "Finish Schedule."

2.3 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.
- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

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. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to 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. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75-percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. 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.
- E. 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. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 4-inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 4-inches in length.
 - a. Miter or cope corners to minimize open joints.

3.4 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.
- 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.

3.5 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management And Disposal."
 - 1. Provide documentation of compliance.

END OF SECTION 09 6513

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SECTION 09 6543 - LINOLEUM FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Linoleum sheet flooring (LIN-2).
- B. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED For New Construction And Major Renovations."

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 6: For linoleum flooring, documentation including printed statement of cost for each rapidly renewable material.
 - 2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC contents.
 - 3. Product Data for Credit IEQ 4.3: For linoleum, documentation from an independent testing agency indicating compliance with the Floor Score standard.
- C. Shop Drawings: For each type of linoleum flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.
- D. Samples: For each exposed product and for each color and pattern specified in manufacturer's standard size, but not less than 6-by-9-inch sections.
 1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- E. Samples for Initial Selection: For each type of linoleum flooring indicated.
- F. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern of linoleum flooring required.
 1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- G. Heat-Welded Seam Samples: For each linoleum flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.
- H. Product Schedule: For linoleum flooring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of linoleum flooring to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Sheet Flooring: Furnish not less than 10 linear feet for every or fraction thereof, in roll form and in full roll width for each type, color, and pattern of sheet flooring installed.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for flooring installation.
 1. Engage an installer who employs workers for this Project who are trained or certified by flooring manufacturer for installation techniques required.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups for flooring including resilient base and accessories.

- a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.
 1. Floor Tile: Store on flat surfaces.
 2. Sheet Flooring: Store rolls upright.

1.10 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 flooring during the following time periods:
 1. 72 hours before installation.
 2. During installation.
 3. 72 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. Close spaces to traffic during flooring installation.
- D. Close spaces to traffic for 72 hours after flooring installation.
- E. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For linoleum flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq.cm.
- B. Floor Score Compliance: Flooring shall comply with requirements of Floor Score certification.
- C. Low-Emitting Materials: Flooring system 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."

2.2 LINOLEUM SHEET FLOORING (LIN-03 & LIN-09)

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Johnsonite; A Tarkett Company. Harmonium xf ²
- B. Linoleum Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.
 - 1. Roll Size: In manufacturer's standard length but not less than 78 inches wide.
- C. Thickness: 0.080 inch.
- D. Heat-Welding Bead: For seamless installation, solid-strand product of linoleum flooring manufacturer.
 - 1. Color: As selected by Architect from manufacturer's full range to contrast with linoleum flooring.
- E. Colors and Patterns: As indicated by manufacturer's designations on drawings "Finish Schedule."

2.3 LINOLEUM SHEET FLOORING (LIN-2)

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Forbo; Marmoleum - Real.
- B. Linoleum Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.
 - 1. Roll Size: In manufacturer's standard length but not less than 78 inches wide.
- C. Thickness: 0.010-inch.
- D. Heat-Welding Bead: For seamless installation, solid-strand product of linoleum flooring manufacturer.
 - 1. Color: As selected by Architect from manufacturer's full range to contrast with linoleum flooring.
- E. Colors and Patterns: As indicated by manufacturer's designations on drawings "Finish Schedule."

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by linoleum flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of [50] g/L or less.

- C. Floor Polish: Provide protective, liquid floor-polish products recommended by linoleum flooring manufacturer.

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

3.2 PREPARATION

- A. Prepare substrates according to linoleum flooring manufacturer's written instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by linoleum flooring manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by linoleum flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Perform tests recommended by linoleum flooring manufacturer, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to 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. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install flooring until it is the same temperature as space where it is to be installed.
 - 1. At least 72 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing flooring.
- B. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- E. Install flooring on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- F. Adhere flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- G. Heat-Welded Seams: For seamless installation, comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.4 LINOLEUM SHEET FLOORING INSTALLATION

- A. Unroll linoleum sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out linoleum sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Avoid cross seams.
 - 5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting linoleum flooring.
- B. Perform the following operations immediately after completing linoleum flooring installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect linoleum flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from linoleum flooring before applying liquid floor polish as per manufactures recommendations.
- E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover linoleum flooring until Substantial Completion.

3.6 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management And Disposal."
 - 1. Provide documentation of compliance.

END OF SECTION 09 6543

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SECTION 09 6813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Modular, carpet tile (C-7).
- B. Related Requirements:
 - 1. Section 01 8113.13 "Sustainable Design Requirements – LEED For New Construction And Major Renovations."
 - 2. Section 09 6513 "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. The DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
- B. LEED Submittals:
 - 1. Product Data for Credit EQ 4.3:
 - a. For carpet tile, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.
 - b. For installation adhesive, documentation including printed statement of VOC content.
- C. Shop Drawings: Show 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 insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.
- E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- F. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for Silver, 37 to 51 points, based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.7 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.

1.8 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. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
 - 1. Build mockups at locations and in sizes shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.10 FIELD CONDITIONS

- A. Comply with CRI 104 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 occupancy levels 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.

1.11 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, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (C-7).

- A. Basis-of-Design Product: Provide product as indicated by manufacturer's designations on drawings "Finish Schedule."

2.2 RESILIENT ACCESSORY INSTALLATION

- 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, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. 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.
 - 1. Install transition strips between dissimilar floor coverings.

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. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Section 03300 "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. For painted subfloors, verify the following:
 - 1. Perform bond test recommended in writing by adhesive manufacturer.
- D. For raised access flooring systems, verify the following:

1. Access floor substrate is compatible with carpet tile and adhesive if any.
 2. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch, protrusions more than 1/32 inch, and substances that may interfere with adhesive bond or show through surface.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- 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. 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 carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosing. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, 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 104, Section 16, "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.

3.5 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management And Disposal." Provide documentation of compliance.

END OF SECTION 09 6813

SECTION 09 9123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Surface preparation and the application of paint systems on interior substrates (P-#).
 - a. Steel.
 - b. Galvanized metal.
 - c. Wood.
 - d. Gypsum board.
 - e. Concrete masonry units.
 - f. Mechanical Pipe and Sprinkler Painting above ceilings and in concealed spaces.

- B. Related Sections:

- 1. Section 01 8113.13 "Sustainable Design Requirements – LEED for New Construction and Major Renovations."
- 2. Section 05 5000 "Metal Fabrications" for shop priming ferrous metal.
- 3. Section 09 2900 "Gypsum Board" for surface preparation of gypsum board.

1.3 LEED BUILDING - GENERAL REQUIREMENTS:

- A. DC Courts requires the Contractor to implement practices and procedures to meet the environmental performance goals for the project, which include achieving LEED "Platinum" Certification. Specific project goals that may impact this area of work include: use of materials with recycled content, use of locally-manufactured materials, use of low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the various sections of these Specifications, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or his subcontractors, will not be permitted if, in the sole opinion of the Architect, such changes may compromise the ability to achieve the stated LEED Performance Criteria.

1.4 PAINTING SCOPE

- A. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- B. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork (door frames and doors).
 - b. Acoustical wall panels.
 - c. Finished mechanical and electrical equipment.
 - d. Light fixtures.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Pipe spaces.
 - d. Duct shafts.
 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.5 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 1. Flat refers to a matte finish with a gloss range maximum 5 when measured at a 60 degree meter.
 2. High side sheen flat "a velvet like" refers to a lusterless finish with a gloss range maximum 10 when measured at a 60-degree meter.
 3. Eggshell refers to low-sheen finish with a gloss range between 10 and 25 when measured at a 60-degree meter.
 4. Satin refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 5. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 6. Full gloss refers to high-sheen finish with a gloss range between 70 and 85 when measured at a 60-degree meter.

7. High gloss refers to high-sheen finish with a gloss range more than 85 when measured at a 60-degree meter.

1.6 ACTION SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
- B. LEED Submittals:
 1. Product Data for Credit EQ 4.2: For paints and coatings, including printed statement of VOC content.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
 1. Submit Samples on rigid backing, 8 inches square.
 2. Step coats on Samples to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.7 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
 1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Wall Surfaces: Provide samples on at least 100 sq.ft.
 - b. Small Areas and Items: Architect will designate items or areas required.
 2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.

- a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
- D. Final approval of colors will be from benchmark samples.
 - 1. Samples of additional colors selected by Architect at no added cost to Owner.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or bind type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. 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.

1.9 PROJECT 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 in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.10 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
- B. Quantity: Furnish an additional 5 percent, but not less than 2 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Material Compatibility: Provide primers, and finish-coat materials that are compatible with one

another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
 - a. Contractor may propose other products for use, produced by an approved manufacturer, and obtain Architect acceptance.
 - 1) Architect does not agree that proposed products are equivalent, Contractor shall provide products specified.

2.2 SCHEDULE - INTERIOR PAINT SYSTEMS

- A. Basis-of-Design Product: Provide product by the following
 - 1. Sherwin Williams
 - a. Or comparable product by one of the following:
 - 1) Moore, Benjamin
 - 2) PPG Paints
- B. Gypsum wallboard surfaces:
 - 1. Satin finish
 - a. First coat: PrepRite 200 Interior Latex Primer, B28W200.
 - b. Second coat: Super Paint Satin A87 Series.
 - c. Third coat: Super Paint Satin A87 Series.
 - 2. Semi-gloss finish:
 - a. First coat: PrepRite 200 Interior Latex Primer, B28W200.
 - b. Second coat: Water-Based Catalyzed Epoxy, B70 Series with Semi-gloss hardener B60V2525.
 - c. Third coat: Water-Based Catalyzed Epoxy, B70 Series with Semi-gloss hardener B60V25
- C. Metals and Steel doors and frames, semi-gloss finish:
 - 1. First coat: Acrylic, DTM Acrylic Primer/Finish B66.
 - 2. Second coat: Pro Classic Waterborne Acrylic Semi-Gloss.
 - 3. Third coat: Pro Classic Waterborne Acrylic Semi-Gloss.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

- A. Interior/Exterior Latex Block Filler: Factory-formulated high-performance latex block fillers
 - 1. Sherwin Williams.
 - a. Heavy Duty Block Filler B42W46
 - 2. Benjamin Moore
 - a. Supercraft Block Filler 285 (Two coats)

2.4 INTERIOR CONCRETE FLOORING

- A. Interior: Factory-formulated 2 components low VOC high performance epoxy coating.
 - 1. Sherwin Williams.:
 - a. Primer - 1 Coat: ArmorSeal Water Based Epoxy Primer Clear @ 2.0 -3.0-Mils DFT
 - b. Finish - 1 Coat - ArmorSeal 700HS Water Based Epoxy @ -6.5 – 7.5-Mils DFT; color as selected by Architect

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 work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Wood: 15 percent.
 - 2. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Remove plates, machined surfaces, and similar items already in place that 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.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.
- C. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- D. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. E. 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.

3.3 PREPARATION - EXISTING SURFACES

- A. Wherever existing work is cut, patched, or added to, touch up to match new work as closely as possible.
1. Check compatibility of new coating to previously painted surfaces by applying test patch.
 2. Allow to dry and test adhesion before continuing painting work.
- B. Put existing work scheduled for repainting in condition to provide good adhesion and to receive paint, as recommended by paint product manufacturers.
1. Wash thoroughly surfaces to be repainted with abrasive kitchen cleaner or sand to manufacturer's recommendations.
 2. Remove residue from cleaning and abrading procedures.
 3. Spot prime bare areas.
- C. Where a wall or ceiling is disturbed and patched, repaint entire wall or ceiling.
- D. On surfaces to be refinished, remove hardware, accessories, plates, surface mounted lighting fixtures, and similar items not to be coated, or provide protection during preparation and coating operations.
- E. Protect and do not paint code labels, such as UL and FM mylar or flat non-embossed plates.
1. Embossed plates and labels stamped into frames may be painted provided label and information on label shall be readily visible and convenient for identification by authority having jurisdiction.
- F. Move furniture, furnishings, equipment and other items as required to paint existing surfaces.

1. Coordinate storage location with Owner.
2. Coordinate mechanical, electric or plumbing service interruptions with other trades and Owner.
3. At completion of painting, replace furniture, furnishings and equipment to original location.

3.4 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- 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. No additional water or thinning of paint will be allowed.

3.5 PAINT SYSTEM SELECTION

- A. Derive each paint system by:
 1. Select primer from specified products for substrates involved. Field-applied primer coat is required for each material scheduled for paint unless the primer was shop-applied. Touch-up of damaged shop-applied primers is a requirement of this Section. This primer coat (whether field-applied, shop-applied, or touched-up) is first coat of the paint system.
 2. Selecting topcoats from specified products for type of finish and sheen scheduled.
 3. Primer and two topcoats are required for each paint system.
 - a. Owner shall approve each coat of paint in all rooms and areas prior to application of next coat.
- B. Color Paint Color Schedule: As indicated on drawings "Finish Schedule."

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 Architect, 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 WASTE DISPOSAL

- A. Waste Management: Disposal and recycling of waste shall comply with requirements of Section 01 7419 "Construction Waste Management And Disposal."
 - 1. Provide documentation of compliance.

END OF SECTION 09 9123

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DIVISION 21
FIRE SUPPRESSION SPECIFICATION INDEX

21 05 00	FIRE PROTECTION SYSTEMS AND EQUIPMENT
21 21 13	PIPING

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SECTION 21 0500 - FIRE PROTECTION SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE:

- A. The work under this section of the specification shall include the furnishing of all labor, equipment, materials and performing of all operations in connection with the installation of:
 - 1. A complete system of fire protection for the entire building.
 - 2. The work shall be indicated on drawings, hereinafter specified under this section and as directed by the Architect.
 - 3. Dry systems, complete shall be provided in areas subject to freezing.
- B. The same requirements of Section 22-05-00 and 23-05-00 - General Conditions, apply to work specified under this Section.
- C. The work to be performed includes, but is not limited to, the furnishing and installing of the following:
 - 1. All labor and materials to complete the fire protection systems
 - 2. Regulations
 - 3. Sprinkler Head and Escutcheons
 - 4. Cleaning and Painting

1.2 REGULATIONS:

- A. It shall be the responsibility of the Fire Protection Sub- Contractor to submit working plans as hereinafter specified. It shall be responsible for the layout and sizing of piping, coordinating this layout with the mechanical and electrical layout shown on the contract drawings. Sprinkler heads shall clear ceiling framework by 6" minimum. The Architectural, Structural, Mechanical and Electrical Drawings shall be consulted to provide satisfactory coordination. Sprinkler Sub-Contractor shall also coordinate locations of all heads with lighting fixtures, ceiling air devices, future partition locations. See reflected ceiling plans on Architectural Drawings and layouts on Mechanical Drawings. Piping and arrangements shown on drawings are schematic only. Actual piping and arrangements are the responsibility of the Contractor and must be completely in accordance with all applicable requirements.
- B. All work shall be installed with the approval and/or acceptance of the following:
 - 1. State of Maryland Codes and Permitting and all applicable authorities having jurisdiction
 - 2. Building Department of Charles County
 - 3. Fire Prevention Authority of Charles County
 - 4. Fire Marshall of the State of Maryland
- C. The Sprinkler Systems shall be designed and installed to comply with latest issue of NFPA Pamphlet 13 - Sprinkler Systems Duty shall be as required.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. All materials, equipment, valves, and devices installed and/or furnished shall be listed and/or approved for use in the Fire Protection installation by the authorities, agencies, codes, and standards hereinbefore named.
- B. Hangers and Supports: All overhead piping shall be supported from above by approved hangers, and as approved by the Architect. Where below bar joist construction, hangers shall be supported from a length of structural channel welded to the top chords of a least

- two joints. Structural channels shall be Kindorf, Unistruct, Fee and Mason or Grinnell
- C. Sleeves and Openings: Furnish and install galvanized sleeves for all piping passing through masonry, concrete and tile walls, partitions, and slabs.
 - D. Escutcheons: Piping exposed in finished areas passing through walls, partitions, floors, and ceilings shall be fitted with steel or cast brass hinged plates, securely fastened in place.
 - E. Pipe: Within building pipe shall be schedule 10 black steel. Piping shall be installed above the finish ceiling wherever ceilings occur. Consult finish schedules on Architectural Drawings. The finished ceilings shall not be erected until all Fire Protection piping has been installed, tested and inspected.
 - F. Fittings: Standard Weight Cast Iron Sprinkler Fittings
 - G. Valves: UL approved for use on sprinkler systems
 - H. CPVC Pipe: Chlorinated Polyvinyl Chloride (CPVC) piping in accordance with ASTM F442, UL approved for sprinkler service, may be used where acceptable to the local authorities having jurisdiction.

2.2 SPRINKLER HEAD AND ESCUTCHEONS:

- A. Sprinkler Head installed shall be upright, sidewall or pendent, as conditions require and shall be of the following type and finish:

<u>Area</u>	<u>Type of Head and Finish</u>	<u>Escutcheons & Finish</u>
Areas having 8'-0" and 9'-0" ceilings	Semi-Recessed pendent type - Satin Chrome (1 ½" max. depth below ceiling) Satin Chrome	Chrome
Other suspended ceiling areas (Generally 10'-0")	Semi-Recessed pendent type - Satin Chrome	Chrome
Areas without suspended ceilings	Standard upright (or pendent if required) Brass	None

NOTE: All sprinkler heads shall be the fast response type as accepted by the local authorities.

2.3 AUTOMATIC SPRINKLER SYSTEM:

- A. Furnish and install a complete system of automatic sprinkler protection for the building. All requirements of NFPA 13, latest edition, shall be satisfied.
- B. The system shall be hydraulically calculated in accordance with NFPA 13, latest edition. Building classification shall be applicable hazard in other areas.
- C. The Contractor shall obtain data of a recent fire flow test (within the past year) before designing the sprinkler system.
- D. System shall include all components required by NFPA, including but not limited to the following:
 - 1. Alarm check valve with retard mechanism
 - 2. Water flow switches
 - 3. Electrical circuit closer
- E. Sprinkler system layout drawings shall be prepared by the Sprinkler Contractor. Drawings shall be made on bond paper the same size and scale as the contract drawings, and shall include all fire protection piping and hydraulic calculations. Drawings shall be approved by all regulating agencies including building Owner's insurance agency.
- F. The drawings shall also be reviewed by the architect. The installation of the sprinkler piping shall be carefully coordinated with all other trades in advance of construction to avoid

interface conflicts. This is particularly important due to the limited ceiling space in certain areas. All sprinkler piping shall be concealed. Exposed piping is permitted only in equipment rooms and trash rooms or in areas otherwise approved by the architect.

- G. Provide in the mechanical equipment room, or where directed, a wall mounted cabinet containing two sprinkler wrenches and seven spare heads of each type used.
- H. Flow switches and tamper switches shall be provided and installed under this section and wired under another Division. Coordinate the location and materials used with the fire Alarm Sub-Contractor.

PART 3 - EXECUTION

3.1 INSPECTION AND TESTS:

- A. All inspections, examinations and tests required by the authorities and/or agencies specified above, shall be arranged and paid for by the Fire Protection Sub-Contractor, as necessary to obtain complete and final acceptance of the Fire Protection System. The Fire Protection Sub-Contractor shall deliver certification of all such inspections to the Architect.

3.2 INSPECTION SERVICE:

- A. The standard form of the National Automatic Sprinkler and Fire Control Association, Inc. "Report of Inspection", shall be filled out in triplicate after each inspection and the copies sent to the Owner, insurance carrier, fire department or other authorities that the Owner may designate.

3.3 TESTS:

- A. Piping shall be tested and proven tight under a hydrostatic pressure of 200 psig, applied for two hours without pressure drop, as defined in NFPA 13.
- B. Piping and fittings found defective shall be replaced by new material. Caulking, plugging, rusting, etc. will not be permitted.
- C. All piping tests shall be conducted before any equipment is connected that would be subject to damage from the test pressure. If necessary, tests shall be conducted in sections as the building progresses.
- D. All equipment, specialties, etc., required for testing shall be furnished by the Contractor under this Division.

3.4 FINALLY:

- A. It shall be the responsibility of the Contractor under this section to provide all devices, valves, electric wiring, etc., which may be required by the regulating agencies or by the requirements of the work under this section and which are not shown or provided under other sections.

END OF SECTION 21 0500

SECTION 21 2113 - PIPING

PART 1 - GENERAL

1.1 SCOPE:

- A. Furnish and install the piping systems shown on the drawings and specified herein. This shall include the following systems:
 - ▶ Heating Water
 - ▶ Chilled Water
 - ▶ Condenser Water
 - ▶ Cooling Tower Water
 - ▶ Gas (commercial)
 - ▶ Gas (residential)
- B. Furnish and install all piping fittings, supports, and valves required for a complete system. Refer to Section 23 05 29 for specifications for pipe supports and Section 23 05 23 for specifications on valves.

PART 2 - SUBMITTALS

- A. Submit manufacturer's certifications of pipe and fittings construction and applicable ratings. Include maximum and minimum pressure and temperature ratings, C-factor and pipe dimensions.
- B. Submit manufacturer's product data for solder, solvent cement, flexible pipe connectors, expansion loops, pipe guides, and pipe anchors.

PART 3 - PRODUCTS

3.1 PIPING:

- A. Above ground commercial gas piping shall be schedule 40 black steel conforming to ASME B36.10M. All piping 3" and larger shall be welded with "Husky" or long radius welding fittings. Piping smaller than 3" may be welded, or assembled with 125 # black cast iron steam pattern heavy banded screwed fittings, bearing the manufacturer's label. Dielectric fittings shall be used to separate piping of dissimilar metals. All fittings in copper piping shall be solder type made with lead free solder.
- B. Residential gas piping shall be corrugated stainless steel tubing (CSST) with brass fittings.
- C. All nipples for steel pipe shall be extra heavy steel. All pipes 6" long and shorter are to be considered nipples. No full thread nipples will be acceptable.
- D. All threads on screwed piping shall be clean and full cut. When screwing up the piping, Crane or approved equal pipe joint cement shall be used.

PART 4 - EXECUTION

4.1 INSTALLATION:

- A. Commercial gas piping shall be tested and proven tight following the recommendations of the local utility and as required by the NFPA pamphlet 54.
- B. Unless otherwise directed, gas piping shall connect to equipment with rigid pipe and fittings. A dirt leg, gas shut-off valve and union shall be installed at the equipment connection.
- C. All piping passing through walls and floors shall be protected using metal sleeves. All sleeves shall be cut flush with the walls and floors.
- D. Unless otherwise directed, piping subject to damage from freezing shall be heat traced using "Raychem XL" self regulating heat tracing system. The heat tracing shall be applied directly to the pipe, valves and fittings underneath any insulation or pipe jacketing specified under other sections of Division 22. The contractor shall coordinate all electrical requirements with Division 26. The heat tracing shall be sized and installed in accordance

with the manufacturers instructions.

END OF SECTION 21 2113

DIVISION 22
PLUMBING SPECIFICATION INDEX

22 05 00 PLUMBING GENERAL PROVISIONS

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SECTION 22 0500 - PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 NOTE:

- A. All work under this section shall be subject to the General Conditions hereinbefore written for the entire work, noting especially the reference to interlocking divisions for the Contractors responsibility under each division. All requirements under this section shall apply to work under this Division.

1.2 SCOPE:

- A. The Contractor shall provide and install all labor, equipment and materials shown on the Plumbing Drawings and specified under this Division, or as required for complete and successfully operating plumbing systems.
- B. It shall be the responsibility of the Contractor under this Division to ensure that work required by other divisions for proper operation of systems or equipment furnished under this Division is performed as part of the general contract.

1.3 EXAMINATION OF PREMISES:

- A. The Contractor shall examine the premises and fully acquaint himself with all existing conditions so that all problems pertaining to work under this division are fully understood. No subsequent allowance will be made in this connection for any error of judgment or negligence on the Contractor's part.

1.4 CODES:

- A. All plumbing work shall be done in strict accordance with all requirements of the 2009 International Plumbing and Building Codes, State Department of Health and Mental Hygiene and the NFPA including specifically NFPA 54. Connections to public utilities shall be in accordance with applicable plumbing and building codes.
- B. In addition, all work shall be installed in accordance with requirements of any other applicable building, plumbing, mechanical, fire and safety codes. Requirements set forth in the Occupational Safety and Health Act will be strictly adhered to.
- C. Work shall conform to the requirements of the latest editions of the following codes, regulations, specifications and standards:
 - American Society for Testing and Materials (ASTM)
 - Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - Air Conditioning and Refrigeration Institute (ARI)
 - American Society of Mechanical Engineers (ASME)
 - Council of American Building Officials (CABO)
 - National Electrical Code (NEC)
 - National Board of Fire Underwriters
 - National Electrical Manufacturers Association (NEMA)
 - Underwriters Laboratories, Inc. (UL)
 - United States of America Standard Institute
 - National Institute of Standards & Technology (NIST)
 - Occupational Safety and Health Act (OSHA)
 - American National Standards Institute (ANSI)
 - National Fire Protection Association (NFPA)
 - American with Disabilities Act (ADA)

1.5 LAWS, ORDINANCES, PERMITS AND FEES:

- A. The Contractor shall give necessary notices, obtain and pay for permits, prepare all documents and obtain all necessary approvals of all Regulating Authorities having jurisdiction; obtain all required Certificates of Inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work.
- B. The Contractor shall include in the work, without extra cost to the Owner, all labor, materials, services, apparatus, drawings (in addition to Contract Drawings and

Documents) required to comply with all applicable laws, ordinances, rules and regulations.

1.6 GENERAL REQUIREMENTS:

- A. Everything necessary for the completion of the work and successful operation thereof, whether they may be definitely specified or indicated or not, shall be furnished and completed in a manner corresponding with the rest of the work as though they were herein distinctly described and specifically provided for.
- B. The Contractor shall have competent foremen on the premises at all times to check layout and superintend the installation of all work included in this division of the specifications and to provide information regarding locations and sizes of chases, openings, etc., and be responsible for the accuracy of such information. The foremen shall layout and superintend the installation of all hangers, inserts, sleeves and other work in masonry and concrete in advance of the work during construction of building, giving consideration to the work of other trades to prevent interference in the location of pipes, conduits, ducts and other equipment.
- C. The Contractor shall provide complete connections for equipment furnished under sections of this division, or under other divisions, or by the Owner, which requires connections under this Division.
- D. All individual pieces of equipment shall be separately valved and fitted with unions so that the individual piece of equipment may be removed for servicing without disturbing other portions of the system.
- E. No beams, columns, structural members, etc., shall be sleeved for the passage of piping or ducts, except where noted on the drawings and approved by the Architect.
- F. The general arrangements and details of the equipment, piping ducts, etc., are shown on the drawings. Dimension or scales shown are approximate and must be checked at the building by the Contractor prior to the installation of any equipment or the fabrication of any equipment. Dimensions for the fabrication of piping, equipment, etc., shall not be scaled from the drawings, but shall be acquired by accurate measurements at the building. Any equipment or materials fabricated off the site, or any work which is installed on the job, which blocks the work of other trades, and is caused by the Contractor's neglect to coordinate his work with the work of other trades, shall be modified or reinstalled without change in the contract price.
- G. All systems and equipment shall be arranged to operate without objectionable noise or vibration. Where objectionable noise or vibration occurs, modifications or changes shall be made until satisfactory results are obtained, at no additional cost to the Owner.
- H. Unless otherwise indicated or required all piping shall be installed parallel to the lines of the building. Piping shall be installed straight and free of traps, sags and bends. Pipe shall be free of kinks, wrinkles and flattened sections. Piping shall properly fit into place and not be forced or stretched.

1.7 SCHEDULE:

- A. Within 30 days of contract date, the Contractor shall submit to the Architect for approval, a schedule showing make, type, manufacturer's specifications for each article of equipment or specialty and shall give dimensions, rated capacity, kind of material, finish, guarantee, etc., and such other detailed information as may be required. When approved, such schedule shall be an addition to the specifications here in with, and shall be of equal force, in that no variation will be permitted except with the approval of the Architect.

1.8 QUALITY STANDARDS:

- A. Manufacturers specified herein, under this Division, represent products that meet the project's quality standards.
- B. Where three or more manufacturers of one product are listed, the Contractor shall bid the job using one of these manufacturers. Should the Contractor desire to substitute another material or product for the material or product specified (if specifically permitted elsewhere within these contract documents), he shall apply in writing for such permission.

Requests for substitutions must be submitted within fourteen (14) days after award of contract or notice to proceed, whichever shall occur first; shall state the credit (or extra cost) involved by the use of such substitution, the advantage to the Owner in accepting such substitution, and acknowledgment that ramifications or impact on other trades and the construction schedule has been considered and costs associated with the substitution are reflected in the request. The Contractor shall pay all costs to determine acceptability of the proposed substitution including, but not necessarily limited to, the following:

1. For tests required by the Engineer for evaluation of both the specified product and the proposed substitution.
 2. For additional evaluation time of the Engineer.
 3. For shipping costs to and from the Engineer, to the Owner, etc. as may be required for evaluation.
 4. For any mockup, installation, or other demonstration required by the Engineer for evaluation of the product(s).
- C. In the event that a substituted item is submitted twice and approval is not obtained by the second submission, the Contractor shall furnish the specified item of material or equipment at no additional cost to the Owner.
- D. The Contractor is responsible for assuring products supplied by listed or alternate manufacturers are of equivalent or better quality as the primary specified manufacturer. This quality standard will apply to all components of the product.

1.9 SUBMITTALS:

- A. Within thirty (30) days after the award of the contract, submit for review to the Engineer a complete list of proposed manufacturers for equipment, materials and subcontractors to be utilized. Lists shall follow the sequence of the specifications. No considerations will be given for partial or incomplete lists. Acceptance of the preliminary list does not relieve the Contractor of responsibility for complete compliance with the specifications. Final acceptance of proposed material and equipment will be pending review of detailed shop drawings. Deviation from the accepted preliminary list will not be permitted without the approval of the Engineer. After review and acceptance of the list, detailed shop drawings and material data shall be submitted. If prior to expiration of the 30 day period or any duly authorized extension thereof, the Contractor fails to submit a schedule of acceptable materials and equipment covering the rejected items, the Owner or his authorized representative reserves the right to select the item. Such selection shall be final and binding upon the Contractor as a condition of the Contract.
- B. Submittals shall consist of manufacturer's certified scale drawings, cuts, catalogs or descriptive literature with complete certified characteristics of equipment, dimensions, capacity, code requirements, motor drive and testing. In addition, Contractor shall provide working shop drawings of ductwork, piping, sprinklers, tank vault and any other details which may be required to clarify installation of piping or equipment.
- C. Certified performance curves for all fans and pumps shall be submitted for approval.
- D. Prior to submittal, the Contractor shall check the submittals thoroughly to ascertain that they comply in detail with the Plans and Specifications, the electrical characteristics are correct for the available service, and that dimensions are shown and checked to fit available space with recommended access. Any deviations from Plans and Specifications shall be clearly noted on the certified submittals. Submittals shall include a reference to the appropriate section, page, paragraph number of the specifications. The Installer shall stamp the submittals with his firm's name, date, and approval noted, indicating that the above has been complied with. Submittals received without his stamp will be returned disapproved without further explanation.
- E. Submittals shall be tendered for items of equipment specified under each section of the specifications or specified on the drawings.
- F. Any changes in any trade brought about by substitutions of specified equipment shall be done at no change in the contract price.
- G. Failure to submit Shop Drawings or Material Lists in ample time for proper checking and necessary re-submission, shall not be allowed as reason for any claim for extension of time or delay.

- H. The review of a Shop Drawing or Material List shall not be considered as a guarantee of the measurements of the building conditions, or that the Shop Drawings or Material Lists have been checked to see that the item submitted properly fits the building conditions. Review shall not in any way relieve the Contractor of his responsibility or necessity for furnishing material or performing work as required by the specifications and contract drawings, or relieve the Contractor of his responsibilities for correctness of dimensions and quantities, or for proper coordination of details and interface with other trades.
- I. All submittals and all shop drawings for work under this division will be reviewed and stamped by the Engineer. The stamp will be checked with one or more of the following notations:
 - "No Exception Taken" - This means that the Engineer is satisfied that the equipment or material submitted is in compliance with specified material and equipment in the opinion of the reviewer. This does not relieve the Contractor from his responsibility to determine that the equipment and material is suitable in all respects for the indicated work. This applies to all equipment and material, even if the equipment or material is exactly as specified.
 - "Make Corrections Noted" - This note is checked in the case of equipment and material that appear to be satisfactory except for some minor corrections which may be noted. The Contractor still bears the same responsibility noted above.
 - "Revise and Resubmit" - This generally means that the submitted equipment or material is satisfactory subject to noted required revisions. The Contractor's responsibilities remain as previously stated. The submittal must be resubmitted corrected as noted.
 - "Rejected" - This means that the submitted equipment or material does not meet the requirements of the drawings or specifications and a different submittal must be found which does comply.

1.10 SHOP DRAWING:

- A. Shop drawings prepared by the Contractor shall be provided and shall include the following:
- B. Mechanical and boiler room detailed drawings showing all equipment, dimensioned and to scale; the arrangement of piping, dimensioned and to scale.
- C. To scale elevations with dimensions of mechanical and boiler rooms in sufficient number to accurately show that the equipment and piping can be installed with adequate clearances for service and maintenance in accordance with manufacturer's recommendations and applicable codes. Coordinate with ductwork working drawings, showing all major ductwork insertions such as fire dampers, motor operated dampers, controls, etc., ensuring complete coordination with other trades, and that these items can be serviced and maintained, and that the ductwork can be installed within the desired locations maintaining ceiling heights etc. and not interfering with other work.
- D. To scale piping drawings showing all major valves, devices, etc. ensuring complete coordination with other trades, there is no interference with other work and that these items can be serviced and maintained, including coordination with sprinkler drawings showing all major devices and arranged to avoid interference with other work.
- E. Such other drawings which may be required or requested by the Architect to clearly indicate that the work can be installed with adequate clearance for proper performance.
- F. No equipment or material may be installed prior to review of submitted data. Any equipment or material installed prior to review shall be at the complete responsibility of the Contractor. He may be required to remove the equipment and material and replace it with acceptable equipment and material at his expense.

1.11 RECORDED CHANGES INFORMATION:

- A. As the work progresses, the Contractor shall record on a set of white prints, the installed locations, sizes and depths of all piping, services, trenches, etc. in the project wherever they differ from those indicated on the Contract Drawings. All dimensions shall be established from datum points approved by the Architect. Upon completion of the work, the Contractor shall turn over to the Architect one (1) neat copy of white prints showing required Recorded Changes Information.

1.12 TEMPORARY SERVICE:

- A. The permanent building facilities, transformers, etc. may be used for temporary power. Written approval must be obtained from the Owner before facilities may be used.

1.13 ELECTRICAL REQUIREMENTS:

- A. Items of electrical work including power wiring, disconnects and motor starters will generally be provided under the Electrical Division of the specifications, unless otherwise noted. Where electrical work is required for equipment furnished and installed under sections of this division including control wiring, interlocking, starters, disconnects, power wiring, heat tracing of mechanical or plumbing piping, etc. and it is not included under the Electrical Division, it shall be furnished and installed under this Division, in conformance with the requirements of the "Electrical Work" Division.
- B. Unless specifically noted otherwise, all motors 1/2 HP and over shall be wound for 208 volt, 3 phase, 60 Hz current or 460 volt, 3 phase, 60 Hz current, and all motors less than 1/2 HP for 115 volts, single phase, 60 Hz current. Verify current requirements with electrical drawings. All motors shall be equipped with grease-packed ball bearings, except as noted. All exposed belt drives shall have belt guards.

1.14 SITE UTILITIES:

- A. Unless otherwise indicated on the plans, this contractor shall be responsible for all utilities inside the building including but not limited to building sanitary sewer, building storm sewer, domestic water, sprinkler water and gas to within 5-feet of the building foot print. The location of these utilities entering the building shall be fully coordinated with the civil plans, all trades and existing conditions. If there are any discrepancies in size, location, etc between the mechanical, plumbing and civil plans, the contractor shall immediately notify the architect.
- B. All underground utilities shall be installed in complete accordance with all applicable codes and standards including those referenced in this section of the specifications. Backfilling and concrete work shall also be completed in accordance with this section of the specifications. All utilities susceptible to freezing shall be installed below the local frost line unless otherwise directed.

1.15 EXCAVATION AND BACKFILL:

- A. The Contractor shall do all excavating and backfilling necessary to install underground piping and tanks included in this division of the work, except as noted. He shall check and establish all lines and grades required for the proper locations of the work and shall be responsible for the correctness thereof. He shall check elevation and location of all utilities before starting work.
- B. All excavation and backfill shall be performed in accordance with the provisions of Division 02, "Site Work" covering excavating and backfilling. Trenches over 4'-0" deep shall be shored.
- C. The Contractor shall accurately locate by dimension on the Recorded Changes Information, all underground piping, etc., before trenches are backfilled.

1.16 COORDINATION OF TRADES:

- A. As instructed in another Division, the General Contractor shall hold a pre-construction meeting. The meeting shall include the following:
 - 1. Attendance by all interested parties (i.e., sub-contractors, architect, engineers, etc.).
 - 2. The interested parties shall acquaint themselves and present a general overview of their work and the potential problems that they may encounter.
 - 3. The General Contractor shall arrange for the cooperation of all sub-contractors in providing assistance to other sub-contractors in the performance of their work. Particular emphasis is placed on work being performed by the Balancing

Contractor and the Building Automation Contractor.

- B. The Subcontractor shall give full cooperation to other trades and shall furnish in writing, with copies to Architect, any information necessary to permit the work of all trades to be installed in proper sequence and with the least possible interference of delay.
- C. If the Subcontractor installs his work without coordinating with other trades, and the installation interferes with their installation, he shall make any changes necessary in this work to correct the condition, without extra charge to the Owner.
- D. The Contractor shall provide dimensioned fabrication drawings of critical areas as described hereinbefore.

1.17 SCAFFOLDING, RIGGING, HOISTING:

- A. The Contractor shall provide all scaffolding and rigging services necessary for the erection and delivery into the premises of all equipment and materials provided under this section, and shall remove same from premises when no longer required.

1.18 DRAWINGS:

- A. The drawings are generally diagrammatic and are intended to convey the scope of work and indicate the general arrangement of equipment, ducts, conduits, piping and fixtures. The location of all items not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project by the Contractor and shall have the approval of the Architect before being installed. Do not scale drawings.

PART 2 - PRODUCTS

2.1 ACCESS DOORS:

- A. All concealed valves, dampers, traps, cleanouts, controls, fire dampers and other devices requiring manual operation or maintenance, shall be provided with metal access doors and frames. Doors shall be Zurn, Inland Steel Project Company "Milcor", quality standard of the following Milcor style:
 - Style AT in acoustic tile surfaces
 - Style K in plastered surfaces
 - Style M in masonry or ceramic tile surfaces
 - Style DW in dry wall walls and ceilings
- B. Access panels and doors shall meet the fire protection rating of the rated walls and floor/ceiling assemblies in which they are installed.
- C. Access doors shall be properly sized for the particular application and shall be furnished under the sections requiring same, unless a means of access is otherwise afforded. Access doors in rated surfaces shall carry UL rating equal to the surface in which it is installed.
- D. Access doors shall be installed as required by Local Codes.

2.2 EQUIPMENT FOUNDATIONS AND SUPPORTS:

- A. All Contractors responsible for work under the Plumbing and Electrical Divisions are to provide concrete housekeeping pads under their respective equipment mounted on the floor or on the ground. Pads shall be 4" thick and shall extend 1" beyond each edge of the equipment supported and all edges shall be beveled.
- B. Equipment suspended or supported from above shall be secured by means of approved hanger rods and other supports properly attached to the structural system. Sub-framing of structural steel beams, angles, or channels shall be provided for all items of mechanical equipment, where said framing is required, but not furnished under another section.
- C. In no case shall runs of piping be supported from other pipes. Trapeze hangers may be used for parallel runs of pipe with the same pitch or grade. It will be permissible by proper arrangement between the plumbing and heating trades to use common trapeze hangers for such pipes.
- D. Vibration isolators shall be provided for all items of equipment producing vibration likely to

- be transmitted to the structure, or portions of building which will disturb occupants.
- E. All pipes shall be braced to prevent shock and swaying.
- 2.3 CONCRETE WORK:
- A. All concrete work required under any section shall be provided and installed under that section, and shall be performed in accordance with the requirements of the general specifications for concrete work as hereinbefore written, except where included under another section. Coordinate to avoid omission or duplication.
- 2.4 SLEEVES AND ESCUTCHEONS:
- A. Provide standard iron pipe size steel sleeves for all lines passing through concrete slabs and masonry walls. All sleeves shall be set before concrete is poured. Holes required in masonry shall be made with core drills in a manner approved by the Engineer.
- B. Sleeves for pipes through walls and floors shall be of sufficient size to permit the insulation, where specified, to continue through the sleeves. Sleeves through floors shall be flush with the underside of the slab and extend 3/4" above finish floor in wet areas only. Projecting sleeves shall be provided with anchors to prevent them from being loosened and knocked down in the floor construction. The annular space between pipe and all sleeves shall be caulked with polysulfide caulking compound. The annular space shall not be larger than 1/2" for all pipes.
- C. Escutcheon plates shall be used to conceal sleeve openings and openings in masonry walls. Ceiling and wall plates shall be chrome plated, properly secured in place. Floor plates shall be cup type, similar to Grinnell No. 400. At the Contractor's option, split type escutcheons equal in quality to one-piece type may be used.
- 2.5 FLASHING:
- A. Where work included under the following sections of this division require pipes to pass through the roof, the pipes shall be flashed under the section concerned.
- B. All roof drains and all floor drains, pipes and pipe sleeves which are installed in floors or walls with membrane waterproofing, shall have flashing clamp devices.
- C. Piping passing through roof shall be waterproofed and flashed in an approved manner. Coordinate with Architectural Drawings and requirements.

PART 3 - EXECUTION

- 3.1 CUTTING AND PATCHING:
- A. All cutting and patching of finished surfaces and the removal of all debris caused by said work shall be performed under the section requiring the installation.
- B. No cutting of any structures or finishes shall be done until the condition requiring such cutting has been examined and approved by the Architect.
- C. All surfaces disturbed as a result of such cutting shall be restored under the section requiring the cutting. The work shall be subject to the Architects approval.
- 3.2 TESTS:
- A. Prior to connection of plumbing fixtures and before sewer connections are made, the entire sanitary and storm drainage piping systems shall be capped and tested as required by the Plumbing Code. The systems shall be filled with water and proven tight under a hydrostatic pressure of at least 15 to 20 feet of water.
- B. All domestic water piping shall be tested and proven tight under a 150 psig hydrostatic test of four (4) hours duration.
- C. After fixtures have been set and connected, all piping and fixtures shall be tested for operation and a smoke or peppermint test shall be made on all soil, waste and vent piping.
- D. After each piping system has been completed and tested, a preliminary operation shall be made of the system for the purpose of cleaning out all sediment, scale, etc., from the piping. Fill and drain the entire systems as required to thoroughly clean same.
- E. After the building has been occupied and the various equipment is in actual use, the

Contractor shall make an operating test of all equipment at a time directed by the Architect to determine that all performance requirements of the Contract are met.

- F. All equipment, specialties, etc., required for all tests shall be furnished by the Contractor under this division.

3.3 PAINTING:

- A. Prior to shipment or delivery to the building, all equipment metal work installed under this division of the specifications shall be given a coat of preservative paint to prevent rusting. Equipment provided with enameled or factory finish which has been scratched or flaked, must be restored to the approval of the Architect.
- B. Except for cast iron pipe, copper pipe and galvanized surfaces, all exposed piping, hangers and other metal surfaces installed under this division, shall be painted one coat of primer, one coat of enamel under-coater and one coat of machinery enamel.
- C. All finish painting of equipment and piping shall be done under this division of these specifications, except where it is indicated under another division.

3.4 LUBRICATION:

- A. All bearings in equipment shall be provided with adequate facilities for lubrication. All oiling devices, fittings, etc., shall be accessible. Lubricate all bearings upon completion of work. Lubricants shall be as specified by equipment manufacturers.

3.5 PROTECTION:

- A. All materials and equipment shall be properly and effectively covered and protected by the Contractor during the execution of the work.
- B. During the execution of the work, the open ends of all piping, ducts and conduits and all openings in equipment shall be closed so as to prevent the entrance of all foreign matter. Plumbing fixtures shall be boarded over.
- C. Any damaged equipment, piping, etc., shall be replaced by the Contractor at his expense.

3.6 WATERPROOFING:

- A. All waterproofing and damp-proofing of the building shall be cleaned and left unharmed by the installation of the work under this division. Wherever any of the work or piping under this division has to pierce waterproofing or damp-proofing, including outside walls, they shall be caulked to wall in a manner satisfactory to the Architect and made watertight. Any waterproofing damaged or destroyed shall be re-water-proofed and made tight by the Contractor. Insulation shall also be waterproofed as required.

3.7 START-UP AND INSTRUCTIONS:

- A. Upon the completion of the installation of all major pieces of equipment specified under this division, a factory-authorized representative shall fully inspect the installation and confirm it complies with the manufacturer's instructions and is free of any damage and faulty components. The equipment shall be started by the representative and run at peak performance to ensure the equipment operates as intended. The representative shall check operating parameters including but not limited to voltage, running amps, supply and return temperatures, motor speed, combustion efficiency, stack temperatures, vibration and excessive noise. All test data shall be recorded on a factory start-up data sheet and submitted to the engineer for review. Refer to other sections of this specification for additional information on start-up.
- B. Upon the completion of all work furnished and installed under this division, the Contractor shall thoroughly instruct the representatives of the Owner in the operation and maintenance of all the various apparatus and equipment to the approval and complete satisfaction of the Architect. This shall be done after the complete system covered by these specifications has been put in operational condition and tested as hereinbefore specified.
- C. Furnish to the Owner, three copies of complete operation and maintenance data covering all equipment installed under this division. This shall include all submittals, shop drawings, factory start-up test sheets, all certifications, as-built drawings and replacement

parts literature and a brief description of the operating features of the equipment. This manual shall be submitted to the Architect for approval prior to presentation. Manuals shall be compiled into three ring binders and arranged in a neat organized manner. The binder shall be tabulated and include a table of contents and labeled tabs for quick reference. Each type of equipment shall be placed under a separate tab.

- D. Manufacturers' suggested maintenance schedules shall be provided for all equipment. This shall include periods for greasing, filter changes, oil changes, etc. Maintenance schedules shall be listed as a separate section of the operation and maintenance manual.

3.8 CLEANING:

- A. At the conclusion of the work, the premises shall be left broom clean. All factory-applied enamel paint shall be cleaned and waxed with industrial quality wax.

3.9 GUARANTEE:

- A. In addition to the guarantee obligations contained in the GENERAL CONDITIONS, the Contractor shall guarantee the complete plumbing systems installation, as embraced by this specification, free from all mechanical and electrical defects for the period of one (1) year- beginning from the day of final acceptance of the work by the Architect.
- B. The guarantee period will only be implemented after the following conditions have been met:
- C. The performance of all systems is satisfactory and meets the requirements of the specifications and drawings.

END OF SECTION

DIVISION 23
HVAC SPECIFICATION INDEX

23 05 00	MECHANICAL GENERAL PROVISIONS
23 05 93	BALANCING
23 07 00	DUCT INSULATION
23 08 00	COMMISSIONING
23 31 13	DUCTWORK

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SECTION 23 05 00 - MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 NOTE

- A. All work under this section shall be subject to the General Conditions hereinbefore written for the entire work, noting especially the reference to interlocking divisions for the Contractors responsibility under each division. All requirements under this section shall apply to work under Division 23.

1.2 SCOPE

- A. The Contractor shall provide and install all labor, equipment and materials shown on the Mechanical Drawings and specified under this Division 23, or as required for complete and successfully operating mechanical and plumbing systems.

1.3 COORDINATION

- A. The Contractor shall fully coordinate his/her work with that of all other trades. Regular coordination meetings shall take place amongst trades to allow for proper working areas, elevations, service clearances etc. No subsequent allowance will be made for removal and/or modifying work to accommodate other trades as a result of a lack of coordination and understanding fixed limits and boundaries.

1.4 CODES

- A. All heating and air conditioning shall be done in strict accordance with all requirements of the International Mechanical Code, publications of the American Society of Heating, Refrigerating and Air Conditioning Engineer, the National Electrical Code of the National Fire Prevention Association and other NFPA requirements, specifically NFPA pamphlets 90A, the ASME Boiler Code including C.S.D.-1.
- B. In addition, all work shall be installed in accordance with requirements of any other applicable building, plumbing, mechanical, fire and safety codes. Requirements set forth in the Occupational Safety and Health Act will be strictly adhered to.
- C. Work shall conform to the requirements of the latest editions of the following codes, regulations, specifications and standards:
- American Society for Testing and Materials (ASTM)
 - Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - Air Conditioning and Refrigeration Institute (ARI)
 - American Society of Mechanical Engineers (ASME)
 - Council of American Building Officials (CABO)
 - National Electrical Code (NEC)
 - National Board of Fire Underwriters
 - National Electrical Manufacturers Association (NEMA)
 - Underwriters Laboratories, Inc. (UL)
 - United States of America Standard Institute
 - National Institute of Standards & Technology (NIST)
 - Occupational Safety and Health Act (OSHA)
 - American National Standards Institute (ANSI)
 - National Fire Protection Association (NFPA)
 - American with Disabilities Act (ADA)

1.5 LAWS, ORDINANCES, PERMITS AND FEES

- A. The Contractor shall give necessary notices, obtain and pay for permits, prepare all documents and obtain all necessary approvals of all Regulating Authorities having jurisdiction; obtain all required Certificates of Inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work.
- B. The Contractor shall include in the work, without extra cost to the Owner, all labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) required to comply with all applicable laws, ordinances, rules and regulations.

1.6 GENERAL REQUIREMENTS

- A. Everything necessary for the completion of the work and successful operation thereof, whether they may be definitely specified or indicated or not, shall be furnished and completed in a manner corresponding with the rest of the work as though they were herein distinctly described and specifically provided for.
- B. The Contractor shall have competent foremen on the premises at all times to check layout and superintend the installation of all work included in this division of the specifications and to provide information regarding locations and sizes of chases, openings, etc., and be responsible for the accuracy of such information. The foremen shall layout and superintend the installation of all hangers, inserts, sleeves and other work in masonry and concrete in advance of the work during construction of building, giving consideration to the work of other trades to prevent interference in the location of pipes, conduits, ducts and other equipment.
- C. The Contractor shall provide complete connections for equipment furnished under sections of this division, or under other divisions, or by the Owner, which requires connections under this Division.
- D. All individual pieces of equipment shall be separately valved and fitted with unions so that the individual piece of equipment may be removed for servicing without disturbing other portions of the system.
- E. No beams, columns, structural members, etc., shall be sleeved for the passage of piping or ducts, except where noted on the drawings and approved by the Architect.
- F. The general arrangements and details of the equipment, piping ducts, etc., are shown on the drawings. Dimension or scales shown are approximate and must be checked at the building by the Contractor prior to the installation of any equipment or the fabrication of any equipment. Dimensions for the fabrication of piping, equipment, etc., shall not be scaled from the drawings, but shall be acquired by accurate measurements at the building. Any equipment or materials fabricated off the site, or any work which is installed on the job, which blocks the work of other trades, and is caused by the Contractor's neglect to coordinate his work with the work of other trades, shall be modified or reinstalled without change in the contract price.
- G. All systems and equipment shall be arranged to operate without objectionable noise or vibration. Where objectionable noise or vibration occurs, modifications or changes shall be made until satisfactory results are obtained, at no additional cost to the Owner.
- H. Unless otherwise indicated or required all piping shall be installed parallel to the lines of

the building. Piping shall be installed straight and free of traps, sags and bends. Pipe shall be free of kinks, wrinkles and flattened sections. Piping shall properly fit into place and not be forced or stretched.

1.7 SCHEDULE

- A. Within 30 days of contract date, the Contractor shall submit to the Architect for approval, a schedule showing make, type, manufacturer's specifications for each article of equipment or specialty and shall give dimensions, rated capacity, kind of material, finish, guarantee, etc., and such other detailed information as may be required. When approved, such schedule shall be an addition to the specifications here in with, and shall be of equal force, in that no variation will be permitted except with the approval of the Architect.

1.8 QUALITY STANDARDS

- A. Manufacturers specified herein, under Division 23, represent products that meet the project's quality standards.
- B. Where three or more manufacturers of one product are listed, the Contractor shall bid the job using one of these manufacturers. Should the Contractor desire to substitute another material or product for the material or product specified (if specifically permitted elsewhere within these contract documents), he shall apply in writing for such permission. Requests for substitutions must be submitted within fourteen (14) days after award of contract or notice to proceed, whichever shall occur first; shall state the credit (or extra cost) involved by the use of such substitution, the advantage to the Owner in accepting such substitution, and acknowledgment that ramifications or impact on other trades and the construction schedule has been considered and costs associated with the substitution are reflected in the request. The Contractor shall pay all costs to determine acceptability of the proposed substitution including, but not necessarily limited to, the following:
 - 1. For tests required by the Engineer for evaluation of both the specified product and the proposed substitution.
 - 2. For additional evaluation time of the Engineer.
 - 3. For shipping costs to and from the Engineer, to the Owner, etc. as may be required for evaluation.
 - 4. For any mockup, installation, or other demonstration required by the Engineer for evaluation of the product(s).
- C. In the event that a substituted item is submitted twice and approval is not obtained by the second submission, the Contractor shall furnish the specified item of material or equipment at no additional cost to the Owner.
- D. The Contractor is responsible for assuring products supplied by listed or alternate manufacturers are of equivalent or better quality as the primary specified manufacturer. This quality standard will apply to all components of the product.

1.9 SUBMITTALS

- A. Within thirty (30) days after the award of the contract, submit for review to the Engineer a complete list of proposed manufacturers for equipment, materials and subcontractors to be utilized. Lists shall follow the sequence of the specifications. No considerations will be given for partial or incomplete lists. Acceptance of the preliminary list does not relieve the Contractor of responsibility for complete compliance with the specifications. Final acceptance of proposed material and equipment will be pending review of detailed shop

drawings. Deviation from the accepted preliminary list will not be permitted without the approval of the Engineer. After review and acceptance of the list, detailed shop drawings and material data shall be submitted. If prior to expiration of the 30 day period or any duly authorized extension thereof, the Contractor fails to submit a schedule of acceptable materials and equipment covering the rejected items, the Owner or his authorized representative reserves the right to select the item. Such selection shall be final and binding upon the Contractor as a condition of the Contract.

- B. Submittals shall consist of manufacturer's certified scale drawings, cuts, catalogs or descriptive literature with complete certified characteristics of equipment, dimensions, capacity, code requirements, motor drive and testing. In addition, Contractor shall provide working shop drawings of ductwork, piping, sprinklers, tank vault and any other details which may be required to clarify installation of piping or equipment.
- C. Certified performance curves for all fans and pumps shall be submitted for approval.
- D. Prior to submittal, the Contractor shall check the submittals thoroughly to ascertain that they comply in detail with the Plans and Specifications, the electrical characteristics are correct for the available service, and that dimensions are shown and checked to fit available space with recommended access. Any deviations from Plans and Specifications shall be clearly noted on the certified submittals. Submittals shall include a reference to the appropriate section, page, paragraph number of the specifications. The Installer shall stamp the submittals with his firm's name, date, and approval noted, indicating that the above has been complied with. Submittals received without his stamp will be returned disapproved without further explanation.
- E. Submittals shall be tendered for items of equipment specified under each section of the specifications or specified on the drawings.
- F. Any changes in any trade brought about by substitutions of specified equipment shall be done at no change in the contract price.
- G. Failure to submit Shop Drawings or Material Lists in ample time for proper checking and necessary re-submission, shall not be allowed as reason for any claim for extension of time or delay.
- H. The review of a Shop Drawing or Material List shall not be considered as a guarantee of the measurements of the building conditions, or that the Shop Drawings or Material Lists have been checked to see that the item submitted properly fits the building conditions. Review shall not in any way relieve the Contractor of his responsibility or necessity for furnishing material or performing work as required by the specifications and contract drawings, or relieve the Contractor of his responsibilities for correctness of dimensions and quantities, or for proper coordination of details and interface with other trades.
- I. All submittals and all shop drawings for work under this division will be reviewed and stamped by the Engineer. The stamp will be checked with one or more of the following notations:

"No Exception Taken" - This means that the Engineer is satisfied that the equipment or material submitted is in compliance with specified material and equipment in the opinion of the reviewer. This does not relieve the Contractor from his responsibility to determine that the equipment and material is suitable in all respects for the indicated work. This applies to all equipment and material, even if the equipment or material is exactly as specified.

“Make Corrections Noted” - This note is checked in the case of equipment and material that appear to be satisfactory except for some minor corrections which may be noted. The Contractor still bears the same responsibility noted above.

“Revise and Resubmit” - This generally means that the submitted equipment or material is satisfactory subject to noted required revisions. The Contractor's responsibilities remain as previously stated. The submittal must be resubmitted corrected as noted.

“Rejected” - This means that the submitted equipment or material does not meet the requirements of the drawings or specifications and a different submittal must be found which does comply.

1.10 SHOP DRAWING

- A. Shop drawings prepared by the Contractor shall be provided and shall include the following:
- B. Mechanical and boiler room detailed drawings showing all equipment, dimensioned and to scale; the arrangement of piping, dimensioned and to scale.
- C. To scale elevations with dimensions of mechanical and boiler rooms in sufficient number to accurately show that the equipment and piping can be installed with adequate clearances for service and maintenance in accordance with manufacturer's recommendations and applicable codes.
- D. To scale ductwork working drawings, showing all major ductwork insertions such as fire dampers, motor operated dampers, controls, etc., ensuring complete coordination with other trades, and that these items can be serviced and maintained, and that the ductwork can be installed within the desired locations maintaining ceiling heights etc. and not interfering with other work.
- E. To scale piping drawings showing all major valves, devices, etc. ensuring complete coordination with other trades, there is no interference with other work and that these items can be serviced and maintained.
- F. To scale sprinkler drawings showing all major devices and arranged to avoid interference with other work.
- G. Such other drawings which may be required or requested by the Architect to clearly indicate that the work can be installed with adequate clearance for proper performance.
- H. No equipment or material may be installed prior to review of submitted data. Any equipment or material installed prior to review shall be at the complete responsibility of the Contractor. He may be required to remove the equipment and material and replace it with acceptable equipment and material at his expense.

1.11 RECORDED CHANGES INFORMATION

- A. As the work progresses, the Contractor shall record on a set of white prints, the installed locations, sizes and depths of all piping, services, trenches, etc. in the project wherever they differ from those indicated on the Contract Drawings. All dimensions shall be established from datum points approved by the Architect. Upon completion of the work, the Contractor shall turn over to the Architect one (1) neat copy of white prints showing required Recorded Changes Information.

1.12 TEMPORARY SERVICE

- A. The permanent building facilities, transformers, etc. may be used for temporary power. Written approval must be obtained from the Owner before facilities may be used.
- B. When the permanent heating equipment is installed, it may be used for temporary heating; this time cannot be deducted from the guarantee period. All equipment shall be kept lubricated and in first class operating condition. Filters shall be in place at all times when the air handling system is operating. If the air handling equipment is operated, filters shall be replaced at the conclusion of the work. The equipment and related ductwork shall be thoroughly cleaned at the conclusion of work before final filters are installed. If permanent heating equipment is used, it must be kept in continuous operation.

1.13 ELECTRICAL REQUIREMENTS

- A. Items of electrical work including power wiring, disconnects and motor starters will generally be provided under the Electrical Division of the specifications, unless otherwise noted. Where electrical work is required for equipment furnished and installed under sections of this division including control wiring, interlocking, starters, disconnects, power wiring, heat tracing of mechanical or plumbing piping, etc. and it is not included under the Electrical Division, it shall be furnished and installed under this Division, in conformance with the requirements of the "Electrical Work" Division.
- B. Unless specifically noted otherwise, all motors 1/2 HP and over shall be wound 460 volt, 3 phase, 60 Hz current, and all motors less than 1/2 HP for 115 volts, single phase, 60 Hz current. Verify current requirements with electrical drawings. All motors shall be equipped with grease-packed ball bearings, except as noted. All exposed belt drives shall have belt guards.

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- A. The General Contractor shall hold a pre-construction meeting. The meeting shall include the following:
 - 1. Attendance by all interested parties (i.e., sub-contractors, architect, engineers, etc.).
 - 2. The interested parties shall acquaint themselves and present a general overview of their work and the potential problems that they may encounter.
 - 3. The General Contractor shall arrange for the cooperation of all sub-contractors in providing assistance to other sub-contractors in the performance of their work. Particular emphasis is placed on work being performed by the Balancing Contractor and the Building Automation Contractor.
- B. The Subcontractor shall give full cooperation to other trades and shall furnish in writing, with copies to Architect, any information necessary to permit the work of all trades to be installed in proper sequence and with the least possible interference of delay.
- C. If the Subcontractor installs his work without coordinating with other trades, and the installation interferes with their installation, he shall make any changes necessary in this work to correct the condition, without extra charge to the Owner.
- D. The Contractor shall provide dimensioned fabrication drawings of critical areas as described hereinbefore.

1.15 SCAFFOLDING, RIGGING, HOISTING

- A. The Contractor shall provide all scaffolding and rigging services necessary for the erection and delivery into the premises of all equipment and materials provided under this section, and shall remove same from premises when no longer required.

1.16 DRAWINGS

- A. The drawings are generally diagrammatic and are intended to convey the scope of work and indicate the general arrangement of equipment, ducts, conduits, piping and fixtures. The location of all items not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project by the Contractor and shall have the approval of the Architect before being installed. Do not scale drawings.

PART 2 - PRODUCTS

2.1 ACCESS DOORS

- A. All concealed valves, dampers, traps, cleanouts, controls, fire dampers and other devices requiring manual operation or maintenance, shall be provided with metal access doors and frames. Doors shall be Zurn, Inland Steel Project Company "Milcor", quality standard of the following Milcor style:
 - Style AT in acoustic tile surfaces
 - Style K in plastered surfaces
 - Style M in masonry or ceramic tile surfaces
 - Style DW in dry wall walls and ceilings
- B. Access panels and doors shall meet the fire protection rating of the rated walls and floor/ceiling assemblies in which they are installed.
- C. Access doors shall be properly sized for the particular application and shall be furnished under the sections requiring same, unless a means of access is otherwise afforded. Access doors in rated surfaces shall carry UL rating equal to the surface in which it is installed.
- D. Access doors shall be installed as required by Local Codes.

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- A. All Contractors responsible for work under the Mechanical and Electrical Divisions are to provide concrete housekeeping pads under their respective equipment mounted on the floor or on the ground. Pads shall be 4" thick and shall extend 1" beyond each edge of the equipment supported and all edges shall be beveled.
- B. Equipment suspended or supported from above shall be secured by means of approved hanger rods and other supports properly attached to the structural system. Sub-framing of structural steel beams, angles, or channels shall be provided for all items of mechanical equipment, where said framing is required, but not furnished under another section.
- C. In no case shall runs of piping be supported from other pipes. Trapeze hangers may be used for parallel runs of pipe with the same pitch or grade. It will be permissible by proper arrangement between the plumbing and heating trades to use common trapeze

hangers for such pipes.

- D. Vibration isolators shall be provided for all items of equipment producing vibration likely to be transmitted to the structure, or portions of building which will disturb occupants.
- E. All pipes shall be braced to prevent shock and swaying.

2.3 CONCRETE WORK

- A. All concrete work required under any section shall be provided and installed under that section, and shall be performed in accordance with the requirements of the general specifications for concrete work as hereinbefore written, except where included under another section. Coordinate to avoid omission or duplication.

2.4 SLEEVES AND ESCUTCHEONS

- A. Provide standard iron pipe size steel sleeves for all lines passing through concrete slabs and masonry walls. All sleeves shall be set before concrete is poured. Holes required in masonry shall be made with core drills in a manner approved by the Engineer.
- B. Sleeves for pipes through walls and floors shall be of sufficient size to permit the insulation, where specified, to continue through the sleeves. Sleeves through floors shall be flush with the underside of the slab and extend 3/4" above finish floor in wet areas only. Projecting sleeves shall be provided with anchors to prevent them from being loosened and knocked down in the floor construction. The annular space between pipe and all sleeves shall be caulked with polysulfide caulking compound. The annular space shall not be larger than 1/2" for all pipes.
- C. Escutcheon plates shall be used to conceal sleeve openings and openings in masonry walls. Ceiling and wall plates shall be chrome plated, properly secured in place. Floor plates shall be cup type, similar to Grinnell No. 400. At the Contractor's option, split type escutcheons equal in quality to one-piece type may be used.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

- A. All cutting and patching of finished surfaces and the removal of all debris caused by said work shall be performed under the section requiring the installation.
- B. The existing slabs are post-tension type. Before any penetrations are made to the slab the area must be examined using X-Ray, GPR or similar methods to locate structural tendons. The tendons shall be marked on the floor and the hole locations reviewed by the structural engineer before drilling or cutting – No Exceptions.
- C. All hanger supports or floor supports that require mechanical fasteners to be drilled into the slab must be first reviewed by the structural engineer for depth, size and location.
- D. No cutting of any structures or finishes shall be done until the condition requiring such cutting has been examined and approved by the Architect.
- E. All surfaces disturbed as a result of such cutting shall be restored under the section requiring the cutting. The work shall be subject to the Architects approval.

3.2 TESTS

- A. All supply and exhaust/return duct associated with the DOAS system contained within the vertical shafts shall be leak tested prior to the shafts being enclosed. The vertical ducts shall be tested as an entire entity and shall be tested and 1.5 times its operating pressure (ie 4.5" wc). Duct leakage shall not exceed 10% of the design airflow at the test pressure.

3.3 PAINTING

- A. Prior to shipment or delivery to the building, all equipment metal work installed under this division of the specifications shall be given a coat of preservative paint to prevent rusting. Equipment provided with enameled or factory finish which has been scratched or flaked, must be restored to the approval of the Architect.
- B. Except for cast iron pipe, copper pipe and galvanized surfaces, all exposed piping, hangers and other metal surfaces installed under this division, shall be painted one coat of primer, one coat of enamel under-coater and one coat of machinery enamel.
- C. All finish painting of equipment and piping shall be done under this division of these specifications, except where it is indicated under another division.

3.4 IDENTIFICATION OF PIPING AND EQUIPMENT

- A. All items of mechanical equipment such as HVAC units, fans, pumps, unit heaters, etc. shall be identified by approved nameplates. Nameplates shall be securely affixed, in a manner approved by the Architect, to each individual piece of equipment and also to include, but not be limited to, each starter, switch, relay and transformer, which controls this equipment. Nameplates shall bear notations corresponding to the same notations on the framed wiring diagrams and operating instructions.
- B. All service piping which is accessible for maintenance operations (except piping in finished spaces) will be identified with pressure-sensitive vinyl identification markers. Direction of flow arrows are to be included on each end of the marker.
- C. Where required by local codes, all piping shall be appropriately marked with color-coded bands at the locations and spacing required by the code.

3.5 LUBRICATION

- A. All bearings in equipment shall be provided with adequate facilities for lubrication. All oiling devices, fittings, etc., shall be accessible. Lubricate all bearings upon completion of work. Lubricants shall be as specified by equipment manufacturers.

3.6 PROTECTION

- A. All materials and equipment shall be properly and effectively covered and protected by the Contractor during the execution of the work.
- B. During the execution of the work, the open ends of all piping, ducts and conduits and all openings in equipment shall be closed so as to prevent the entrance of all foreign matter. Plumbing fixtures shall be boarded over.
- C. Any damaged equipment, piping, etc., shall be replaced by the Contractor at his expense.

3.8 START-UP AND INSTRUCTIONS

- A. Upon the completion of the installation of all major pieces of equipment specified under this division, a factory-authorized representative shall fully inspect the installation and confirm it complies with the manufacturer's instructions and is free of any damage and faulty components. The equipment shall be started by the representative and run at peak performance to ensure the equipment operates as intended. The representative shall check operating parameters including but not limited to voltage, running amps, supply and return temperatures, motor speed, combustion efficiency, stack temperatures, vibration and excessive noise. All test data shall be recorded on a factory start-up data sheet and submitted to the engineer for review. Refer to other sections of this specification for additional information on start-up. Equipment to be started includes but is not limited to the following.

Water Source Heat Pumps
Building Automation Controls
Exhaust Fans

- B. Upon the completion of all work furnished and installed under this division, the Contractor shall thoroughly instruct the representatives of the Owner in the operation and maintenance of all the various apparatus and equipment to the approval and complete satisfaction of the Architect. This shall be done after the complete system covered by these specifications has been put in operational condition and tested as hereinbefore specified.
- C. Furnish to the Owner, three copies of complete operation and maintenance data covering all equipment installed under this division. This shall include all submittals, shop drawings, factory start-up test sheets, all certifications, as-built drawings and replacement parts literature and a brief description of the operating features of the equipment. This manual shall be submitted to the Architect for approval prior to presentation. Manuals shall be compiled into three ring binders and arranged in a neat organized manner. The binder shall be tabulated and include a table of contents and labeled tabs for quick reference. Each type of equipment shall be placed under a separate tab.
- D. Manufacturers' suggested maintenance schedules shall be provided for all equipment. This shall include periods for greasing, filter changes, oil changes, etc. Maintenance schedules shall be listed as a separate section of the operation and maintenance manual.

3.9 VALVE CHARTS AND TAGS

- A. All valves, except as specified below, shall be provided with tags as specified in this section. Tags shall be secured to valve wheels with metal chain. Stop valves on individual fixtures or equipment where their function is obvious, or where the fixture or equipment is immediately adjacent, need not be so equipped. Care shall be exercised in selecting valve numbers to prevent conflict between various trades. The Contractor shall furnish schematic drawings prepared on tracing mylar showing locations, details of arrangement, etc., of all manual and automatic control valves indicating identity and function. A print of this drawing shall be framed and mounted where directed by the Architect.

3.10 CLEANING

- A. At the conclusion of the work, the premises shall be left broom clean. All factory-applied enamel paint shall be cleaned and waxed with industrial quality wax.

3.11 GUARANTEE

- A. In addition to the guarantee obligations contained in the GENERAL CONDITIONS, the Contractor shall guarantee the complete mechanical systems installation, as embraced by this specification, free from all mechanical and electrical defects for the period of one (1) year - beginning from the day of final acceptance of the work by the Architect.
- B. The guarantee period will only be implemented after the following conditions have been met:
 - 1. Commissioning, as defined in that section, is complete.
 - 2. The performance of all systems is satisfactory and meets the requirements of the specifications and drawings.

END OF SECTION 230500

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SECTION 23 05 93 - BALANCING

PART 1 - GENERAL

1.1 SCOPE

- A. Total System Balance shall be performed by an agency certified by the Associated Air Balance Council (AABC) and approved by the Owner's Representative. All work done by this agency shall be by qualified technicians under the direct supervision of an AABC Certified Test and Balance Engineer.
- B. Total System Balance shall be performed in accordance with the latest edition of the AABC National Standards, Total System Balance, and in accordance with the scope of work specified in the contract documents.
- C. Specific systems shall be balanced in accordance with all the procedures listed in the AABC National Standards. These systems include, but are not necessarily limited to:
 - Supply Return and Exhaust Systems
 - Make-Up Air Systems
 - Outside Air Systems
- D. Total System Balance shall not begin until systems are complete and operational.
- E. Upon the completion of the work, the Test and Balance Agency shall submit four (4) copies of the complete Test and Balance Report to the architect.
- F. One agency shall be responsible for all phases of Total System Balance.
- G. The responsibility for performing Total System Balance, as defined by ASHRAE, is "The overall concept requires that one source be responsible for the complete testing, adjusting, and balancing of all systems."
- H. Projects constructed in phases shall be balanced at the completion of each phase. At the completion of the entire project all systems shall be checked and adjusted as a complete and fully integrated facility.
- I. The Test and Balance Agency shall permanently mark the settings of all valves, dampers, and other adjustment devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop, it shall be set and locked.

PART 2 - PRODUCTS

2.1 SUBMITTALS

- A. The name of the Test and Balance Agency, plus the name and registration number of the Certified Test and Balance Engineer, shall be submitted to the Owner's Representative for approval within 30 days after the award of the project contract.
- B. The selected Test and Balance Agency shall submit to the Owner's Representative:
 - 1. Detailed procedures
 - 2. Agenda
 - 3. Report Forms
 - 4. AABC National Project Performance Guaranty
- C. An approved copy of each of the above must be returned to the Test and Balance Agency before Total System Balance is begun.
- D. If a complete submittal in accordance with Paragraph B is not received within the specified time, the Owner's Representative reserves the right to select the Test and Balance Agency.

2.2 ADDITIONAL WORK

- A. The Contractor shall provide the Test and Balance Agency with one set of the following documents:
 - 1. Within 30 days after approved selection of the Test and Balance Agency:
 - a. Contract drawings

- b. Applicable specifications
 - c. Addenda
 - 2. As issued:
 - a. Change orders
 - 3. Within 30 days after approval of the below items:
 - a. Approved shop drawings
 - b. Approved equipment manufacturer's submittal data
 - c. Approved temperature control drawings
- B. The Contractor shall provide the Test and Balance Agency with:
 - 1. Reasonable time, as determined by the Test and Balance Agency, to complete Test and Balance prior to the specified completion date.
 - 2. Completely operable systems
 - 3. The right to adjust the systems
 - 4. Access to system components
 - 5. Master keys, if the building is occupied
 - 6. Secure storage space for tools and instruments
- C. The Contractor shall be responsible for start-up and operation of systems during Total System Balance. Start-up shall include the following:
 - 1. All equipment operable in safe and normal condition
 - 2. Temperature control systems installed complete and operable.
 - 3. Proper thermal overload protection in place for electrical equipment.
 - 4. Air Systems:
 - a. Final filters clean and in place. If conditions warrant, the Contractor shall install temporary media in addition to the final filters.
 - b. Duct systems clean of debris
 - c. Correct fan rotation
 - d. Fire and volume dampers in place and open
 - e. Coil fins cleaned and combed
 - f. Access doors closed and duct end caps in place
 - g. All outlets installed and connected
 - h. Duct system leakage shall not exceed the rate specified.
 - 5. Construction strainers removed from base mounted pumps
 - 6. All coil strainers cleaned
- D. If it is determined by the Test and Balance Agency that drive changes are required, the purchaser of the equipment must obtain and install all necessary new components.

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION PROCEDURES

- A. Pre-construction plan checks and mechanical construction reviews shall be provided by the Test and Balance Agency. The Test and Balance Agency shall fully review all contract documents and shall submit a full report of any areas that may not be possible to balance or other circumstances that may affect the successful balancing of any system. This report shall be submitted within 30 days after approval of the Test and Balance agency.

3.2 GENERAL BALANCING PROCEDURES

- A. The Test and Balance Agency shall cooperate with the Owner's Representative and all Contractors to perform the work in such a manner as to meet the job schedule.
- B. The Test and Balance Agency shall leave all system components in proper working order, such as:
 - 1. Replace belt guards
 - 2. Close access doors

- 3. Close doors to electrical switch boxes
- 4. Restore thermostats to specified settings.
- C. All recorded data shall represent a true, actually measured, or observed condition.
- D. Any abnormal conditions in the mechanical systems or conditions which prevent Total System Balance, as observed by the Test and Balance Agency, shall be reported as quickly as possible to the individual responsible.
- E. The Contractor shall provide any required additional balancing devices, including but not limited to additional volume dampers and balancing valves, as determined by the Test and Balance Agency.
- F. The various systems shall be balanced to within the following tolerances unless otherwise directed:
 - Supply Air: 0 to + 10% of Design CFM
 - Exhaust Air: 0 to - 10% of Design CFM
 - Return Air: 0 to - 10% of Design CFM
 - Outside Air: 0 to + 10% of Design CFM
- G. Duct leakage shall be determined by comparing traverse measurements to the sum of all outlet air flows. Duct leakage shall not be more than +/- 5% of the design air flow rate.

3.3 TEMPERATURE RECORDINGS

- A. The Test and Balance Agency shall record temperature performance readings of all coils, listing, entering and leaving dry bulb and wet bulb temperatures when outside temperature is 80° F or above and entering and leaving dry bulb temperatures when outside temperature is 45° F or below.

END OF SECTION

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SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 SCOPE

- A. Provide and install insulation as hereinafter specified for all piping and duct systems where indicated.

1.2 FIRE SAFETY CONSIDERATIONS

- A. All insulating materials used shall have Flame Spread Rating not exceeding 25, and a Smoke Developed Rating not to exceed 50. These ratings shall be determined and verified by ASTM E-84, NFPA 255, or UL 723.
- B. Insulation using "Salts" to impart fire safety will not be accepted.

1.3 MANUFACTURERS

- A. Insulation shall be by one manufacturer, either "Owens-Corning" or other manufacturers as specified hereinafter

PART 2 - PRODUCTS

2.1 DUCT INSULATION

- A. All heating and air conditioning supply, return exhaust and fresh air duct installed in unconditioned spaces (i.e. - above ceilings, in attic and in fan rooms), and all outside air ducts (including those at wall boxes), shall be wrapped with 2" foil-faced fiberglass duct insulation, with vapor barrier. Ducts in ceiling spaces used as a return air plenum shall be insulated as above for unconditioned spaces. Supply ducts shall be internally lined in lieu of external insulation where indicated on drawings or described herein. Minimum installed 'R' value shall be no less than 8.
- B. Exposed ductwork in conditioned spaces shall not be insulated.
- C. The first twenty feet (20') of return air ductwork of each air handling unit shall be lined on the inside with ¹/₂" Owens Corning Quiet R Acoustic R Duct Liner, Certainteed Tuff Guard 2, or Johns Manville Permacote Linacoustic. The lining shall be fastened with approved adhesive and weld pins. Weld pins shall be approved type and fastened in accordance with SMACNA manual recommendations. Duct dimensions shown on drawings are internal dimensions and shall be adjusted accordingly to compensate for the duct liner. The total 'R' value shall be no less than 8.
- D. Supply air ductwork shall be lined the same as return air ductwork for the first twenty feet (20') downstream from unit discharge. Duct dimensions shown on drawings are internal dimensions and shall be adjusted accordingly to compensate for the duct liner. The total 'R' value shall be no less than 8.
- E. Ductwork and piping located outside the building and/or exposed to the weather shall be insulated as indicated in the paragraph entitled, "Insulation Exposed To Weather".

2.2 MISCELLANEOUS ITEMS

- A. Items such as expansion tanks, converters, pumps, etc. subject to sweating or excessive heat loss shall be insulated the same as the system to which they attach.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All insulation shall be applied on clean, dry surfaces only.
- B. All insulation shall be continuous thru wall and ceiling openings, and sleeves.
- C. Insulation on all cold surfaces where vapor barrier jackets are used, will be applied with continuous, unbroken vapor seal. Hangers, supports, anchors, etc. that are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation.

- D. Inserts shall be installed at outsize hangers. Inserts between the pipe and pipe hangers shall consist of rigid pipe insulation of equal thickness to the adjoining insulation, and shall be provided with vapor barrier where required. Insulation inserts shall be B-Line or equal and shall not be less than the following lengths:
 - 1/2" to 2-1/2" pipe size: 6" long
 - 3" to 6" pipe size: 9" long
 - 8" to 10" pipe size: 12" long
 - 12" to over pipe size: 18" long
- E. Metal shields shall be applied between hangers or supports and the pipe insulation. Shields shall be formed to fit the insulation and shall extend up to the centerline of the pipe and length specified for the insulation hanger inserts. Metal shields shall be B-Line or equal.
- F. Specified adhesives, mastics and coatings shall be applied at the manufacturer's recommended minimum coverage per gallon.
- G. Exposed insulated vertical pipe shall be protected to eight feet (8') above floor with 22 gauge smooth paintable riveted steel jacket. Vertical piping in equipment rooms do not require metal jackets.

3.2 INSULATION OUTSIDE BUILDING ENVELOPE

- A. Duct Insulation:
 - 1. All insulation outside the building envelope (garages, out buildings, roof, etc.) shall be rigid type, 1/2" thicker than otherwise specified and shall be weatherproofed in an approved manner. The total 'R' value must be no less than 8.
 - 2. Insulation exposed to weather shall have factory applied type II jacket or two coats of class I adhesive finish with a layer of glass cloth between the coats. The total, dry film thickness shall be approximately 1/16 inch. The total 'R' value must be no less than 8.

3.3 OTHER MANUFACTURERS

- A. Other acceptable manufacturers are Johns Mannville, Gustin Bacon, PPG and Knauf. These manufacturers are acceptable provided they meet the quality of the specified material. This includes the items which are standard for the specified material.

END OF SECTION

SECTION 23 08 00 - COMMISSIONING

PART 1 - GENERAL

1.1 SCOPE

- A. The purpose of commissioning is to ensure that the mechanical and plumbing systems along with their associated controls and power connections are installed as specified and in accordance with good practice, and are performing in a manner to provide satisfactory results throughout the entire installation.

PART 2 - PRODUCTS

2.1 SCHEDULE AND REPORT SHEETS

- A. The Contractor shall submit a schedule to the Construction Manager or other designated representative of the Owner responsible for all of the systems to be commissioned including packaged rooftop equipment, boilers, pumps, air handling units, condensing units, PTAC units, control equipment, air balancing, hydronic balancing, exhaust fans, domestic hot water systems, and domestic hot water re-circulation systems.
- B. Commissioning, testing and reporting shall not commence until the systems are completely installed, permanent power is connected, the systems are tested and air and water balancing is complete. A preliminary copy of the balance report should be available when commissioning commences.
- C. The Contractor shall retain an authorized commissioning agent at the beginning of construction to oversee and coordinate the entire commissioning process. Acceptable candidates for the commissioning agent shall be a licensed mechanical engineer, a qualified independent mechanical contractor with knowledge of the type of systems installed or an independent quality control contractor. All candidates must have a minimum of five (5) years experience of commissioning the types of mechanical systems included in this project.
 - 1. The Commissioning Agent shall hold a meeting prior to starting the commissioning process. He shall arrange with the General Contractor to ensure the attendance of affected trades, particularly Building Automation and Balancing.
- D. Commissioning shall be a three part enterprise.
 - 1. The systems installation shall be reviewed by the authorized commissioning agent to ensure the equipment and systems are installed in accordance with the drawings and specifications. This includes, but not limited to, verifying equipment model numbers, critical dimensions, piping and valve arrangements, duct sizes and configurations, installation of supports, vibration isolation devices, controls, power wiring, etc.
 - 2. Start-up of major equipment, (ie: boilers, packaged units, temperature control systems, etc.), by factory authorized personnel. The authorized commissioning agent shall use the forms published by the American Air Balance Council (AABC) for commissioning or similar forms. These forms must be completed and signed by the authorized agent and the installing contractor. The authorized agent shall attach to forms, any factory check lists which are used as part of the start-up procedure.
 - 3. Actual review and explanation of the operation of all systems in the presence of the Owner's Representatives and maintenance staff. This part shall not be performed until items 1 and 2 above are completed and the authorized commissioning agent is satisfied that the systems are installed and operating according to the specifications. The systems shall be operated through their full range and the operation of all control and safety devices shall be demonstrated. A copy of the commissioning report, including all checklists completed in item 2 above, shall be available. Periodic tests shall be performed to confirm the systems are operating properly.

PART 3 - EXECUTION

3.1 MISCELLANEOUS

- A. Commissioning shall consist of a team concept that includes periodic commissioning meetings with the involved trades for each system and the authorized agent. A checklist shall be completed for each piece of equipment along with any pertinent comments regarding the installation or performance. Any piece of equipment found to be installed or operating incorrectly shall be repaired by the Contractor and re-commissioned. A copy of the start-up checklists completed by factory authorized personnel shall be attached to the commissioning checklist.
- B. The final commissioning shall consist of a witnessing of the operation of each system in the presence of the Authorized Agent, the Contractor, the Construction Manager and an authorized Owner's Representative. The purpose of this final commissioning is to ensure that all parties are satisfied with the operation of the system and have a full understanding of the systems operation. The authorized agent shall compile all of the commissioning checklist in a three ring binder organized by type of equipment and tag number. A summary of the commissioning process shall be included, which shall list the personnel involved, issues that were handled during the process and any other pertinent comments or documentation. Once the commissioning is complete, this binder shall then be turned over to the Owner for his records.
- C. Equipment to be commissioned include:
 - Gas fire furnaces with DX cooling
 - Energy Recovery Units
 - PTACs (minimum 10% of total units)
 - Attic Ventilation fan
 - Packaged Air Conditioning Unit

3.2 GUARANTEE

- A. Guarantees referred to in other sections of this specification, begin only after the final commissioning report is signed by the Owner's representative.

END OF SECTION

SECTION 23 31 13 - DUCTWORK

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish and install all sheet metal work necessary for complete heating, ventilation and air conditioning systems. Construction shall be in accordance with SMACNA recommendations, or UL 181.
- B. All work shall conform with NFPA No. 90A and the International Mechanical Code.
- C. All duct systems, unless otherwise noted, shall be built to low-pressure (3" WG static pressure) construction standards.

PART 2 - PRODUCTS

2.1 SHEETMETAL WORK

- A. All low pressure ductwork shall be galvanized sheet steel of the following thicknesses, unless otherwise noted or indicated by SMACNA:

<u>Max. Duct Dimension</u>	<u>Low Pressure</u>
12"	26 ga.
13" to 30"	24 ga.
31" to 50"	22 ga.
51" to 84"	20 ga.
85" and larger	18 ga.
Plenums and Casings	16 ga.

- B. Provide fire dampers as shown and required. Fire dampers shall be equal in rating to the surfaces being protected and shall be UL listed.
- C. All metal ductwork shall be constructed and installed in accordance with the Sheet Metal and Air Conditioning Contractor's National Association "Low Pressure Duct Standards", and "Medium Pressure Duct Standards" and shall be air-tight and neat in appearance. Low pressure duct systems shall be constructed using a seal class "B" rating. Medium pressure duct systems shall be constructed using a seal class "A" rating. Cross joints in all low-pressure and medium pressure ducts, supply, return and exhaust, shall be sealed with fire retardant sealer or duct tapes securely glued in place. Interior surfaces shall be smooth and free of obstructions.
- D. Low pressure spiral duct shall be equal to "Uni-Seal" lockseam duct as manufactured by McGill Airflow Corporation or approved equal. The duct shall be constructed with an interlocking helical seam on the outside of the duct that runs the length of the duct.
- E. All duct lines shall be true and smooth. Where exposed ducts pass through openings in partitions and ceilings, they shall be fitted with trim angles to close joint between duct and construction.
- F. Ductwork exposed to damp or wet conditions shall be constructed of aluminum with the same duct construction standards as indicated above.
- G. Duct dimensions shown on the plans are the interior "free" opening dimensions. Ducts required to have an internal lining in accordance with Section 15180 of the specifications, or as otherwise directed, shall be constructed in a manner to maintain the interior dimensions indicated.
- H. Furnish and install volume control dampers, splitters, and other devices, with locking handles and memory stops, at all locations indicated on drawings and where required to properly balance the systems and to deliver the air quantities specified. All branch ducts serving a single air device shall be equipped with a volume control damper. See section 15011 for more information on Balancing.
- I. Furnish and install in each duct connection to motor driven equipment, a flexible joint to prevent vibration being transmitted from equipment to ductwork.
- J. Turning vanes shall be provided for all square elbows and shall be the acoustical type.
- K. Flexible duct shall be Hart & Cooley F114 or approved equal. The duct shall have two plies of polyethylene encapsulating a wire helix and insulation with a "R" value of 4.2 or more.

The duct shall have a vapor barrier and comply with the requirements of UL-181, NFPA 90A and ASTM C-518. The duct shall have a flame spread rating less than 25 and a smoke development rating of less than 50. The duct shall be rated for a maximum continuous working temperature of 140 degrees.

2.2 FIRE DAMPERS

- A. Furnish and install approved fusible link fire dampers where indicated on the drawings and where required by local codes and the standard of the National Fire Protection Association and by the latest directions of the Inspection Authorities.
- B. Fire dampers construction shall be in accordance with the requirements set forth in NFPA Pamphlet No. 90A including latest revisions. Fire dampers shall be so designed so as to close against the flow of air. Fire dampers shall be tight closing and shall be set in frames which shall be securely fastened to ductwork at fire partitions.
- C. Fire dampers in floor and masonry openings shall be of the multi-leaf accordion type, as manufactured by Air Balance, Inc., or approved equal, and shall be held in the normally open position by means of adequately spaced heavy gauge wires with fusible links. Vertical dampers shall rely on gravity for closing. Horizontal dampers shall be provided with adequate strength springs for forced closing when links melt. Damper frames shall in all cases, be of the type which shall be installed with a ducted pocket to contain the damper leaves in the normal position and which will provide a maximum free area of the full indicated opening size for passage of air.
- D. Number and locations of fire dampers and fusible link registers, etc., described and shown, are the minimum number and designation required. It shall be the Contractor's responsibility to satisfy that his bid includes all dampers and devices required at the date of submitting his bid.
- E. Any changes in requirements by the governing authorities which are made effective prior to bid date, shall be provided and installed at no change in contract price.
- F. Adequately sized removable and replaceable airtight panels shall be provided in the ductwork for access to all damper links. Access panels in building construction shall be provided as specified under Section 23 05 00.

2.3 SMOKE DAMPERS

- A. Smoke dampers shall have a UL classification of UL 555S or UL 555 as applicable and shall be low leak type.
- B. Dampers shall be capable of operating at 350°F and shall close completely in less than 20 seconds.
- C. Dampers shall operate with fire alarm system or with local indications as shown or as directed.
- D. Dampers shall have 24 volt electric actuation with factory-mounted and wired integral duct smoke detector. Transmit alarm to the fire alarm system upon activation. Damper shall operate on a corresponding signal from the fire alarm system.
- E. Dampers shall have optional automatic reset.

2.4 REGISTERS, GRILLES & DIFFUSERS

- A. Registers, grilles and diffusers shall be as specified on the drawings. Acceptable manufacturers are Price, Tuttle and Bailey, Metal Aire and Titus. Submitted air devices shall meet or exceed the quality standards of the specified air device and shall be equal in terms of type, appearance, and performance.
- B. Where volume dampers cannot be installed in the branch duct and where otherwise indicated, the air device shall be equipped with an opposed blade damper. The damper shall be constructed out of the same material as the air device.
- C. Air devices installed in wet or damp areas such as shower rooms and compartments, bathrooms, poolrooms, saunas, and outside of the building shall be constructed of aluminum.
- D. The corners of the air devices shall be constructed using full penetration resistance welds.

- E. All air devices shall be finished with baked on anodic acrylic paint that will pass a 100-hour salt spray test in accordance with ASTM D117 and a 250-hour water immersion test in accordance with ASTM 870.
- F. Air devices shall be furnished with the proper border and frame to interface with the type of surface it is being mounted to.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide all necessary devices to balance the airflow to produce air quantities at outlets as marked on the drawings. See section 23 05 93 for more information on Balancing.
- B. Make provisions for, and install in ductwork, all automatic control systems, dampers, smoke dampers, smoke sensors, thermometers and similar equipment furnished under this or other sections of the specifications. Provide angle iron or channel frames and sheet metal duct collars as required for mounting ATC dampers and manual dampers over weatherproof louvers for air intake and exhaust, as indicated on drawings.
- C. Duct connections to flanged coils, etc., shall be made with soft neoprene gaskets with adhesive between coil and duct flange.
- D. Provide access panels in the duct for access to fire dampers. Provide access panels in all ceilings and walls to allow access to concealed dampers and accessories that require manual operation or visual inspection. Where possible, dampers, valves and accessories shall be installed in a common location to minimize the number of access panels. Refer to section 23 05 00 for more information on access panels.
- E. Flexible duct shall be installed on supply air systems connecting the air device to the branch duct. Flexible ducts shall have the inner diameter specified on the plans. Flexible ducts shall not exceed 6 ft. in length and shall not turn more than a total of 180 degrees. Flexible ducts shall not be used on return, outside air, and negative pressure exhaust systems unless directed by the Engineer.
- F. Ductwork which does not meet minimum leakage specified in Section 23 05 93 "Balancing" shall be reworked until the minimum requirement is reached.

END OF SECTION

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DIVISION 26
ELECTRICAL SPECIFICATION INDEX

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SECTION 26 05 00 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SCOPE

- A. Work under this section shall be subject to the GENERAL CONDITIONS hereinbefore written for the entire work, noting especially the reference to interlocking divisions for the Contractors responsibility under each division. Requirements under this SECTION shall apply to all work under DIVISIONS 26 - 28.
- B. The Contractor shall furnish labor, materials, equipment and services necessary for the construction of the complete electrical systems.
- C. Labor and materials, although not specifically mentioned, but necessary for the completion of the work and the successful operation of entire electrical system, shall be provided as if specifically called for.
- D. The Contractor shall coordinate the installation of the electrical systems with other trades to insure proper fit, adequate clearances, and proper connections prior to commencement of the work and during the construction phase.

1.2 EXAMINATION OF SITE

- A. The Contractor shall examine the site and observe the conditions under which the work will be done or other circumstances which will affect the contemplated work. No allowance will be made subsequently in this connection for any error or negligence on the Contractor's part.

1.3 REGULATIONS AND CODE REQUIREMENTS

- A. Work shall conform to the requirements of the latest editions of the following codes, regulations and specifications:
 - 2011 National Electrical Code (NEC)
 - 2012 International Energy Conservation Code (IECC)
 - 2013 District of Columbia Building Code
 - 2013 District of Columbia Green Construction Code
 - 2013 District of Columbia Fire Code
 - 2012 ICC Building Code
 - 2012 ICC Fire Code
 - 2012 ICC Green Construction Code
 - 2012 ICC Existing Building Code
 - 2013 National Fire Protection Association (NFPA) 72
 - International Electrical Testing Association – Acceptance Testing Specifications (NETA ATS)
 - National Electrical Manufacturers Association (NEMA)
 - Institute of Electrical and Electronics Engineers (IEEE)
 - Underwriters Laboratories, Inc. (UL)
 - United States of American Standard Institute
 - National Institute of Standards & Technology (NIST)
 - Occupational Safety and Health Act (OSHA)
 - Illumination Engineering Society (IES)
 - National Electrical Safety Code (NESC)
 - American National Standards Institute (ANSI)
 - National Fire Protection Association (NFPA)
 - American with Disabilities Act (ADA)
 - Local Regulations and/or Amendments

- B. Definitions:
1. Approve - Term used in conjunction with Engineers/Architects actions on the Contractors submittals, applications, and requests; is limited to the Architects/Engineers duties and responsibilities as stated in the General and Supplemental Conditions.
 2. Equal (or similar phrases, such as “approved equal”, “equivalent”, “acceptable”) - Having characteristics which are as good as or better in quality, performance and appearance; meeting qualifications indicated or specified in the Contact documents for a particular product or material.
 3. Furnish - To supply and deliver to the project site, unload, and store until required for installation or use.
 4. Install - To set a piece of equipment or material in place at the project site, and connect to the system for which it is intended, complete with appurtenances, accessories, mounting devices, etc. as required.
 5. Provide - To furnish and install, complete and ready for the intended use.
 6. Material - Manufactured products and processed and unprocessed natural substances required for the completion of the Contract.
- C. The terms “or equal” or “approved equal” or “equivalent” are used as synonyms throughout the contract documents pertaining to Divisions 26 - 28. These terms are not implied, but are stated in the contract documents where applicable. Only materials or products fully equal in all details will be considered.

1.4 QUALITY STANDARDS

- A. Manufacturers specified herein, under Divisions 26 - 28, represent products that meet the projects quality standards. Other products which meet or exceed this standard shall be considered equivalent, subject to final review.
- B. Where three or more manufacturers of one product are listed, the Contractor shall bid the job using one of these manufacturers. Should the Contractor desire to substitute another material or product for the material or product specified (if specifically permitted elsewhere within these contract documents), he shall apply in writing for such permission. Requests for substitutions must be submitted within fourteen (14) days after award of contract or notice to proceed, whichever shall occur first; shall state the credit (or extra cost) involved by the use of such substitution, the advantage to the Owner in accepting such substitution, and acknowledgment that ramifications or impact on other trades and the construction schedule has been considered and costs associated with the substitution are reflected in the request. The Contractor shall pay all costs to determine acceptability of the proposed substitution including, but not necessarily limited to, the following:
1. For tests required by the Engineer for evaluation of both the specified product and the proposed substitution.
 2. For additional evaluation time of the Engineer.
 3. For shipping costs to and from the Engineer, to the Owner, etc. as may be required for evaluation.
 4. For any mockup, installation, or other demonstration required by the Engineer for evaluation of the product(s).
- In the event that a substituted item is submitted twice and approval is not obtained by the second submission, the Contractor shall furnish the specified item of material or equipment at no additional cost to the Owner.
- C. The Contractor is responsible for assuring products supplied by listed or alternate manufacturers are of equivalent or better quality as the primary specified manufacturer. This quality standard will apply to all components of the product.

1.5 SUBMITTALS

- A. Within 30-days after the award of the contract, submit for review to the Engineer a complete list of proposed manufacturers for equipment, materials and subcontractors to be utilized. Lists shall follow the sequence of the specifications. No considerations will be given for partial or incomplete lists. Acceptance of the preliminary list does not relieve the Contractor of responsibility for complete compliance with the specifications. Final acceptance of proposed material and equipment will be pending review of detailed shop drawings. Deviation from the accepted preliminary list will not be permitted without the approval of the Engineer. After review and acceptance of the list, detailed shop drawings and material data shall be submitted. If prior to expiration of the 30-day period or any duly authorized extension thereof, the Contractor fails to submit a schedule of acceptable materials and equipment covering the rejected items, the Owner or his authorized representative reserves the right to select the item. Such selection shall be final and binding upon the Contractor as a condition of the Contract.
- B. Detailed shop drawings based upon the accepted material and equipment list shall be prepared for submission prior to commencement of the work, consisting of manufacturer's certified scale drawings, cuts, wiring diagrams, catalogs or descriptive literature with complete certified characteristics of equipment, dimensions, capacity, code requirements, and testing.
- C. The Contractor shall submit scaled drawings detailing the main and each sub-electric room plan layouts showing proposed equipment and main conduit routing (1/2" = 1'- 0" scale). Elevations shall be provided where necessary to clarify equipment arrangement and clearances. These details shall be submitted for concurrent review with the electrical distribution equipment submittals.
- D. Prior to review submission, the Contractor shall check the shop drawings thoroughly to ascertain that they comply in detail with the Plans and Specifications and that dimensions are shown and checked to fit available space with recommended access. Any deviations from Plans and Specifications shall be clearly noted on the certified shop drawings. Drawings shall include a reference to the appropriate section and paragraph number of the specifications or the appropriate drawings reference. The Installer shall stamp the shop drawings with his firm's name, date and approval noted, indicating that the above has been complied with. Shop drawings received without the Contractor's stamp, or other contract requirements, will be returned disapproved without further explanation.
- E. Shop drawings shall be submitted for items of equipment specified under each section of the specifications, or specified on the drawings. Additional shop drawings requirements will be as indicated under the specific section.
Failure to submit Shop Drawings or Material Lists in ample time for proper checking and necessary re-submission, shall not be allowed as reason for any claim for extension of time or delay.
- F. The Contractor shall submit working samples and/or demonstrate proposed system operation upon request.
- G. The review of a Shop Drawing or Material List shall not be considered as a guarantee of the measurements of the building conditions, or that the Shop Drawings or Material Lists have been checked to see that item submitted properly fits the building conditions. Review shall not in any way relieve the Contractor of his responsibility or necessity for furnishing material or performing work as required by the specifications and contract drawings, or relieve the Contractor of his responsibilities for correctness of dimensions and quantities, or for proper coordination of details and interface with other trades.
- H. Samples, drawings, specifications, catalogs, correspondence, and other data submitted for review must be properly labeled, indicating the following data:
 - Project name and address

- Project title
- Contractor's name, address, telephone number, contact person
- Supplier's name, telephone number (shop drawings)
- Applicable specification section and specific paragraph number, relating to this submission (shop drawings).

Failure to identify any submission data or correspondence in this manner shall be cause for immediate return of the data, submission, or correspondence without further review or comment.

1.6 COORDINATION

- A. It shall be the responsibility of the Contractor to coordinate the work and equipment as specified herein, with work to be performed and equipment to be furnished as specified under other sections of the specifications, in order to assure a complete and satisfactory installation, meeting the approval of the Architect.
- B. Prior to the start of construction, the Contractor shall review the construction documents and specifications of all divisions to assure that electrical provisions for equipment have been made. The Contractor shall notify the Architect of any discrepancies in the electrical provisions prior to commencement of the work and submission of shop drawings. No allowance will be made subsequently in this connection for failure to identify discrepancies between the electrical work and other trades.
- C. The Contractor shall coordinate with all trades and review shop drawings of electrically operated equipment, whether furnished under Divisions 26 - 28 or not, to verify electrical connection requirements for equipment voltage, phase and loads prior to rough-in of provisions and connections. Replacement costs for damaged equipment and/or labor and material costs associated with roughing-in of improper provisions as a result of the Contractor's failure to coordinate the equipment electrical requirements will be the responsibility of the Contractor.
- D. If a conflict exists between drawings (and/or specifications), the more stringent (which is generally considered to be the more expensive) requirement shall apply. Items shown on the drawings but not specified, shall be provided.

PART 2 - PRODUCTS

2.1 MATERIAL AND EQUIPMENT

- A. Furnish, install and connect equipment as specified herein and under the subsequent sections of Divisions 26 - 28 and/or on the drawings.
- B. The Contractor, in accepting the contract, is assumed to be thoroughly familiar with the materials required and their limitations as to use and requirements for connection, setting, maintenance and operation. Whenever an article, material or equipment is specified and a fastening, furring, connection (including utility connection), access hole, closure piece, or accessory is normally considered essential to the installation in good quality construction, such shall be included as if fully specified.
- C. Material and equipment installed as a part of the permanent installation shall be new unless otherwise indicated or specified, and shall be listed and labeled by the Underwriter's Laboratories, Inc., for installation in each particular case where standards have been established.

2.2 CONCRETE WORK

- A. Unless otherwise indicated, concrete work for electrical equipment foundations, pads, etc., shall be provided under this section of the work. Concrete work shall conform to the

requirements specified in other sections of these specifications. Concrete shall be 3,000 psi (minimum) test in 28 days.

PART 3 - EXECUTION

3.1 PERMITS AND CERTIFICATES

- A. The Contractor shall obtain necessary permits and certificates and shall pay fees and charges connected therewith. The certificates shall be delivered to the Architect before final payment is made.

3.2 SUPERVISION AND CONSTRUCTION PROCEDURES

- A. It shall be the Contractor's responsibility to completely supervise and direct the work using his best skill and attention. He shall be solely responsible for construction means, techniques, sequence and procedures and for coordinating all portions of the work under the contract.
- B. The Contractor shall completely familiarize himself with the entire project, including work of other trades, and shall also coordinate his work with the other trades. The Contractor shall also familiarize himself with and conduct his work in accordance with other portions of the complete contract documents, including, but not limited to, the GENERAL CONDITIONS and GENERAL REQUIREMENTS of the Contract.

3.3 ELECTRICAL SYSTEM INSTALLATION

- A. The entire work shall be constructed and furnished in a first-class, substantial, and workmanlike manner, according to the full intent and meaning of the drawings and specifications. Everything necessary for the completion of the work and successful operation thereof shall be furnished.
- B. Wiring, conduit runs, risers, and connection points shown on the drawings are diagrammatic; however, the general arrangement of conduit, wiring and equipment shall be as shown on the contract drawings. Detailed drawings of proposed departures due to actual field conditions or other causes, shall be submitted to the Architect for approval. The Contractor shall carefully examine all contract drawings and shall be responsible for the proper fitting of materials and equipment in each location as indicated, without substantial alteration.
- C. Spacing and arrangement of lighting fixtures, etc. shall be coordinated with ceiling patterns so as to be symmetrical and centered in individual bays. Equipment, fixtures, devices, etc., installed in or on the ceiling shall be compatible with the ceiling pattern and structure.
- D. Conduit, outlets, wiring and any other necessary fittings or accessories for power connections for equipment furnished under this division and other divisions, such as heating, cooling and ventilating equipment, pumps, fans, etc., shall be installed under this section. Motor and equipment ratings shown on the drawings are approximate and should be verified. Should substituted equipment of different ratings be furnished, the effected circuit components shall be adjusted accordingly at no additional cost to the Owner.
- E. New and relocated electrical devices and equipment shall be installed with working space/clearance and provisions as required by the NEC.

3.4 CUTTING AND PATCHING

- A. Cutting and patching necessary for the installation of the electrical work shall be done under this section. Any damage done to the work already in place by reason of this work shall be repaired at the Contractor's expense. Patching shall be uniform in appearance

and shall match the surrounding surface.

3.5 SYSTEM IDENTIFICATION

- A. Electrical equipment, including service entrance equipment, disconnect switches, panelboards, time clocks, contactors, motor starters, etc., shall be provided with proper identification to relate its function either by reference to the equipment served or to the electrical riser diagram or both. Service entrance equipment shall have main disconnecting devices clearly labeled (e.g., SERVICE MAIN #1 of 4, SERVICE MAIN #2 of 4, etc.). Identification shall be by the use of engraved plastic or metal nameplates screw-attached to the equipment. Uses of embossed plastic "tape" labels as prepared by "Tape-Writer" type equipment are not acceptable for electrical equipment labeling.
- B. During back-filling/top-soiling of each exterior underground wiring system, provide continuous underground-type plastic line markers, located directly over buried lines at 6" to 8" below finished grade. Where multiple conduits or cables are buried in a common trench and exceed an overall width of 24", provide a line marker for every 24" of width (or fraction thereof). Markers shall indicate type of system.
- C. Junction box and pull box covers shall be labeled using permanent marker or other acceptable means. Covers for circuits shall be marked to indicate circuit numbers, panel source and voltage. Covers for special systems shall be marked to identify system and/or function.

3.6 CLEANING AND PAINTING

- A. Exposed equipment installed under this section shall be cleaned, primed, and finish painted under this section of the specifications. Hangers, supports, etc., not provided with corrosion-proof finish shall be primed and finish painted under this section.
- B. Electrical control equipment, panels, and supporting framework shall have light gray finish which may be manufacturer's standard gray, as approved by the Architect. Where the finish becomes scratched or marred, it shall be touched up or repainted to match the original finish as directed by the Architect. Particular caution shall be exercised so as not to obscure the nameplate data.

3.7 PROJECT CLOSEOUT

- A. As-Built Drawings: As the work progresses, the Contractor shall record, on a set of white prints, the installed locations and sizes of electric feeders, equipment, etc. Upon completion of the work, the Contractor shall deliver to the Engineer one (1) complete set of white prints with "as-built" information neatly recorded thereon in red ink.
- B. Inspections: The Contractor shall arrange and pay for all inspections of the electrical work.
- C. Tests:
 - 1. The Contractor shall furnish labor, material, instruments, fuel and power required to perform necessary tests. Tests shall be performed to the complete satisfaction of the Architect. Defective materials and/or workmanship discovered as a result of these tests shall be removed and replaced at the Contractor's expense and the test repeated.
 - 2. A thorough test shall be made to demonstrate that the electrical system is entirely free from ground faults, short circuits and open circuits; that the resistance to ground of non-grounded circuits, before and after connection of fixtures and equipment, has a minimum of one Megohm Insulation Resistance and that circuits are connected properly in accordance with the plans and the manufacturer's wiring diagrams.
 - 3. Additional testing requirements will be as required under other sections of this

specification.

D. Operating Instructions:

1. The Contractor shall furnish three (3) brochures of operating and maintenance instructions for each item of equipment installed under this section. Included shall be original catalog cuts of all equipment (panels, lighting fixtures, starters, devices, etc.), schematics as specified under other sections of this specification, maintenance instructions, and warranties.
2. The Contractor shall provide the Owner's authorized representative instructions in the operation and maintenance of the systems before final acceptance of the job.

E. Guarantee:

1. Guarantee the complete electrical system installation free from mechanical and electrical defects.
2. The guarantee period shall be as defined under Division 1. As a minimum, the guarantee period shall be one (1) year, beginning from the day of final acceptance of the work by the Architect or substantial completion and beneficial occupancy by the Owner, whichever occurs first.

END OF SECTION

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SECTION 26 05 20 - EXISTING CONDITIONS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall make necessary changes to the existing electrical systems to accommodate the new work, and additionally to ensure that all existing work complies with the currently enforced edition of the National Electrical Code (2014 NEC). This shall include removal or relocation and reconnection of existing equipment disturbed by the new work.
- B. Material and equipment made superfluous by reason of the new work shall become the property of the Contractor and shall be removed from the site unless the equipment is specifically indicated to be retained by the Owner, in which case the Contractor shall disconnect and remove the equipment and return to the Owner.

1.2 SITE VISIT

- A. Prior to preparing the bid, the Contractor shall visit the site and familiarize himself with existing conditions. The Contractor shall make necessary investigations as to locations of utilities and other matters which can affect the work. No additional compensation will be made to the Contractor as a result of his failure to familiarize himself with the existing conditions under which the work must be performed. No compensation will be allowed for failure to clarify any existing condition prior to bid.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The Contractor shall provide labor, material and equipment necessary to complete the demolition work, and maintain existing circuits/systems required to remain in service during the construction phase and/or after the completion of the work.

PART 3 - EXECUTION

3.1 UTILITY COORDINATION

- A. No work shall be performed on or near existing service entrance and distribution equipment without the approval of the authorized utility representatives.

3.2 OUTAGES

- A. Electrical work which will interfere with the normal use of the building in any manner, shall be done at such times as mutually agreed upon by the Owner.
- B. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area, shall be scheduled at least ten (10) days in advance with the Owner. Such outages shall be performed on other than normal duty hours.
- C. The Contractor shall include in his price, the cost of premium time required for outages and other work which interferes with the normal use of the building, which will be performed in most cases during other-than-normal work time and at the convenience of the Owner.

3.3 CONNECTIONS AND ALTERATIONS TO EXISTING WORK

- A. When existing work is removed, conduits, wiring, etc. shall be removed back to electric panels and capped, unless noted otherwise, except where other devices in same circuit remain.
- B. Removal and/or relocation of existing services shall be closely coordinated with the Owner as they impact adjacent areas which shall remain operational.

- C. While performing connections and alterations to existing electrical work, the Contractor shall take extreme care to protect existing materials, equipment, casework, etc. from dirt, debris and damage. Damage to existing materials, equipment, casework, etc., shall be repaired at the Contractors expense.

3.4 CUTTING AND PATCHING

- A. Cutting and patching associated with the work in the existing structure shall be performed in a neat and workmanlike manner. Existing surfaces that are damaged by the Contractor shall be repaired or patched with new materials.
- B. Structural members shall not be cut or penetrated. Holes cut through concrete and/or masonry to accommodate new work shall be cut by reciprocating or rotary, non-percussive methods. Contractor shall perform GPS scanning prior to all cutting or core drilling.
- C. Patching of areas disturbed by installation of new work and/or required demolition, shall match existing adjacent surfaces as to material texture and color.
- D. For masonry walls, existing outlet boxes may be reused for new outlets (if within 12" horizontally and the same mounting height of new locations), or provided with a blank cover plate. Cover plates shall be painted to match the surrounding surfaces. This is in lieu of patching and painting masonry walls.
- E. For drywall partitions, existing outlet boxes may be reused where the existing outlets are in the same location as the new outlets. Where existing outlet boxes can not be reused and drywall partitions are to remain, provide a blank cover plate and paint to match the surrounding surface.

3.5 WIRING IN EXISTING AREAS

- A. Lighting fixtures, outlets, or existing equipment which are not indicated or specified to be removed, shall remain in service unless directed otherwise. Additional wiring, conduits, connections, switches, etc., which may be required to maintain electric connections, shall be furnished and installed by the Contractor as part of this contract whether indicated on the drawings or not.
- B. New wiring shall be provided for new outlets. In existing areas, the new wiring shall make use of existing concealed conduit as much as possible. Such usable concealed conduit shall be cleared of existing wiring, provided with new junction boxes, raceway extensions, etc., as necessary.
- C. The Contractor shall schedule the electrical work so that interruptions to existing circuits are kept to a minimum. When an interruption is necessary, the Contractor shall notify the proper authority and obtain their approval before proceeding with the interruption. Any outage required shall be coordinated by the Contractor with all interested parties. Bridging or temporary service connections shall be provided by the Contractor as part of this contract.
- D. All existing circuitry shall be field verified by use of an electronic circuit tracer.
- E. Remove exposed raceways, hangers, and electrically related items no longer required for active circuits. Include patching of holes, painting of surfaces, and, on abandoned outlets, furnishing new metal covers finished or painted to match surroundings.
- F. The availability and suitability of equipment denoted as "Existing" has been determined as accurately as possible at this time. However, it must be clearly understood that where such equipment is found to be not available or suitable for any reason, then the Contractor shall replace or repair the equipment as required at no additional cost.
- G. Generally, wiring shall be concealed above ceilings or in walls wherever possible. Where new wiring is indicated to be located in existing walls, the walls shall be cut and patched as necessary.
- H. Surface metal raceways shall be used only where conditions prevent the installation of concealed wiring and as approved by the Architect. The raceway shall be secured by means of metal screws in wood, or metal expansion shields in concrete or masonry, or

toggle bolts on hollow masonry tiles. Wood, plastic, or composition plugs shall not be used. The exposed raceway shall lay flat against the running surface. It shall be installed in corners, alongside molding, etc., so as to be inconspicuous. The raceway shall be offset only at outlet boxes, cabinets, etc., and shall be provided with appropriate manufactured right-angle fittings so as to lay flat at corners, frames, pilasters, etc. The surface raceway shall be primed and finished to match the surrounding finish surface areas and as approved by the Architect.

- I. Bridging or temporary service connections shall be provided by the Contractor during a service interruption as may be necessary to maintain any essential building security system, such as Fire Alarm, Burglar or Sprinkler Alarm Systems, Security Lighting, etc.

3.6 RETAINED PANELBOARDS

- A. Existing panels to remain in service shall be provided with new directory cards, which shall be updated to show, after completion of all new work, the actual locations of outlets connected. The directory cards shall also show "spares". Directory cards shall be typed.
- B. Existing panelboard branch circuits, which are not indicated to be removed, shall be maintained. The conductors of circuits no longer used shall be completely removed.
- C. New branch circuits, as noted on the drawings, shall be installed from existing retained panelboards, as indicated on the drawings. New wiring shall be installed and concealed in finished areas. Cut, chase, patch and paint the wall at flush mounted retained panelboards supplying new circuits.

END OF SECTION

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SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 SCOPE

- A. Provide ground for circuits, as shown on the drawings specified herein and required by the National Electrical Code.
- B. Provide grounds for all raceways, mechanical equipment and outlets, in accordance with IEEE Standard 141.

1.2 GENERAL

- A. Provide separate green insulated ground wires for all isolated ground receptacles and equipment grounds for flexible connections to equipment or devices, and where indicated on the drawings or as required by code. Where separate insulated grounds are specified or indicated on the circuit homeruns, the insulated ground shall be installed along the entire length of the circuit and bonded to all devices, fixtures, etc., although not specifically indicated on the remaining circuit connections shown.
- B. Receptacles shall be positively grounded and not dependent upon the grounding strap.
- C. Required separate insulated equipment grounds shall be installed in addition to and bonded to raceway grounding.
- D. Step down transformers shall be grounded per NFPA 70, Article 250 for separately derived systems.
- E. Isolated grounds shall be installed and connected to all isolated ground receptacles and where indicated on the drawings. The isolated grounds shall be isolated from the branch feeder equipment ground, and shall be directly bonded to the main grounding electrode (or the secondary step down transformer grounding if same supplies the connected circuit). Isolated grounds shall be installed in strict accordance with NFPA 70, Article 250.

1.3 SUBMITTALS

- A. Submit cut-sheets of all grounding system materials and schematic wiring diagram of proposed ground system showing all main bonding points.

PART 2 - PRODUCTS

2.1 CONNECTION

- A. Cable connection to ground rods shall be stranded copper (minimum #1/0). All connections to ground rods shall be made using "Cadweld" exothermic bonding process.
- B. Cable connections to water pipe shall be made using bronze clamps with rigid jaws and bolt-on connectors.
- C. Grounding connection to mechanical equipment or panelboards shall be made using lug connectors bolted on to the equipment. These lugs shall be furnished by the Contractor.

PART 3 - EXECUTION

3.1 CONTINUITY

- A. Continuity of metal raceways shall be insured by the use of double locknuts. Provide bonding jumpers on concrete lined water system and around water valves where required.

3.2 PVC

- A. All PVC raceways containing power wiring shall have a separate grounding conductor installed.

END OF SECTION

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SECTION 26 05 33 - BASIC WIRING METHODS

PART 1 - GENERAL

1.1 GENERAL

- A. Furnish and install all conductors, conduits, fittings, cables, junction boxes, pull boxes, etc. for a complete wiring system as specified herein and as indicated on the drawings.
- B. Wiring methods utilized by the Contractor shall be in accordance with this specification and as restricted by NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Conductors in the building, unless specifically noted otherwise, shall be copper, 98% conductivity, suitable for 600 volt duty, type THHN, solid for #10 and smaller and stranded for #8 and larger.
- B. Conductors #1/0 AWG or larger may be aluminum of ampacities equivalent to amperage ratings of copper conductors indicated on the drawings. Aluminum conductor termination lugs shall be torqued in accordance with manufacturer's specifications and recommendations. Contractor shall submit shop drawings scheduling all proposed aluminum feeders indicating size, amperage, length, conduit sizes, etc. AWG sizes shall be based on a 75 degree temperature rating.
- C. Minimum branch circuit wires for 20 amp circuits shall be #12 AWG unless specified otherwise. 20 amp circuit wiring to the first outlet shall be adjusted for voltage drop as follows:

<u>Circuit Length</u>	<u>120 V</u>	<u>277 V</u>
Up to 75'	# 12	#12
75' - 150'	# 10	#12
Over 150'	# 8	#10

- D. Minimum size for control wiring shall be #14 AWG or as specified under other sections of the specifications.
- E. Conductors shall have identification markings along their outer braid denoting conductor size, type of insulation and manufacturer's trade name.
- F. Conductors for underground installation shall have 600 volt insulation and be copper, 98% conductivity, type USE, style RR with RHW or RHH insulation, #10 AWG minimum.
- G. Conductor insulation for sizes up to # 6 AWG shall be color coded as follows:

<u>Conductor</u>	<u>120/208 V</u>	<u>277/480 V</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Insulated Ground	Green	Green
Isolated Ground	Green w/ stripe	Green w/ stripe

Color code for conductors larger than #10 or cable assemblies may be by means of tape per color listed above. The conductors shall be taped at all junction and terminations points along the entire visible length at intervals acceptable to the local authority.

- H. Control and instrument wiring shall be color-coded using color impregnated into the insulation. All wiring contacts and binding posts shall be suitably tagged for ease of identification and tracing of circuits. Identification tags shall be engraved fiber or plastic type, subject to the approval of the Architect. Wires shall be numbered and coded, using Brady "Quicklabels".

2.2 METALLIC CONDUIT

- A. Hot-Dip, galvanized conduit shall be used for exposed exterior work and interior areas subject to wet or damp conditions. Conduit shall be provided with bonded PVC jacket

where buried directly in the earth. Fittings shall be threaded galvanized steel connected with double locknuts with insulated bushings.

- B. Hot-Dip, galvanized, intermediate metal conduit (IMC) or electrical metallic tubing (EMT) may be used for interior work. Fittings shall be compression type or set screw type, concrete or rain tight, made of galvanized steel or malleable iron, with insulated throats. Compression type fittings are required for conduits run exposed on the interior of the building in finished areas, and in areas which are subject to possible liquid or liquid spray.
- C. Flexible metal conduit (Green Field) in lengths not to exceed 6-foot, shall be used for final connections to light fixtures, dry type transformers, mechanical equipment, and other equipment subject to vibrations. Connectors shall be angle wedge "Tite-Bite" with nylon-insulated throat.
- D. Liquid-tight flexible metal conduit (sealtight) shall be used for final connections of exterior equipment, commercial/kitchen equipment, and other final connections subject to wet or damp conditions. Fittings shall be liquid-tight with threaded ferrule, nylon sealing ring, and steel or malleable iron compression nut and body. The conduit shall be installed in such a manner that liquid tends to run off the surface and not drain towards the fittings. Fittings at enclosure knockout shall be installed with a gasket assembly consisting of an "O" ring and retainer on the outside.
- E. Compound sealed fittings shall be used for hazardous locations, for conduits passing from exterior to interior and other areas subject to widely varying temperature such as walk-in coolers/freezers.
- F. Expansion fittings with bonding jumpers shall be used where conduits pass through expansion joints or where otherwise required to compensate for thermal expansion and contraction.
- G. Use of aluminum conduit will not be permitted.

2.3 NON-METALLIC CONDUIT

- A. PVC, Schedule 40, non-metallic conduit may be used for direct burial in the earth or for concrete encasement. All joints shall be sealed watertight using moisture-proof permanent solvent cement. Carlon or approved equivalent.
- B. Where buried conduit rises above finished grade, the PVC conduit shall be transitioned below grade to a metallic "boot" or may be PVC conduit encased in concrete.
- C. Use of electrical non-metallic tubing (ENT) will not be permitted for this project.

2.4 CABLE ASSEMBLIES

- A. Cable shall be factory assembled with continuous jacket containing individually insulated conductors conforming to all applicable UL standards.
- B. Cable assembly types for interior applications shall be as follows:
 - 1. Metal clad cable type MC with insulated ground wire.
 - 2. Armored type AC (BX) will not be acceptable for this project.
 - 3. Non-metallic cable will not be acceptable for this project.
- C. Cable for branch circuit wiring rated 100 amp or less will be acceptable for use in concealed locations as permitted by code, and noted above. Wiring rated more than 100 amps shall be conductors run in conduit.
- D. Cable assemblies for special systems shall be as permitted under other sections of this specification.

2.5 JUNCTION AND PULL BOXES

- A. Junction and pull boxes shall be furnished and installed as shown or where required to facilitate pulling of wires or cables. Such boxes shall be installed in accessible locations and shall be approved by the Architect.
- B. Boxes for interior concealed work shall be constructed of 12-gauge USS galvanized sheet steel minimum, unless otherwise specified or indicated, and provided with mounting brackets and flat screw covers secured in position by round head brass or stainless steel 300 grade machine screws.

- C. Boxes for exterior work shall be cast aluminum or galvanized cast iron type with threaded hubs unless otherwise directed by the Engineer. Gasketed cover plates shall be furnished for outdoor installation.
- D. Boxes used for supporting fixtures shall be furnished with malleable iron fixture studs of "no-bolt" type secured by locknut. Provide support for boxes occurring in suspended ceilings. Outlets in ceilings directly on bottom of joists shall be supported independent of ceiling construction. Outlets in suspended ceilings shall not be supported from ceiling construction. Special supports for boxes shall be as directed and approved by the Architect.
- E. Low voltage junction boxes shall be certified by an approved testing agency (with sticker affixed inside of box) as required by local AHJ.

PART 3 - EXECUTION

3.1 CONDUCTOR INSTALLATION

- A. Circuit numbers shown on drawings indicate quantity only. Contractor shall connect loads to panels so that loads are evenly balanced on all phases equally.
- B. All wires shall be neatly shaped in all panels, troughs, boxes, etc., to the satisfaction of the Architect.
- C. Conductors shall be continuous from outlet to outlet and from terminal board to point of final connection, and no splice shall be made except within outlet or junction box.
- D. The joints of 10 AWG and smaller shall be made with properly insulated solderless type pressure connectors. Where stranded conductors or multiple solid conductors are connected to terminals, solderless lugs manufactured by Thomas and Betts Company shall be used. Ideal "Wing Nut" electrical expandable spring connectors shall be used on all other splices and connections, except that on joints and splices of lighting fixtures Ideal "Wirenuts" with threaded metal inserts may be used.
- E. The joints of No. 8 AWG and larger in power and lighting circuits shall be of the type indented into the conductor by means of a hand or hydraulic pressure tool. Connectors shall be Burndy "Hy-dent" or T & B "Sta-Kon". For small wiring such as control wiring, small connection, Burndy "Hy-Lug" shall be used.
- F. Conductors shall not be installed until building is under roof.
- G. Conductors shall be installed using wire-pulling compound. Use of oils or grease will not be acceptable.

3.2 CONDUIT INSTALLATION

- A. Conduit shall be sized not to exceed 40% fill, and minimum size of 3/4" diameter for interior locations and 3/4" for installation in concrete/fill or where directly buried in the earth.
- B. Conduit shall be installed level and ran in as direct lines as possible, with bends made with long sweeps.
- C. Where conduit rises into masonry walls, it shall be put in place before the walls are built and the Contractor shall be responsible for the accurate setting of all outlets so served.
- D. Conduits above 18" of grade-line shall be galvanized steel tubing. Conduits below 18" height above grade line shall be galvanized steel heavy wall conduit.
- E. Single runs of exposed feeder conduit shall be supported by Kindorf C-149 or C-150 adjustable hangers, using 3/8" rods for conduit up to 2" size and 1/2" rods for conduits larger than 2". Groups of exposed conduits run in parallel shall be supported on trapeze hangers constructed of Kindorf channels of suitable size to support the load of the conduits with C-105 conduit straps, and suspended from 1/2" hanger rods. All hangers, channels, rods, bolts, etc., shall have Kindorf "Galv-Krom" finish.
- F. Where conduit passes through building expansion joints, suitable expansion fittings with bonding jumpers shall be installed.
- G. Conduit or sleeve penetrations through masonry walls, concrete walls, slabs or roof shall be sealed. Waterproofing compound shall be used for exterior penetrations or wherever

wet conditions may exist. Where firewalls or rated floors are penetrated, a fire proofing compound seal shall be used.

- H. Empty conduits shall be installed with nylon pull wire and shall be capped.

3.3 CABLE INSTALLATION

- A. All cable shall be concealed unless otherwise specified or indicated on the drawings.
- B. Groups of cable shall be neatly bundled or installed in cable tray or other support method to assure a neat, workmanlike installation.
- C. Cable above acoustical tile ceilings shall be supported from the structure above so as to permit removal of tiles without interference or obstruction.
- D. Cable penetrations through load bearing block or firewalls shall be through a conduit sleeve. The sleeve shall be sealed after cable installation.

END OF SECTION

SECTION 26 09 23 - CIRCUIT CONTROL DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish and install lighting control equipment for circuits indicated on the plans and as specified.

PART 2 - PRODUCTS

2.1 LIGHTING CONTACTORS

- A. Lighting contactors for individual circuits shall be Square D, Class 8903 w/form R6 contactor for 2 wire control (pulse on/pulse off from maintained source) or equivalent by ASCO. Contactors to control panel bus shall be integral with panel and sized accordingly.
- B. Lighting contactors shall have silver alloy double break power contacts capable of making and breaking load without the assistance of auxiliary arcing contacts. Auxiliary arcing contacts are not acceptable. All contacts must be removable without disturbing line or load wiring.
- C. All contactors shall be industrial duty and rated 600 volts.
- D. Lighting contactors shall be mounted in a NEMA 1 general-purpose enclosure unless otherwise indicated on Drawings.
- E. Lighting contactor shall be electrically operated and mechanically held. Contactor coils shall be continuously rated and encapsulated as a further protection against burnout.
- F. Provide lighting contactors with number of poles, ampere rating, and voltage rating as indicated on Drawings.

2.2 PROGRAMMABLE TIME CLOCK

- A. Clock shall be Paragon #EC74/50S 120v series or approved equivalent.
- B. The clock shall have the following features:
 - Memory battery back-up
 - 4 independent on/off channel controls
 - Time of day/365 day calendar w/holiday programming
 - Automatic leap year correction
 - Astro dial for control of exterior light circuits
- C. The contractor shall coordinate and set initial channel control settings as directed by the owner.

2.3 PHOTOCELL

- A. Photocells shall be Paragon No. PJ201 or equivalent by Tork, Sangamo or Intermatic.
- B. Photocells shall have a rating of 2000 watts at 120 volts. Shall have "Fail-Safe" feature to leave load on in event of control failure. Outer housing shall be formed aluminum and unit shall have adjustable swivel-arm mounting stem and junction box for mounting on end of 1/2" conduit. Photocell shall be suitable for temperature range of -30°F to +158°F. Light shall be three (3) foot-candles to turn ON and ten (10) foot-candles to turn OFF. Unit shall have UL label.
- C. Photocells shall be installed to face north.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide lighting contactors, photocells, and time switches where indicated on Drawings.

END OF SECTION

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SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 GENERAL

- A. Furnish and install where indicated on drawings, panelboards complete with enclosing cabinets. Enclosure shall be for recessed or surface mounted as indicated. Panelboards and enclosing cabinets shall conform to standards established by Underwriter's Laboratories, Inc., and requirements of the NEC. Panelboards shall be as manufactured by Eaton (Cutler Hammer), or equivalent by Square D, General Electric, Westinghouse, or Siemens.

1.2 SUBMITTALS

- A. Provide complete schedules of each panelboard. The schedules shall include panel designation, main lugs or circuit breaker size, voltage, phase, wire, mounting, fault current rating, quantity and type of branch circuit breakers, quantity of spares and bussed spaces, etc.

PART 2 - PRODUCTS

2.1 PANELBOARD TYPES

- A. Panelboards for 120/208 volt service, 400 ampere and less shall be Eaton Pow-R-Line series. Circuit breakers shall be bolt-on, quick-make/quick-break, thermal magnetic, trip-indicating and have manufacturer's common trip on all multi-pole breakers.
- B. Panelboards for distribution shall be Eaton Pow-R-Line 3a or Pow-R-Line 4B type. Circuit breakers shall be equipped with individually insulated, braced and protected connectors.

2.2 CONSTRUCTION

- A. All panelboard interiors shall be factory assembled, complete with circuit breakers as scheduled on drawings. Interior shall be so designed and assembled that any individual breaker can be replaced without disturbing adjacent units or without removing main bus, and shall employ sequence bussing. Main busses and back pans of distribution and power panelboards, shall be of such design that branch circuits may be changed without additional machining, drilling, or tapping. All circuit breakers shall be "Quick-Make" and "Quick-Break" and shall be trip indicating.
- B. Phase, Neutral and Ground Bus shall be fully rated for amperage indicated on schedule.
- C. Multi-section panelboards shall be provided with double barrel lugs in the first panel and shall be cable connected to the second panel. All panel sections shall be fully rated to match the supply feeder rating. Multi-section panels shall be furnished with a common front cover.

2.3 INTEGRATED EQUIPMENT SHORT CIRCUIT RATING

- A. Each panelboard as a complete unit, shall have a short circuit current rating equal to, or greater than, the integrated equipment rating shown on the panelboard schedule or on the plans. This rating shall be established by testing with the overcurrent devices mounted in the panelboard. The short circuit tests on the overcurrent devices and on the panelboard structure shall be made simultaneously by connecting the fault to each overcurrent device and on the panelboard connected to its voltage source. Method of testing shall be per NETA ATS. The source shall be capable of supplying the specified panelboard short circuit current or greater. Testing of panelboard overcurrent devices for short circuit rating only while individually mounted is not acceptable. Also, testing of the bus structure by applying a fixed fault to the bus structure alone is not acceptable. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed.

2.4 CABINETS AND FRONTS

- A. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA Standards Publication No. PBI-1977 and UL Standards No. 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Fronts shall include doors and have flush, stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4" high x 3" long or equivalent for each circuit. The directory shall be typed to identify the load fed by each circuit.
- B. Recessed mounted panels shall have a minimum of three 1" conduits extended from the panel to an area of exposed construction, or to an area above a removable ceiling. Where recessed mounted panels are located above floors with removable or accessible ceilings or exposed construction, then three additional 1" conduits shall be extended from each panel to the area below the panel.

PART 3 - EXECUTION

3.1 MOUNTING

- A. All surface-mounted panelboards shall be located 6'-6" to top. Verify mounting of recessed panelboards with structural and finish conditions prior to installation.
- B. Conduits entering the top and bottoms of flush panels shall be located back from the front edge of the panels to allow approximately 2" between the finished wall and the edge of the conduits. Contractor shall check these conditions during construction.

3.2 DIRECTORY

- A. Each affected panel shall be equipped with a typewritten directory, indicating plainly each branch circuit served.

3.3 BRANCH CIRCUIT BREAKER INSTALLATION

- A. Two- or three-pole circuit breakers shall be common trip type (tie-handle type not acceptable).
- B. Use of tandem breakers are not permitted.
- C. Branch circuit breakers serving clocks, communication equipment, fire alarm, security, emergency lighting and other life safety systems shall be provided with handle lock-off covers.
- D. Upon completion of branch circuit wiring, the Contractor shall check and adjust circuit breaker arrangement to assure system load balance is within +10% or -10% across all three phases.
- E. Multiple 1-pole circuit breakers which serve circuits sharing a common neutral shall have a common trip.

END OF SECTION

SECTION 26 50 00 - LIGHTING FIXTURES

PART 1 - GENERAL

1.1 GENERAL

- A. The conditions and requirements of the general provisions and related sections of this specification shall govern the work herein specified under this section.
- B. Comply with NFPA 70 "National Electrical Code" and 2012 IECC for components and installation.

1.2 LISTING AND LABELING

- A. Provide fixtures and emergency lighting units that are listed and labeled for their indicated use on the Project.
 - 1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations and recessed in combustible construction specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard. Fixtures that are in direct contact with insulation shall be IC rated.
 - 2. The terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - 3. Lighting and Labeling Agency Qualification: A "National Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulations 1910.7.

1.3 SCOPE

- A. Furnish all labor, equipment and services necessary for the complete installation of all lighting fixtures. The work shall be as shown on the drawings and herein specified.
- B. Furnish and install a complete lighting fixture for every outlet indicated on the drawings, and within each room, so that every outlet shall be properly provided with a suitable fixture of type specified, of wattage indicated, etc. All fixtures shall be installed complete with sockets, castings, fittings, holders, shades, glassware, lamps, etc., all wired and completely assembled.
- C. Coordination of Fixtures With Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Specification Section 26 05 00.
- B. The Contractor shall submit complete shop drawings of each fixture specified. The shop drawings shall include, but not be limited to, all dimensional data, lamp type and quantities, photometrics, finishes, ballast data, fixture type, quantities and necessary mounting hardware. When so directed by the Architect, the Contractor shall also submit a complete sample of any or all of the fixtures specified.
- C. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation as indicated on schedule. Include data on features and accessories and the following information:
 - 1. Outline drawings of fixtures indicating dimensions and principal features.
 - 2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory test. Provide paper copy and electronic file in IES format when requested.
 - 3. Data on batteries and chargers of emergency lighting units.
 - 4. Data for fixtures which are "substitutes" shall be clearly identified as a substitute item. Provide listing of characteristics which differ from the specified unit, and an explanation of the difference.
 - 5. Provide a point-to-point lighting calculation for all Site lighting, including parking lots, walkways, and building mounted exterior lighting. Calculations shall be

based upon .85 Light Loss Factor, and calculation points shall not be less than ten foot on centers. Printouts shall be a minimum of 1" = 40'.

- D. Mounting and suspension detail for each fixture type other than standard lay-in grid, or fixture mounted directly to wall or ceiling, shall be submitted to the Engineer for approval. These shall include fixture type and proposed method of suspension.
- E. Maintenance data for products for inclusion in Operating and Maintenance Manual.
- F. Shop Drawings from manufactures detailing nonstandard fixtures and indicating dimensions, weights, methods of field assembly, components, features, and accessories.

1.5 QUALITY STANDARDS

- A. The fixtures specified on the Lighting Fixture Schedule, herein, or under related sections of this specification, and as modified or clarified on the drawings, represent the quality standard established for this project.
- B. The quality standard shall include but not limited to, the fixtures photometric performance, construction including gauge of metal, supports and hardware, functionality, finishes and methods of finishing, etc. as established by the standard practice of the specified manufacturer.

1.6 SUBSTITUTIONS

- A. Other manufacturers will be acceptable provided that the quality standard is matched or exceeded.
- B. Proposed substitutions which deviate from the established standard, partly or in whole, shall be explained in writing and itemized. Judgment of the importance or unimportance of particular aspects of the specified fixture will be based on the reasons given for the deviation(s), data supplied, and if requested, working samples. Fixtures which are deemed unacceptable will be rejected and the Contractor will be required to provide the specified or an acceptable alternate.
- C. Where substitutions are proposed for site or exterior lighting, provide photometric study of complete area utilizing proposed substitute and separate study utilizing specified fixture. Provide calculation grid points 5-foot on center.
- D. Where substitutions are proposed for interior areas using special lighting, such as indirect, direct/indirect, up-lighting, high intensity discharge lighting, and any area requested by the engineer, provide a photometric study of complete area utilizing proposed substitute and separate study utilizing specified fixture.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURE SCHEDULE

- A. Furnish and install all fixtures as described and specified on the drawings in the Lighting Fixture Schedule. Fixture types are indicated by a letter adjacent to each outlet.
- B. The catalog number on the fixture schedule establishes the manufacturers series indicating the style, configuration, etc. of the fixture required. The descriptive data in the schedule, and information that may be contained on the drawings plans or notes, shall establish the complete catalog numbers.

2.2 LED DRIVERS

- A. Driver should be UL Recognized under the component program and shall be modular for simple field replacement. Total Harmonic Distortion less than 20% percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD. Drivers that are not UL Recognized or not suited for field replacement will not be considered. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity. Provide a 5-year warranty on all LED drivers.
- B. LED dimming shall be equal in range and quality to a commercial grade incandescent

- dimmer. Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
- C. Driver must limit inrush current.
 - 1. Base specification: Meet or exceed NEMA 410 driver inrush standard of 430 Amps per 10 Amps load with a maximum of 370 Amps² – seconds.
 - 2. Preferred Specification: Meet or exceed 30mA²s at 277VAC for up to 50 watts of load and 75A at 240us at 277VAC for 100 watts of load.
 - D. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
 - E. Driver must support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
 - 1. Adjustment of forward LED voltage, supporting 3V through 55V.
 - 2. Adjustment of LED current from 150mA to 1.4A at the 100 percent control input point in increments of 1mA.
 - 3. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.
 - F. Driver must be able to operate for a (+/- 10%) supply voltage of 120V through 277VAC at 60Hz.
 - G. Driver shall include ability to provide no light output when the analog control signal drops below 0.3 V, or the DALI/DMX digital signal calls for light to be extinguished and shall consume 0.5 watts or less in this standby. Control deadband between 0.3V and 0.65V shall be included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.
 - H. Over the entire range of available drive currents, driver shall provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0% relative light output, or 100 – 1% light output and step to 0% where indicated. Driver shall respond similarly when raising from 0% to 100%
 - 1. Driver must be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
 - 2. Driver must be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels
 - I. Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100-0.1 percent luminaire shall have:
 - 1. LED dimming driver shall provide continuous step-free, flicker free dimming similar to incandescent source.
 - 2. Base specification: Based on IEEE PAR1789, minimum output frequency should be greater than 1250 Hz.
 - 3. Preferred specification: Flicker index shall be equal to incandescent, less than 1% at all frequencies below 1000 Hz.
 - J. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers
 - 1. Must meet IEC 60929 Annex E for General White Lighting LED drivers.
 - 2. Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
 - 3. Must meet ESTA E1.3 for RGBW LED drivers
 - K. To be installed per manufacturers prescribed methods.
 - 1. Driver may be remote mounted up to 300 ft. (100 m) depending on power level and wire gauge.

2. 0-10V input shall be protected from line voltage miswire, and shall be immune and output unresponsive to induced AC voltage on the control leads.

2.3 LAMPS

- A. Lamps shall be of the wattage, type and shape indicated on the drawings. The Contractor shall verify lamp type and quantity for each fixture type with the manufacturer and supply as required. Acceptable manufacturers are as follows: Phillips, Osram-Sylvania, General Electric, Venture.
- B. LEDs shall be long-life coupled with higher efficiency drivers to provide 90% LED lumen maintenance at 60,000 hours. LED lamps shall provide a minimum 82 CRI.
- C. Fluorescent lamps shall have a minimum of 20,000 hours life. Color characteristics of lamp output shall be as indicated on the fixture schedule by Kelvin Temperature. The lamp CRI shall exceed 80 unless otherwise indicated.
- D. Incandescent lamps shall be as indicated on the plans. 'A' lamps shall be inside frosted and 130 volt extended service rated. Par lamps shall be T-H extended service rated.
- E. Compact fluorescent lamps (CF) shall be furnished to match specified fixture. The Contractor shall check the lamp configuration (i.e. twin tube, triple tube, quad tube, etc.) with the manufacturer's data and supply as required. The lamp shall be supplied with 3,500 Kelvin Temperature rating unless otherwise indicated on the drawings.
- F. HID lamps shall be size and shape as required by the manufacturer. Metal halide lamps shall be phosphor-coated for wattages 175 watt or less and clear for wattages greater than 175 watt unless otherwise indicated on the drawings.
- G. Specialty lamps shall be as specified elsewhere.

2.4 DIFFUSERS

- A. Diffusers, lenses, covers and globes shall be 100% virgin acrylic plastic unless otherwise indicated. Prismatic diffusers may be either injection molded or hard-rolled extrusions. All prisms shall be sharp edged for proper control. No etched, engraved, or "Hogged-out" lenses permitted. Flat diffusers shall be extruded nominal 0.125" thickness.

PART 3 - EXECUTION

3.1 MOUNTING

- A. Lighting fixtures, including surface, suspended and/or recessed fixtures, shall be independently supported from the building structural system and shall not be supported from the ceiling structure. Provide two all-thread rods or #12 cables per fluorescent, attached on opposite corners of fixture. The Contractor shall verify all mounting heights of wall-mounted fixtures with the Architect prior to roughing-in.
- B. Recessed fixture frames and trims shall be mounted tight to ceiling system.
- C. Lighting layout in mechanical/electrical equipment areas is diagrammatic indicating type, quantity and circuiting of fixtures. Exact location and mounting height shall be adjusted to avoid interference with equipment and prevent shadows cast by pipes, ducts, etc. and to provide the overall best illumination of the space.

3.2 COORDINATION

- A. The Contractor shall completely familiarize himself with the architectural, structural and mechanical drawings prior to commencement of the work. Any discrepancies in the fixture compatibility with ceiling types, ceiling space, suspension requirements, clearances between ducts and pipes above ceiling, etc. shall be brought to the attention of the Architect prior to commencement of the work.
- B. The Contractor shall coordinate the installation of all fixtures with the installer of the ceiling and mechanical system to insure that all fixtures are properly aligned, ventilated and located.

- C. The Contractor shall be responsible for furnishing fixtures to fit the particular ceiling patterns established.

3.3 WIRING

- A. All fixtures shall be wired for polarized system with one wire in each fixture to be distinctly marked for its entire length. Wire shall bear the label of approval of the Underwriters Laboratories, Inc. Fixture wiring for fluorescent fixtures and branch circuit wiring in fluorescent fixture channels shall be type THHN. Type AF wire shall only be used for interior incandescent fixture wiring.

3.4 FIRE RATED ASSEMBLIES

- A. Where fixtures are flush mounted in fire rated ceiling assemblies and exceed the penetration area allowance, the Contractor shall furnish and install "tents" over the fixture to maintain the ceiling fire rating in accordance with UL standards. Down lights in fire rated ceilings shall be installed with 6" clearance minimum from tent walls on all sides and top.
- B. All fixtures installed in fire rated assemblies shall be listed and labeled for installation in this type of assembly.

3.5 ACCENT AND FLOOD LIGHTING

- A. Accent and flood lighting shall be field adjusted at the completion of the work. Necessary adjustments to exterior fixtures shall be made at night. Final adjustments shall be made in the presence and at the direction of the Architect.

3.6 DISCONNECTING MEANS

- A. Provide a disconnecting means for the ballast(s) of non-emergency fluorescent fixtures, in accordance with NEC 410.130(G).

3.7 CONTROLS

- A. All light fixtures, other than those to be operated 24/7, shall have manual and/or automatic controls as required by IECC 2012. All lights, except those in corridors, dining rooms and resident rooms, shall be controlled by occupancy detection devices, with manual on and timed off capability.
- B. Occupancy sensors shall be as manufactured by Wattstopper, either wall or ceiling-mounted, as indicated on drawings.

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DIVISION 27
COMMUNICATIONS SPECIFICATION INDEX

27 01 10 TELEPHONE, DATA, & CATV PRE-WIRING SYSTEM

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SECTION 27 01 10 - TELEPHONE, DATA, & CATV PRE-WIRING SYSTEM

PART 1- GENERAL

1.1 SCOPE

- A. This Contractor shall be responsible for complete pre-wiring of the building voice, CATV, and data systems as specified herein and as shown on the drawings.
- B. Modular jacks for voice, CATV, and data shall be furnished and connected with wiring to separate racks at the main or closest backboard.
- C. Coordinate extension of the incoming service with the local utility companies and the Owner.

1.2 QUALIFICATIONS

- A. The Installing Contractor shall be a single source supplier for all wiring and devices with a minimum of 5 years experience in voice/CATV/Data system installation.

1.3 SUBMITTALS

- A. The Contractor shall submit complete copies of devices, cables, etc., for review. Shop drawings shall include typical wiring diagrams and jack configuration with color-coding.

PART 2 - PRODUCTS

2.1 COMMUNICATION DISTRIBUTION

- A. Main communication backboard shall be 3/4' thick x 8' wide x 8' high minimum fire treated plywood backboard.
- B. The Contractor shall furnish and install an approved ground at all communication backboards insuring proper bonding to the main grounding electrode. The Contractor shall ensure ground continuity by properly bonding all appropriate cabling, conduit raceways, closures, cabinets, service boxes, and framework. All grounds shall consist of 6 AWG copper wire and shall be supplied from an approved building ground and bonded to the main electrical ground.

2.2 CABLES

- A. The type of horizontal cables used shall be unshielded twisted pair (UTP). The UTP cable shall be 24 AWG bare solid copper conductors insulated with PVC and twisted into pairs conforming to EIA/TIA 568, TSB-36, TSB-40 standards.
 - One 4-pair UTP category 5e cable shall be used for each resident unit and administration voice dedicated homerun to main backboard.
 - One 4-pair UTP category 5e cable shall be used for each resident unit and administration data dedicated homerun to main backboard.
- B. Cable shall be plenum rated.

2.3 OUTLETS

- A. Voice and data outlets shall be furnished and installed in the following configuration as indicated on the drawings:
 - 1. Voice Outlet:
 - Single gang backbox
 - Single jack face plate
 - 1 voice jack wired RJ45
 - Direct cable connected (Category 5e)
 - 2. Data Outlet:
 - Single gang backbox
 - Single jack face plate

- 1 data jack wired RJ45
- Direct cable connected (Category 5e)
- 3. Voice/Data Outlet:
 - Single gang backbox
 - Dual jack face plate
 - 1 voice jack wired RJ45
 - 1 data jack wired RJ45
 - Direct cable connected (per jack, two cables total; Category 5e)
- B. Wall phone outlets shall be provided with stainless steel faceplate with mounting clips for wall-hung phone.
- C. RJ45 shall be category 5e rated modular universal application type wired ISDN 8-position/8 conductor standard and shall be capable of receiving conventional 4 and 6 pin jack/plug. The jacks shall be multi-vendor supportive and shall be capable of reconfiguration for future applications.

2.3 TELEVISION SYSTEM

- A. Provide television jacks where indicated on the plans, and run a dedicated RG6 (minimum) cable to the local telecommunications backboard, and terminate.

PART 3 - EXECUTION

3.1 SYSTEM INSTALLATION

- A. Terminate all homeruns at a standard 18" rack (separate racks for voice and data) at the closest telecommunications backboard. Coordinate final connections with the Owner.
- B. Fire Alarm and Intrusion Alarm: Digital communicators shall be connected with dedicated 4 pair UTP.
- C. A low-tension junction box shall be provided at the elevator machine room with dedicated 4 pair UTP. Leave 10' slack cable at the J-box. Coordinate final connections with Division 14 work.

3.2 TESTING

- A. Copper Cable Plant Testing: Testing shall diagnose the presence of all open-loop conductors, grounded, shorted or crossed conductors, Db loss and split connections. All pairs shall be tested for continuity and shall be certified free of all appreciable AC or DC voltages. The Contractor shall perform all tests on all pairs installed (including spares), including but not limited to riser, ties and stations.

END OF SECTION

DIVISION 28
ELECTRONIC SAFETY & SECURITY SPECIFICATION INDEX

28 31 00 FIRE ALARM SYSTEM

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SECTION 28 31 00 –

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor shall furnish and install all labor, materials, equipment and services necessary for modifications to the existing Fire Alarm System, as specified herein and shown on plans. New devices shall include booster/exterior panels, Manual Alarm Stations, Smoke Detectors, Alarm Signals and other necessary devices to be wired, connected and left in a first class operating condition. All equipment shall be completely compatible with the existing system and shall be approved by the Underwriter's Laboratory. Operational functions and features, dimensions and finishes shall be furnished in strict compliance to specifications and the drawings.
- B. The system shall comply with the latest applicable sections of the following codes, regulations, and guidelines:
 - National Fire Protection Association (NFPA)
 - Underwriters Laboratory, Inc. (UL)
 - Factory Mutual Approval Guide (FM)
 - American Insurance Association Fire Protection Code
 - BOCA Basic/National Building Code
 - Applicable State & Local Jurisdiction Regulations, Amendments and Codes
 - American Disabilities Act (ADA)

1.2 SCOPE

- A. Provide modifications to the existing fire alarm system in accordance with NFPA and the local jurisdiction, to include the following:
 - 1. Extender/booster controls.
 - 2. Renovations to the existing annunciator.
 - 3. HVAC unit controls per NFPA 90A. Provide all necessary control wiring interface with Automatic Temperature Control system. (Coordinate with Division 23 work).
- B. Manual Pull Stations: Provide pull stations at all ground floor exit doors, all exit stairs on each floor and where additionally shown on the plans. Pull station spacing shall not exceed 100 feet from any point in a path of egress.
- C. Visual Alarms (Strobes): Provide visual alarm devices in all corridors, meeting/conference rooms, public restrooms, other areas used by the public, rooms subject to occupancy by more than one person, and where additionally shown on the drawings or required by code. Spacing of devices and candela ratings shall be minimally as required by NFPA 72 or as exceeded on the plans.
- D. Audible Alarms (Horns): Provide audible alarms in all corridors, public spaces and as additionally indicated on the plans in accordance with NFPA and the applicable BOCA building code. Spacing of devices in corridors shall not exceed 50 linear feet. Audible

alarms may be combined with visual alarms where spacing requirements permit and where indicated on the plans.

- E. Smoke Detectors: Provide smoke detectors directly above booster/extender fire alarm control panels, at smoke doors, and as required by code and as additionally indicated on the plans.
- F. Duct Smoke Detectors: Provide duct smoke detectors per NFPA and local jurisdictional requirements as follows:
 - 1. HVAC units rated 2,000 cfm or more (refer to mechanical plans for unit ratings).
 - 2. Multiple smaller HVAC units with a common supply/return totaling 2,000 cfm or more (refer to mechanical plans for common areas served).
 - 3. Additionally, where indicated on the plans and as indicated in this specification.
- G. Smoke Doors: Provide magnetic door holders and smoke detectors on either side of the door. Doors shall be released upon alarm activation.
- H. Delayed Egress Doors: Interconnect fire alarm with delayed egress for immediate release.

1.3 SUBMITTALS

- A. The Contractor shall submit shop drawings to the local fire protection authorities for complete review and approval.
- B. The Contractor shall submit local authority approved shop drawings to the Architect for review. The shop drawings shall include cuts of all new components, schematic wiring diagram of the complete system, zone schedule, annunciator details, battery calculations, sequence of operation, etc.

1.4 PERMITS AND CERTIFICATES

- A. The Contractor shall obtain and pay for all necessary permits and approvals from the local authority.
- B. The Contractor shall obtain and pay for all necessary certificates of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. New devices shall be completely compatible with the existing system.

2.2 AUTOMATIC ALARM INITIATING DEVICES

- A. Addressable/Analog Detectors: All addressable/analog smoke and heat detectors as specified below shall be pluggable into their bases. The detector unit shall contain electronics that communicate the detector chamber analog value to determine (normal, alarm, trouble) to the control panel over two wires. The same two wires shall also provide power. Upon removal of the head, the base shall transmit a trouble signal to the control panel. It shall be possible to change out detector heads without having to reprogram or address the unit. The detector's address shall be stored in the base.

Detectors that store address information in the head shall not be allowed. Addressable/analog detectors shall be UL listed.

- B. Photoelectric Smoke Detectors: Addressable/analog photoelectric smoke detectors shall sense the presence of smoke particles between a light source and a receiver within the detector. Sensitivity shall be set by the manufacturer and provisions shall be included to check the sensitivity at the control panel without generating smoke. The unit shall be equipped with a visible LED for alarm indication. The detector screen and cover shall be easily removable for field cleaning.
- C. Heat Detectors: Addressable heat detectors shall continually monitor and sense the change in ambient temperature. Temperature sensitivity shall be set by the manufacturer and provisions shall be included to check the sensitivity at the control panel without generating heat at the detector. The unit shall be equipped with a visible LED for alarm indication. The detector shall be easily removable for field cleaning.
- D. Duct Type Detectors: Addressable/analog duct type smoke detectors shall operate on the photoelectric principle. The detector shall be for mounting on ductwork, the detector shall include a sampling tube which shall be field cut to size to cover complete duct width. The unit shall be restorable. The detector shall be cable of stable operation under varying conditions, including vibration, mechanical shock and changes in supply voltage, ambient temperature and barometric pressure. Unit shall be complete with relay as required for fan shutdown, and auxiliary contacts for Building Automation System interface. The unit shall be equipped with a visible LED for alarm indication. The detector screen and cover shall be easily removable for field cleaning.

2.3 MANUAL ALARM INITIATING DEVICES

- A. Addressable Manual Stations: Stations shall have visible status LED to indicate polling and alarm status. Provide clear impact-resistant lift lid covers and local alarm for all stations. Non-coded, semi-recessed, and restorable. Manual station shall be UL listed.

2.4 ALARM INDICATING DEVICES

- A. Visual (V) Alarm Signals:
 - 1. Provide Visual units with surface backboxes for all locations as shown on the plans (office areas, etc.). Visual units shall provide candela rating per NFPA 72 and shall meet the requirements of the Americans with Disabilities Act (ADA).
 - 2. Visual Alarm Signals shall be UL listed for fire protection service and shall be field selectable multi-candela type. Settings of 15, 30, 75, and 110 candela shall be provided.
 - 3. Visual Alarms in common spaces shall have synchronized strobe pulse.
- B. Audible (A) Alarms:
- C.
 - 1. Provide Audible alarm units flush in wall for all locations where required to meet audible requirements of NFPA and local building codes. Combination audible/visual units shall be used wherever possible.
 - 2. Audible alarms shall be horn type 95 db at 10 ft. Mini horns shall be used only where indicated on the plans and shall be rated 85 db at 10 ft. minimum.

2.5 DOOR HOLDERS

- A. Provide dual voltage 24/120 volt DC/AC electromagnetic door holders. Units shall be durable die-cast metal with double chrome finish. Provide minimum hold force of 30 lbs. Units shall be surface mounted.

2.6 POINT IDENTIFICATION DEVICE (PID)

- A. A Point Identification Device (PID) shall be provided for monitoring conventional initiating device type such as water flow, manual station, beam detector, or kitchen hood system. Modules shall include cover for surface mounting. The PID shall provide feedback to the FACP for positive confirmation of the controlled devices activity.

2.7 CONTROL ELEMENTS

- A. A Remote Control Element (RCE) shall be provided for any devices that require control, activation or feedback during Fire Alarm condition, such as door holders, stairwell pressurization fans, smoke exhaust, and damper control.

2.8 SPRINKLER SWITCHES

- A. Switches are to be furnished and installed under Division 21 and connected to the fire alarm system under Division 26. The fire alarm supplier shall verify locations, quantities and connection requirements with the sprinkler supplier.
- B. Connect sprinkler system water flow alarm switches such that should the sprinkler system become activated, the fire alarm signals and annunciator shall operate. Coordinate installation with sprinkler work.
- C. Tamper switches shall be connected at each sprinkler valve including building main. Activation of tamper switches shall initiate a supervisory alarm only.
- D. Provide zone addressable module for each device.

2.9 HVAC CONTROLS

- A. Furnish and install H-O-A switches to control all HVAC equipment in accordance with NFPA 90A.
- B. Switches shall be arranged and located adjacent to the existing annunciator as directed by the local authorities. Switches shall be installed as acceptable by the local authorities.

PART 3 - EXECUTION

3.1 WIRING

- A. System wiring shall be as recommended by the system manufacturer and shall comply with all applicable codes.
- B. The control panel or the annunciator shall not be used as a pull or junction box. A junction box with a Jones terminal strip shall be installed above the control panel to loop the various initiating device and bell circuits. Only those wires necessary to terminate on

panel terminals shall be brought into the control panel or annunciator. All wires shall also be tagged at all junction points and all connections shall be made under the direct supervision of a current accredited representative of the manufacturer.

- C. All wiring shall have at least 12" of wire left at each outlet. All junction and pull boxes shall have "Fire Alarm" stenciled in 1/2-inch black letters on the covers.
- D. Point wire annunciation is not acceptable.

3.2 SMOKE DETECTOR INSTALLATION

- A. Smoke detectors shall not be installed until the completion and final clean-up of all work. Detectors installed prior to final clean-up shall be cleaned and thoroughly tested. Detectors which fail to operate properly or false alarm shall be replaced at the Contractors expense.

3.3 DUCT SMOKE DETECTOR INSTALLATION

- A. Duct smoke detectors shall be installed per NFPA installation requirements and as recommended by the detector manufacturer for proper operation.
- B. Multiple detectors shall be provided in main trunk duct branches where necessary for proper operation (refer to mechanical ductwork plans for duct configurations).
- C. Coordinate installation and unit control interface with Division 15 work.

3.4 TESTING AND SERVICE

- A. The manufacturer shall furnish qualified and certified factory trained engineering personnel for the system installation supervision, testing and maintenance.
- B. Upon completion of installation, the Owner shall be given complete operation and testing instructions and the Contractors as-built drawings shall be delivered to the Engineer.
- C. The Contractor shall also furnish to the Architect a letter from the manufacturer of the equipment stating that all equipment, wiring, etc., has been inspected by a factory accredited representative and that everything is operating properly.
- D. "As-Built Drawings": A separate and distinct set of drawings shall be made to show all actual locations of all fire alarm equipment, wiring and junction boxes. These drawings shall be given to the Consulting Electrical Engineer at the completion of the job for review prior to delivery to the Owner after inclusion by the Contractor of any additions or correction found necessary.
- E. The entire system shall be tested in the presence of the Owner and his technical representatives. The tests shall involve activating each and every device. The Contractor shall provide personnel, and equipment for the tests. This shall include apparatus for manufactured smoke and coordination with the sprinkler contractor to test

flow and tamper alarms.

END OF SECTION