SECTION 04 2000

UNIT MASONRY

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. Concrete masonry units.
2. Concrete building brick.
3. Decorative concrete masonry units.
4. Pre-faced concrete masonry units.
5. Concrete face brick.
6. Clay face brick.
7. Building (common) brick.
8. Hollow brick.
9. Glazed brick.
10. Structural clay facing tile.
11. Firebox brick.
12. Clay flue lining units.
13. Stone trim units.
14. Mortar and grout.
15. Steel reinforcing bars.
16. Masonry-joint reinforcement.
17. Ties and anchors.
18. Embedded flashing.
19. Miscellaneous masonry accessories.
20. Masonry-cell fill.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in unit masonry.
2. Steel lintels in unit masonry.
3. Steel shelf angles for supporting unit masonry.
4. Cavity wall insulation.

1.3 ALLOWANCES

A. Face brick is part of the Face Brick Allowance.

1.4 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

E. Mortar Cement: ASTM C1329/C1329M.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C404.

I. Epoxy Pointing Mortar: ASTM C395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

J. Refractory Mortar Mix: Ground fireclay or nonwater-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C199 test; or an equivalent product acceptable to authorities having jurisdiction.

K. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.

B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime masonry cement or mortar cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime masonry cement or mortar cement mortar.
4. For reinforced masonry, use portland cement-lime masonry cement or mortar cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.

2. Proportion grout in accordance with ASTM C476, Table 1.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns,

and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in grouted masonry, including starting course on footings.
3. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at[**corners,**] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

J. Prism Test: For each type of construction provided, according to ASTM C1314 at28 days.

3.9 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.10 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 2000

SECTION 05 1200

STRUCTURAL STEEL 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. Structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Slide bearings.
8. Prefabricated building columns.
9. Shop primer.
10. Galvanized-steel primer.
11. Etching cleaner.
12. Galvanized repair paint.
13. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand-critical welds.
8. Identify members not to be shop primed.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

C. Mill test reports for structural-steel materials, including chemical and physical properties.

D. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.

E. Survey of existing conditions.

F. Source quality-control reports.

G. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE Category CSE.

C. Shop-Painting Applicators: Qualified in accordance with AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3.

D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M.

B. Channels, Angles: ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M.

D. Corrosion-Resisting (Weathering) Structural-Steel Shapes, Plates, and Bars: ASTM A588/A588M, 50 ksi.

E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959/F959M, Type 490-1, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

2.3 PRIMER

A. Steel Primer:

1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
2. SSPC-Paint 23, latex primer.
3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.4 SHRINKAGE-RESISTANT GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.

F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to

provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Corrosion-resisting (weathering) steel surfaces.
7. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7 (WAB)/NACE WAB-4.
4. SSPC-SP 14 (WAB)/NACE WAB-8.
5. SSPC-SP 11.
6. SSPC-SP 6 (WAB)/NACE WAB-3.
7. SSPC-SP 10 (WAB)/NACE WAB-2.
8. SSPC-SP 5 (WAB)/NACE WAB-1.
9. SSPC-SP 8.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E165/E165M.
    b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    c. Ultrasonic Inspection: ASTM E164.
    d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

    a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
    b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Maintain erection tolerances of structural steel within ANSI/AISC 303.

C. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

D. Splice members only where indicated.

E. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

C. Install prefabricated building columns to comply with ANSI/AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1) Liquid Penetrant Inspection: ASTM E165/E165M.
2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3) Ultrasonic Inspection: ASTM E164.
4) Radiographic Inspection: ASTM E94/E94M.

3.6 PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05 1200

SECTION 05 3100

STEEL DECKING

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. Roof deck.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Evaluation Reports: For steel deck, from ICC-ES.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E119; 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 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 50, zinc coating.
2. Span Condition: Triple span or more.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

C. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

D. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

E. Galvanizing Repair Paint: ASTM A780/A780M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: As indicated.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of four welds per deck unit at each support.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 24 inches, and as follows:

1. Mechanically clinch or button punch.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on top surface of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 05 3100

SECTION 05 4000

COLD-FORMED 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. Load-bearing wall framing.
2. Roof joist framing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST33H.
2. Coating: G60, A60, AZ50, or GF30.

2.2 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: Per drawings..

2.3 ROOF JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

C. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M.

B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.7 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for 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. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of

fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated on Drawings.
2. Stud Spacing: As indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically as indicated on Drawings. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated on Drawings.
2. Joist Spacing: As indicated on Drawings.

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 FIELD QUALITY CONTROL

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

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

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

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 4000

SECTION 05 5100
METAL STAIRS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Prefabricated, OSHA Compliant Stairs with grating treads.

B. Handrails and guards.

C. Prefabricated stair treads and nosings.

1.2 REFERENCE STANDARDS

A. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2021).

B. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.3 SUBMITTALS

A. See Section 01 3000 Submittals, for submittal procedures.

B. Product Data: Provide stair details, materials, and standard components..

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage (fixed and slip connections), size and type of fasteners, and accessories.

D. Provide engineered stamped drawings.

1.4 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

PART 2 - PRODUCTS

2.1 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations. Stairs to comply with OSHA Standard 1917.120 - Fixed Stairways.
   2. Dimensions: As indicated on drawings. Verify all dimensions on site.

3. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
4. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
5. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

E. Provide slip joint connection at lower level floor.

2.2 HANDRAILS AND GUARDS

A. Guards:
1. Top Rails: Round pipe or tube rails unless otherwise indicated.
   a. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
2. End and Intermediate Posts: Same material and size as top rails.
   a. Horizontal Spacing: As indicated on drawings.
   b. Mounting: Welded to top surface of stringer.

2.3 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
2. Number of Coats: One.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, and slip connections required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Obtain approval prior to site cutting or creating adjustments not scheduled.

E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

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SECTION 05 5133
METAL LADDERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Prefabricated ladders.

1.2 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders current edition.

B. 29 CFR 1926.1053 - Ladders Current Edition.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.

D. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2021.

E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2021, with Errata (2022).

F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2020.

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

H. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2019.

1.3 SUBMITTALS

A. See Section 01 3000 Submittals, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 - PRODUCTS

2.1 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.

1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
2. Materials: Aluminum; ASTM B211/B211M 6063 alloy, T52 temper.
3. Finish: Manufacturer's standard clear anodized coating, comply with AAMA 611, Class 1.

B. Manufacturers:
1. O'Keeffe's Inc: Model 503A: www.okeeffes.com/#sle.
2. Precision Ladders, LLC; Fixed Alumnium Wall Ladder: www.precisionladders.com/#sle.
3. Substitutions: See 01 3000 Submittals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 06 1000

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. Framing with timber.
3. Framing with engineered wood products.
4. Rooftop equipment bases and support curbs.
5. Wood blocking and nailers.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. OSB: Oriented strand board.

E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
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.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Post-installed anchors.
6. Metal framing anchors.

1.6 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.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

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

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

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat all rough carpentry unless otherwise indicated.

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Ceiling Joists: As noted on drawings.

B. Joists, Rafters, and Other Framing Not Listed Above: As noted on drawings.

2.4 MISCELLANEOUS LUMBER

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

1. Blocking.
2. Nailers.
3. Equipment bases and support curbs.

B. 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.

C. 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.

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

2.5 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.6 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

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

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

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

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

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

H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

I. Sort and select lumber so that natural characteristics do 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.

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

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

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

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

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. 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.
3. ICC-ES evaluation report for fastener.

M. 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.

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

1. Comply with indicated fastener patterns where applicable.
2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

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

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

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of

ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF FLOOR JOIST FRAMING

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by toe nailing or by using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.

D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

F. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

G. Provide solid blocking between joists under jamb studs for openings.

H. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

I. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.

1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal-size lumber, double-crossed and nailed at both ends to joists.
2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.4 INSTALLATION OF CEILING JOIST AND RAFTER FRAMING

A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal-size or 2-by-4-inch nominal-size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal-size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.5 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.

END OF SECTION 06 1000

SECTION 07 2100
THERMAL INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Board insulation at cavity wall construction, over roof deck, over roof sheathing, and exterior wall behind specified wall finish.

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

C. Fiberglass girts at exterior wall.

1.2 REFERENCE STANDARDS

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

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2019.

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

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C 2019a.

1.3 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

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

1.4 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 APPLICATIONS

A. Insulation Over Roof Deck: Expanded Polystyrene (EPS) board.

B. Insulation on Exterior Walls: Mineral Fiber Board Insulation with Fiberglass Girts.

C. Insulation at parapet walls, behind seismic joint bellow assemblies and at infill locations: Mineral Fiber Blanket Insulation.

2.2 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
   4. Board Edges: Square.
   5. Min. thickness: 6 inches.
   6. Type and Thermal Resistance, R-value (RSI-value): Type I, 3.6 (0.63), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.

2.3 MINERAL FIBER BOARD INSULATION MATERIALS

A. Mineral Wool Block, Board, or Blanket Thermal Insulation: Complying with ASTM C612 or ASTM C553.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   2. Board Thickness: 4 inches (102 mm).
   3. Dimensions: 16" x 48"
   4. Type and Thermal Resistance, R-value (RSI-value): , 4.3 (0.23), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
   5. Products:
      a. ROCKWOOL; CAVITYROCK: www.rockwool.com/#sle.
      b. Thermafiber, Inc; RainBarrier [___]: www.thermafiber.com/#sle.
      c. Substitutions: See 01 3000 - Submittals.

2.4 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.

B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

2.5 ACCESSORIES

A. Fiberglass Girts: GreenGirt, SMARTci, by Advanced Architectural Products: www.smartcisystems.com
   1. Fiberglass Z installed at 16 inches on center.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards as indicated on drawings on walls.

B. Install mineral fiber boards on walls with fiberglass Z girts.
   1. Install girts and semirigid mineral fiber boards per manufacturer's instructions.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and protrusions.

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

3.3 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

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

3.4 BATT INSTALLATION

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

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

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

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

END OF SECTION

SECTION 07 2119

FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. In exterior wall crevices.
   2. At junctions of dissimilar wall and roof materials.
   3. Pourable insulation at interface between roof and penetrations.

1.2 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.

1.3 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

B. Product Data: Provide product description, insulation properties, and preparation requirements.

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

1.4 QUALITY ASSURANCE

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

1.5 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Foamed-In-Place Insulation:
   1. Tigerfoam ASTM E84 Class 1 High Rise.

B. Pourable Foarm Insulation
   1. WR Meadows Pourthane Non Sag Joint Sealant

2.2 MATERIALS

A. Foamed-In-Place Insulation: Low-density, flexible, open or closed cell, water vapor permeable polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Thermal Resistance: R-value (RSI-value) of 3.0 (0.53), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature when tested in accordance with ASTM C518.
   2. Air Permeance: 0.04 cfm per square foot (0.2 L/(s/sq m)), maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf (75 Pa).
   3. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

PART 3 - EXECUTION

3.1 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 2600

VAPOR RETARDERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exterior Vapor retarder (VR).
   1. On the exterior face of sheathing.
   2. At connections between wall and roof to form a continuous vapor retarder on the warm side of insulation.

B. Roof Vapor retarder (VR)/underlament.
   1. On top of roof sheathing.

C. Interior Wall Vapor Retarder (VR)
   1. At infill locations where existing walls have continuous vapor retarder between framing and interior gypsum board.

1.2 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

B. Section 07 5300 - Elastomeric Membrane Roofing: Vapor retarder installed as part of roofing system.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with vapor retarders.

1.3 DEFINITIONS

A. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to degree specified, with seams and joints sealed to adjacent surfaces.

B. Vapor Retarder Class: A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class is defined using Procedure A, Desiccant Method at 73 degrees F (23 degrees C) and 50 percent Relative Humidity (RH), in accordance with ASTM E96/E96M and ICC (IBC)-2018, as follows:
   1. Class I: 0.1 perm or less.
   2. Class II: Greater than 0.1 perm to 1.0 perm.
   3. Class III: Greater than 1.0 perm to 10 perms.

1.4 REFERENCE STANDARDS

A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2021.

B. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications 2016.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022.

E. ICC (IBC)-2018 - International Building Code 2018.

F. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials 2017.

G. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing 2015.

1.5 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

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

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.6 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 - PRODUCTS

2.1 VAPOR RETARDERS

A. Vapor Retarder Sheet (at exterior walls): ASTM D1970/D1970M.
   1. Basis of Design: Henry Blueskin SA LT Self-Adhered Water Resitive Air Barrier
   2. Type: Rubberized asphalt bonded to thermoplastic sheet, self-adhesive.
   3. Thickness: 40 mil, 0.040 inch (1.016 mm), nominal.
   4. Service Temperature: -40°F to 158 °F (-40 °C to 70 °C)
   5. Water Vapor Permeance: [.08] perm ([___] ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M.
   6. Air Permeance (ASTM E2178): <0.0002 cfmft2 (0.0011 L/s.m.2)
   7. Air leakage:
      a. Assembly (ASTM E2357): Pass
      b. Air Leakage Rate (CAN/ULC-S742) Classification A1
   8. Nail Sealability (AAMA 711, ASTM D1970 modified): Pass

B. Vapor Retarder/underlayment (on top of roof sheathing)

C. Self-adhered rubberized waterproof vapor retarder membrane underlayment designed to protect from damages caused by water infiltration. ASTM D1970 and ASTM E108/UL 790 Class A fire rated.
   1. Basis of Design: Henry Blueskin PE200 HT
      a. Thickness: 40 mils
      b. Air Leakage at 75 Pa <.004 per ASTM E2357
      c. Nail Sealability per ASTM D1970
      d. Moisture Vapor Permeance: 0.05 per ASTM E96
      e. Service Temperature: -40 - 260 degrees F
      f. Locations: At roof and as indicated.

D. Vapor Retarder Sheet : Polyethylene sheeting complying with ASTM D4397, clear colored.
   1. Thickness: 10 mil, 0.010 inch (0.254 mm), nominal.
   2. Water Vapor Permeance: .0016 perm (.092 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M.
   3. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2 inches (50 mm) wide; compatible with sheet material.
   4. Locations: inside face of exterior walls between framing and gypsum board.

2.2 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.

B. Sealant for Cracks and Joints in Substrates: Resilient elastomeric joint sealant compatible with substrates and vapor retarder materials.
   1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch (0.76 to 1.02 mm), nominal thickness.
   2. Color: Green.

C. Flexible Flashing: SSelf-adhered water resistive air barrier membrane comprised of rubberized asphalt and integrally laminated to a blue engineered thermoplastic film surface; having the following typical physical properties:
   1. Basis of design: Henry Blueskn SA Self-Adhered Water Resistive Air Barrier

D. Thru-Wall Flashing:
   1. Vapor impermeable, self-adhered water resistive air and vapor barrier consisting of an SBS rubberized asphalt compound, integrally laminated to a thermoplastic film, having the following typical properties:
   2. Basis of design: Henry Blueskin TWF Self-Adhered Thru Wall Flashing

E. UV resistant self-adhered water resistive air barrier membrane comprised of rubberized asphalt and dual-layers of high strength polyolefin with a surface layer metallic aluminum film; having the following typical physical properties:
   1. Basis of design: Henry Blueskin Metal Clad Self-Adhered Water Resistive Air Barrier

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.3 INSTALLATION

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

B. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Self-Adhered Sheets:
   1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle fashion to shed water and seal laps airtight.
   3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
   4. Use same material, or other material approved by sheet manufacturer, to seal sheets to adjacent substrates, and as flashing.
   5. At expansion joints, provide transition to joint assemblies approved by sheet manufacturer.

E. Openings and Penetrations in Exterior Vapor Retarders:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches (127 mm) onto vapor retarder and at least 6 inches (152 mm) up jambs; mechanically fasten stretched edges.
   2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
   3. At openings with nonflanged frames, seal vapor retarder to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
   4. At head of openings, install flashing under vapor retarder extending at least 2 inches (50 mm) beyond face of jambs; seal vapor retarder to flashing.
   5. At interior face of openings, seal gaps between window/door frame and rough framing using appropriate joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of vapor retarder.

3.4 FIELD QUALITY CONTROL

A. Do not cover installed vapor retarders until required inspections have been completed.

B. Take digital photographs of each portion of installation prior to covering up vapor retarders.

3.5 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

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SECTION 07 4213

METAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels and subgirt framing assembly, with related flashings and accessory components.

1.2 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 07 2100 - Thermal Insulation.

C. Section 07 2600 - Vapor Retarders: Vapor retarder barrier under wall panels.

D. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.3 REFERENCE STANDARDS

A. ASTM E331: Water Penetration

B. ASTM E1592: Wind Uplift

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

F. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components 2019.

1.4 SUBMITTALS

A. See Section for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips , and methods of anchorage.

D. Samples: Submit two samples of wall panel, 12 inches by 12 inches (305 mm by 305 mm) in size illustrating finish color, sheen, and texture.

E. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Test Reports: Indicate compliance of products with project requirements.

I. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum 10 years of documented experience.

B. Installer Qualifications: Company specializing in installing products specified in this section with minimum five years of documented experience.

1.6 WARRANTY

A. See Section 01 7400 - Closeout for additional warranty requirements.

B. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 5-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Metal Wall Panels - Concealed Fasteners:

B. Basis of Design:
1. AEP Span Perception
2. Substitutions: See Section 01 3000 Submittals.

2.2 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels and subgirt framing assembly.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   7. Corners: Factory-fabricated in one continuous piece with minimum 2-inch (51 mm) returns.

B. Exterior Wall Panels:
   1. Profile: Horizontal; style as indicated.
   2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
   3. Material: 22 gauge: Yield strengt 50,000 psi; with aluminum -zinc alloy coating conforming to ASTM A792, Class AZ50.
   4. Color: As selected by Architect from manufacturer's full line.

C. Subgirt Framing Assembly:
   1. Reference 07 2100 - Thermal Insulation

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

E. Expansion Joints: Same material, thickness and finish as exterior sheets; [___] gauge, [___] inch ([___] mm) thick; manufacturer's standard brake formed type, of profile to suit system.

F. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles. In addition to drawn profiles, manufacturer to provide standard trim profiles for all edges, corners, openings, caps, drip edges, and transitions.

G. Profile closures: Polyethylene foam, die-cut or formed to panel configuration.

H. Fasteners and Anchors: Stainless steel or as recommeded by manufacturer.

2.3 FINISHES

A. Provide primer and finish on exposed faces. Provide primer on concealed faces of panels.

B. DuraTech 5000; Polyvinylidine Fluoride (PVDF), ful 70 percent Kynar500/Hylar 5000 consisting of a baked-on .20 mil corrosion resistant primer and a baked on 80 mil finish coat with a specular gloss of 8-15 when tested in accordance with ASTM D523 at 60 degrees.

2.4 ACCESSORIES

A. Cladding Support Clips: clips with pre-drilled holes attachment holes at one end and panel hook at other end for support of cladding panels, sized to fit panels.
   1. Material: 18 gauge 40ksi yield min., G90 galvanized, material conformance with ASTM A-653 Class G90.
   2. Panel clips to be of proper design to resist uplift forces and reduce permanent deflection of panel assembly under design loads. Pane system manufacturer to provide proof that this has been addressed through use of clip strengthening ribs, short clip reach, or similar.
   3. Clip Depth: 1/2 inches (12.7 mm).

B. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

C. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 9200

2.5 FABRICATION

A. Unless otherwise shown on Drawings, fabricate panels in continuous lengths and fabricate flashings and accessories in longest possible lengths.

B. Panels shall be factory correctively leveled.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that water-resistive barrier, see Section 07 2500, has been properly installed over substrate; see Section 05 4000.

3.2 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane, and spaced at intervals indicated.

B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

C. Framing/Substrate Tolerances:
   1. 1/4 inch in 20 feet vertically or horizontally.
   2. 1/8 inch in 5 feet.

3.3 INSTALLATION

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

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Use concealed fasteners unless otherwise indicated by Architect.

3.4 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove site cuttings from finish surfaces.

C. Remove protective material from wall panel surfaces.

D. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.5 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

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SECTION 07 5300

ELASTOMERIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Elastomeric roofing membrane application.

B. Insulation, flat and tapered.

C. Vapor retarder.

D. Deck sheathing.

E. Cover boards.

F. Flashings.

G. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.2 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation

B. Section 07 2119 - Foamed-In-Place Insulation

C. Section 07 2600 - Vapor Retarders

D. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashings, reglets.

E. Section 07 7200 - Roof Accessories: Roof-mounted units; prefabricated curbs.

1.3 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2019.

C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.

D. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane 2015 (Reapproved 2021).

E. FM (AG) - FM Approval Guide current edition.

F. FM DS 1-28 - Wind Design 2016.

G. NRCA (RM) - The NRCA Roofing Manual 2022.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed under other sections.

B. Preinstallation Meeting: Convene a preinstallation meeting two weeks before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.5 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, fasteners, and roof scuppers..

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and walkway pad layout.

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

E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

F. Installer's qualification statement.

G. Warranty:
1. Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
2. Submit installer's certification that installation complies with all warranty conditions for the waterproof membrane.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 20 years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience, and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.8 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 45 degrees F (7.2 degrees C).

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

F. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.

1.9 WARRANTY

A. See Section 01 7400 - Closeout for additional warranty requirements.

B. Provide membrane manufacturer's twenty year warranty agreeing to replace materals that shows manufacturing defects.

C. System Warranty: Provide manufacturer's twenty year system warranty for material and labor agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.

Exception NOT permitted:

1. Damage due to roof traffic.
2. Damage due to wind speed greater than 56 mph but less than 100 mph.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. EPDM Membrane Materials:
1. Carlisle SynTec Systems; Sure-Tough EPDM: www.carlisle-syntec.com/#sle.
2. Firestone Building Products; Rubbergard Max EPDM : www.firestonebpco.com/#sle.
3. Johns Manville; JM EPDM R: www.jm.com/#sle.
4. Substitutions: See 01 3000 - Submittals.

2.2 ROOFING - UNBALLASTED APPLICATIONS

A. Elastomeric Membrane Roofing: One ply membrane, fully adhered, over recovery board and tapered insulation..

B. Roofing Assembly Requirements:
   1. Wind Uplift:
      a. Designed to withstand wind uplift forces calculated with ASCE 7.
      b. Design Wind Speed: In accordance with local building code and authorities having jurisdiction (AHJ).
      c. Drainage: No standing water within 24 hours

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane: Ethylene-propylene-diene-monomer (EPDM); internally reinforced with fabric or scrim; complying with minimum properties of ASTM D4637/D4637M.
   1. Thickness: 60 mil, 0.060 inch (1.5 mm).
   2. Sheet Width: 120 inches (3,048 mm), maximum; factory fabricate into widest possible sheets.
      a. Adhered Application: Limit width to 120 inches (3,048 mm), maximum, when ambient temperatures are less than 40 degrees F (4.4 degress C) for extended period of time during installation.
   3. Color: Black.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Membrane Fasteners: As recommended by and approved by membrane manufacturer.

D. Vapor Retarder: in Section 07 2600; confirm material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
   1. Fire-retardant adhesive.

E. Flexible Flashing Material: Same material as membrane.

F. Base flashing material: Provide waterproof, fully-adhered base flashing system at all penetrations, plane transitions, and terminations.

2.4 DECK SHEATHING

A. Deck Sheathing: Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 5/8 inch (15.9 mm) thick.
   1. Products:
      a. Georgia-Pacific; DensDeck: www.densdeck.com/#sle.

2.5 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 1/2 inch (12.7 mm), Type X, fire-resistant.

2. Products:
   a. Georgia-Pacific; DensDeck: www.densdeck.com/#sle.

2.6 INSULATION

A. Expanded Polystyrene (EPS) Board Insulation: Complying with ASTM C578,.
   1. Tapered Board: Slope as indicated; minimum thickness 1/2 inch (12.7 mm); fabricate of fewest layers possible.
   2. Reference 07 2100 Thermal Insulation specification for additional information.

2.7 ACCESSORIES

A. Prefabricated Flashing Accessories:
   1. Corners and Seams: Same material as membrane, in manufacturer's standard thickness but no less than specified roof membrane thickness.
   2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clampling rings, and flanges.
   3. Sealant Pockets: Same material as membrane, with manufacturer's standard accessories, in manufacturer's standard configurations.
   4. Sure-Seal Pressure-Sensitive Reinforced Universal Securement Strips (RUSS).

B. Insulation Fasteners: Appropriate for purpose intended.

C. Membrane Adhesive: As recommended by membrane manufacturer.

D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

E. Cleaners: Manufacturer's standard, clear, solvent-based cleaner.

F. Primer: Manufacturer's recommended product.

G. Sealants: As recommended by membrane manufacturer.

H. Edgings and Terminations: Manufacturer's standard edge and termination accessories.

I. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Roofing membrane manufacturer's standard.
   2. Surface Color: match roof color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.2 PREPARATION - WOOD DECK (WHERE APPLICABLE)

A. Verify flatness and tightness of joints in wood decking; fill knot holes with latex filler. Verify wood decking edges (where applicable in scope) are fully supported.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

3.3 PREPARATION - METAL DECK

A. Install deck sheathing on metal deck.
   1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
   2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
   3. Tape joints.

3.4 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER RECOVERY BOARD AND MEMBRANE

A. Install vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
   1. Extend vapor retarder under cant strips and blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation:
   1. Mechanically fasten cover board and insulation to deck in accordance with roofing manufacturer's instructions.

D. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

E. Lay subsequent layers of insulation with joints staggered minimum 12 inches (304.8 mm) from joints of preceding layer.

F. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

G. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

H. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

I. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches (457 mm).

J. Recovery board: install over insulation as shown in Drawings.

K. Do not apply more insulation than can be covered with recovery board and membrane in same day.

3.5 INSTALLATION - MEMBRANE

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive at manufacturere's recommended rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches (76 mm) of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 6 inches (152.4 mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 12 inches (304.8 mm) onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Install roofing expansion joints where indicated. Make joints watertight.

G. Coordinate installation of roof drains and sumps and related flashings. Locate all field splices away from low areas and roof drains. Lap upslope sheet over downslope sheet.

3.6 INSTALLATION - MEMBRANE FINISH COATING/COVER

A. Install walkway pads. Space pad joints to permit drainage. Space pad joints to permit drainage.

B. Daily Seal: Install daily seal per manufacturer's instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.7 CLEANING

A. See Section 01 4000 Closeout for additional requirements.

B. Remove wrappings, empty containers, paper, and other debris from the roof daily. Dispose of debris in compliance with local, State and Federal regulations.

C. Remove bituminous markings from finished surfaces.

D. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

E. Repair or replace defaced or damaged finishes caused by work of this section.

3.8 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, sheet metal roofing, exterior penetrations, and other items indicated in Schedule.

B. All metal flashing to be aluminum, pre-painted unless noted otherwise.

C. Sealants for joints within sheet metal fabrications.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2021, with Errata (2022).

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

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

E. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.4 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

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

C. Samples: Submit two samples, 2 by 2 inches (50.8 by 50.8 mm) in size, illustrating metal finish color.

D. Submit samples of all exposed fasteners to be used with color matched heads as required.

1.5 QUALITY ASSURANCE

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

B. Maintain one copy of each document on site.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

A. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 20 gauge, 0.032 inch (0.81 mm) thick; plain finish shop pre-coated with fluoropolymer coating.
   1. Fluoropolymer Coating: High performance organic powder coating, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: To match existing flashing..

2.2 FABRICATION

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

B. Form pieces in longest possible lengths.

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

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

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

F. Scuppers: SMACNA (ASMM) through wall scupper.
   1. Provide heat trace. Reference electrical Drawings and Specifications.

2.3 EXTERIOR PENETRATION FLASHING PANELS

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

2.4 ACCESSORIES

A. Fasteners: Stainless Steel 316, with soft neoprene washers.

B. Do not use exposed fasteners unless required.

C. Heads of exposed fasteners to be finished to match flashing.

D. Exposed fasteners to be pop rivets unless noted otherwise.

E. Primer: Zinc chromate type.

F. Concealed Sealants: Non-curing butyl sealant.

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

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

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.4 mm).

3.3 INSTALLATION

A. Comform with drawing details.
   1. If detail not provided, conform to best practices as recommended by industry standards and referenced guidelines.

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

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

3.4 FIELD QUALITY CONTROL

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

END OF SECTION

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SECTION 07 7123

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. [_____] Downspouts.

1.2 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting: Field painting of metal surfaces.

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

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

1.4 ADMINISTRATIVE REQUIREMENTS

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

1.5 SUBMITTALS

A. See Section 01 3000 Submittals for submittal procedures.

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch (0.6 mm) thick base metal.
   1. Finish: Shop pre-coated with PVDF (polyvinylidene fluoride) coating.
   2. Color: To match metal panel system..

2.2 COMPONENTS

A. Downspouts: CDA rectangular profile.

B. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Downspout Supports: Brackets.

C. Fasteners: Stainless steel, with soft neoprene washers.

2.3 FABRICATION

A. Form downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

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

D. Hem exposed edges of metal.

E. Fabricate downspout accessories; seal watertight.

2.4 ACCESSORIES

A. Downspout diverter. See Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.2 INSTALLATION

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

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

C. Slope gutters [____] inch per foot ([____] mm/m) , [___] percent minimum.

END OF SECTION

SECTION 07 8123

INTUMESCENT FIRE PROTECTION

PART 1 - PART 1 GENERAL

1.1 SECTION INCLUDES

A. Thin-film intumescent fire protection.

1.2 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.

1.3 SUBMITTALS

A. See Section 01 3000 - Submittals for submittals procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   a. Performance characteristics and test results.
   b. Preparation instructions and recommendations.
   c. Storage and handling requirements and recommendations.
   d. Installation methods.

C. Certificates: Certify that intumescent fireproofing provided for this project meets or exceeds specified requirements in all respects.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company that specializes in manufacturing the type of products specified, with minimum of ten years of documented experience.

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened containers with identification labels and testing agency markings intact and legible.

B. Store products in manufacturer's unopened packaging until ready for installation.
   a. Store at temperatures not less than 50 degrees F (10 degrees C) in dry, protected area.
   b. Protect from freezing, and do not store in direct sunlight.

c. Dispose of any materials that have come into contact with contaminants of any kind prior to application.

C. Dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 FIELD CONDITIONS

A. Protect areas of application from windblown dust and rain.

B. Maintain ambient field conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.
   a. Provide temporary enclosures as required to control ambient conditions.
   b. Do not apply intumescent fireproofing when ambient temperatures are below 50 degrees F (10 degrees C) without specific approval from manufacturer.
   c. Maintain relative humidity between 40 and 60 percent in areas of application.
   d. Maintain ventilation in enclosed spaces during application and for not less than 72 hours afterward.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Fireproofing: Provide intumescent thin-film fire protection systems tested by an independent testing agency in accordance with ASTM E119 and acceptable to authorities having jurisdiction (AHJ).

B. Exposed Interior Structural Steel Surfaces: Class A, flame spread index (FSI) and smoke developed index (SDI) of 25/450, maximum, when tested in accordance ASTM E84; fire resistance rating of 1 hour; Design Number [___].

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fire protection; verify that substrates are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.

B. Do not begin installation until substrates have been properly prepared.

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

3.2 PREPARATION

A. Thoroughly clean surfaces to receive fireproofing.

B. Repair substrates to remove surface imperfections that could effect uniformity of texture and thickness of fireproofing system, and remove minor projections and fill voids that could telegraph through finished work.

C. Cover or otherwise protect other work that might be damaged by fallout or overspray of fireproofing system, and provide temporary enclosures as necessary to confine operations and maintain required ambient field conditions.

3.3 APPLICATION

A. Comply with manufacturer's instructions for each particular intumescent fire protection system installation application as indicated.

B. Apply manufacturer’s recommended primer to required coating thickness.

C. Apply fireproofing to full thickness over entire area of each substrate to be protected.

D. Apply coats at manufacturer’s recommended rate to achieve dry film thickness (DFT) as required for fire resistance ratings designated for each condition.

E. Apply intumescent fire protection by spraying to maximum extent possible, and as necessary complete coverage by roller application or other method acceptable to manufacturer.

3.4 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

3.5 PROTECTION

A. Protect installed intumescent fire protection from damage due to subsequent construction activities, so fireproofing is without damage or deterioration before Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

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SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

C. Patching of abandoned holes in concrete slab and CMU walls.

1.2 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

C. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.

D. UL (FRD) - Fire Resistance Directory Current Edition.

1.3 SUBMITTALS

A. See Section 01 3000 Submitta for submittal procedures.

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

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

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

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.4 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD) will be considered as constituting an acceptable test report.

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

C. Installer Qualifications: Company specializing in performing the work of this section and:

1. Verification of minimum three years documented experience installing work of this type.

2. Verification of at least five satisfactorily completed projects of comparable size and type.

1.5 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Firestopping Manufacturers:

1. Expansion Joint Foam Fire Barrier: Inpro Jointmaster; www.inprocorp.com

2. Penetrations: 3M Fire Protection Products; [_____]; www.3m.com/firestop/#sle.

3. Control Joints:

a. Hilti; www.hilti.com

b. Clark Dietrich; www.clarkdietrich.com

2.2 MATERIALS

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

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance T, L and/or F Rating equal to required fire rating of penetrated assembly.

2.4 FIRESTOPPING FOR FLOOR-TO-WALL MOVABLE JOINTS

A. Floor-To-Wall Joint Systems That Have Movement Capabilities:

1. Basis-of-design: Inpro Jointmaster 995H2

2. UL listing: FW-D-0052

3. Movement Capacity: 50% of joint width in compression or expansion (100% total)

2.5 FIRESTOPPING FOR WALL-TO-WALL CONTROL JOINTS

A. Wall-To-Wall Joint Systems with Flexible Firestop Sealant:

1. Basis-of-design: Hilti CP 606

2. Movement Capability: 25% of joint width in compression or expansion (50% total)

3. Finish / color: Paintable

B. Wall-To-Wall Joint Systems with Fire Rated Metal Control Joints:

1. Basis-of-design: Clark Dietrich FAS-093X

2. UL listing: WW-D-0172

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.4 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 07 9100
PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Precompressed foam seals for expansion joints, vertical and horizontal.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Liquid and mastic joint sealants and their backing materials.

B. Section 07 9513 - Expansion Joint Cover Assemblies.

1.3 SUBMITTALS

A. See Section 01 3000 Submittals for submittal procedures.

B. Product Data: Manufacturer's technical data sheets for each product, including chemical composition, movement capability, color availability, limitations on application, and installation instructions.

C. Color Cards: For color selection.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

F. Submit details for application between existing and new conditions.

1.4 QUALITY ASSURANCE

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

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

1.5 WARRANTY

A. See Section 01 7400 - Closeouts for additional warranty requirements.

B. Correct defective work within a two year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealers that fail to achieve watertight seal or exhibit loss of adhesion or cohesion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Precompressed Foam Seals:
   1. Basis of Design: Johns Manville Expansion Joint Bellow system and cover.

2.2 ACCESSORIES

A. Adhesive: As recommended by seal manufacturer.

B. Substrate Cleaner: Non-corrosive, non-staining type recommended by seal manufacturer; compatible with joint forming materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive this work.

B. Measure joint dimensions and verify that seal products are of the correct size to properly seal the joints.

3.2 INSTALLATION

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

B. Precompressed Foam Seals:
   1. Install only when ambient temperature is within recommended application temperature range of adhesive. Consult manufacturer when installing outside this temperature range.
   2. Prepare joints and install seals in accordance with manufacturer's written recommendations.
   3. Remove loose materials and foreign matter that could impair adhesion of sealant.

3.3 CLEANING

A. Clean adjacent soiled surfaces.

3.4 PROTECTION

A. Protect joints from damage until adhesives have properly cured.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 2600 - Vapor Retarders: Sealants required in conjunction with vapor retarders.

1.3 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants 2018.

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

D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.

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

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2018.

G. ASTM C1311 - Standard Specification for Solvent Release Sealants 2014.

H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints 2019 (Reapproved 2020).

1.4 SUBMITTALS

A. See Section 01 3000 Submittals for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.

3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

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

D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

F. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

1.5 QUALITY ASSURANCE

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

B. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Allow sufficient time for testing to avoid delaying the work.
4. Deliver to manufacturer sufficient samples for testing.
5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

C. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.

1.6 WARRANTY

A. See Section 01 7400 Closeouts for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      b. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      c. Joints where installation of sealant is specified in another section.
      d. Joints between suspended panel ceilings/grid and walls.

2.2 NONSAG JOINT SEALANTS

A. Type Exterior - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Manufacturers:
      a. Dow; DOWSIL 795 Silicone Building Sealant: www.dow.com/#sle.

2.3 SELF-LEVELING SEALANTS

A. Type Interior - Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
   2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).

2.4 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

E. Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.2 PREPARATION

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

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

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

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

3.3 INSTALLATION

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

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

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

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

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

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

H. Install backing material in accordance with Manufacturer's instructions.

I. Installation of Sealant: Apply sealant in accordance with Manufacturer's printed instructions for the specific condition including manufacturer range of installation using a handgun with nozzle of proper size. Fill joints and voids solid. Superficial pointing and skin beading will not be accepted. Tool joints with equipment designed especially for that purpose, leaving surfaces uniform, smooth and free of sags, gaps, bulges, air pockets, and other inconsistencies. Remove excess material immediately. Leave adjacent surfaces clean. Cure sealed joints for a period of not less than 48 hours.

J. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

K. Compression Gaskets: Avoid joints except at ends, corners and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

END OF SECTION

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SECTION 07 9513

EXPANSION JOINT COVER ASSEMBLIES

PART 1 - NOT USED

PART 2 - PRODUCTS

2.1 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Basis of Design Manufacturer: Johns Manville; www.jm.com
   2. Joint Type, Dimensions, and Configurations: As indicated on drawings.
   3. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   5. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

PART 3 - NOT USED

END OF SECTION

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SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Thermally insulated hollow metal doors with frames.

1.2 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting: Field painting.

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

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

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2018.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

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

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

H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.

I. ASTM C476 - Standard Specification for Grout for Masonry 2020.

J. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.

K. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.

M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.

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

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

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

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

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2019.

S. UL (DIR) - Online Certifications Directory Current Edition.

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

1.4 SUBMITTALS

A. See Section 01 3000 Submittals for submittal procedures.

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

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

1.5 QUALITY ASSURANCE

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

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company; [_____]: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company; [_____]: www.assaabloydss.com/#sle.

3. Substitutions: See 01 3000 - Submittals.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.
   6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

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

2.3 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Type [___] , Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
   4. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   5. Door Face Sheets: Flush.
   6. Weatherstripping: See Drawings with hardware schedule.

2.4 HOLLOW METAL FRAMES

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

B. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Weatherstripping: Separate, see Drawings with Hardware Schedule.

2.5 ACCESSORIES

A. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

B. Astragals and Edges for Double Doors: See Drawings.

C. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

D. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

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

3.2 INSTALLATION

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

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Insulate frames.

E. Touch up damaged factory finishes.

3.3 TOLERANCES

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

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

3.4 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

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SECTION 08 3100

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall-mounted access units.

B. Ceiling-mounted access units.

1.2 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Field paint finish.

1.3 REFERENCE STANDARDS

1.4 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

2.2 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, drywall bead flange, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Frames: 16 gauge, 0.0598 inch (1.52 mm), minimum thickness.
   4. Single Steel Sheet Door Panels: 1/16 inch (1.6 mm), minimum thickness.
   5. Steel Finish: Primed.
   6. Door/Panel Size: As indicated on the drawings.
   7. Hardware:
      a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
      b. Latch: heavy-duty concealed touch latch.
      c. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

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

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Acoustic insulation.

C. Gypsum sheathing.

D. Cementitious backing board.

E. Gypsum wallboard.

F. Joint treatment and accessories.

G. Stainless steel base - plenum rated finishing and edge-protection profiles for wall assembiles.

1.2 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Acoustic insulation.

B. Section 07 2600 - Vapor Retarders: Water-resistive barrier over sheathing.

C. Section 09 2216 - Non-Structural Metal Framing.

1.3 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017.

B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.

C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.

D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.

E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2018.

F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2020.

G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.

H. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing 2018.

I. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

K. ASTM E413 - Classification for Rating Sound Insulation 2016.

L. GA-216 - Application and Finishing of Gypsum Panel Products 2016, with Errata.

1.4 SUBMITTALS

A. See Section 01 3000 Submittals for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, joint finishing system, and base profiles and components..

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

E. Verification samples: For each finish product specified, two samples, minimum 6 inches long, representing actual product, color and finish.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.2 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation; [____]: www.certainteed.com/#sle.
   2. Georgia-Pacific Gypsum; [____]: www.gpgypsum.com/#sle.
   3. National Gypsum Company; [____]: www.nationalgypsum.com/#sle.
   4. USG Corporation; [____]: www.usg.com/#sle.
   5. Substitutions: See 01 3000 - Submittals.

B. Gypsum Wallboard (GWB): Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
   4. Mold Resistant Paper Faced Products:
      a. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
      b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
      c. National Gypsum Company; Gold Bond XP Gypsum Board: www.nationalgypsum.com/#sle.
      d. USG Corporation; USG Sheetrock Brand EcoSmart Panels Mold Tough Firecode X: www.usg.com/#sle.
      e. Substitutions: See 01 3000 - Submittals.

C. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Core Type: Regular.
   4. Type X Thickness: 5/8 inch (16 mm).
   5. Edges: Square.
   6. Glass Mat Faced Products:
      a. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing: www.certainteed.com/#sle.
      b. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing: www.gpgypsum.com/#sle.

2.3 GYPSUM BOARD ACCESSORIES

A. Water-Resistive Barrier: See section 07 2600.

B. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
   1. Types: As detailed or required for finished appearance.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
   2. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
   3. Joint Compound: Setting type, field-mixed.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

2.4 STAINLESS STEEL BASE

A. Plenum rated finishing and edge protection
   1. Basis of Design: Schluter Systems Designbase - SL
   2. Description: Baseboard profile comprised of a symmetrically-round top, flat exposed face, and 5/16 inch (8 mm) radius lower section.
   3. Additional components:
      a. Provide matching inside corners, outside corners, connectors, end caps and Sealing Lip.
   4. Height, Material and Finish:
      a. V2A - Stainless steel.
      b. Brushed stainless steel.
      c. 4-3/8 inches (110 mm)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

3.3 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Finishing and edge protection: Install in accordance with manufacturer's instructions.

3.4 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.5 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

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SECTION 09 2217

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior infill metal framing.

B. Framing accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking within stud framing.

B. Section 09 2116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

1.3 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members 2016, with Supplement (2018).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.

D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.

E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2020.

F. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

1.4 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

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

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 - PRODUCTS

2.1 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (L/240 at 240 Pa).
   1. Studs: C shaped with flat or formed webs with knurled faces..
   2. Runners: U shaped, sized to match studs.

B. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot-dipped galvanized coating.

C. Non-Loadbearing Framing Accessories:
   1. Fasteners: ASTM C1002 self-piercing tapping screws.

2.2 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.2 INSTALLATION OF STUD FRAMING

A. Comply with requirements of ASTM C754.

B. Align and secure top and bottom runners at 24 inches (600 mm) on center.

C. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

D. Align stud web openings horizontally.

E. Secure studs to tracks using crimping method. Do not weld.

F. Fabricate corners using a minimum of three studs.

G. Install double studs at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.

H. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

END OF SECTION

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SECTION 09 3000
TILING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Tile for floor applications.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.3 REFERENCE STANDARDS

A. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar 2021.

B. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.

C. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2019.

D. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2021.

1.4 SUBMITTALS

A. See Section 01 3000 Submittals for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.

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

E. Installer's Qualification Statement:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

PART 2 - PRODUCTS

2.1 TILE

A. Manufacturers: All products by the same manufacturer.
   1. Basis of Design: Dal-Tile Corporation; Quarry 0T03: www.daltile.com/#sle.

B. Quarry Tile, Type [__]: ANSI A137.1 standard grade.
   1. Moisture Absorption: < 3.0 percent as tested in accordance with ASTM C373.
   2. Size: 8 by 8 inch (203 by 203 mm), nominal.
   3. Thickness: 1/2 inch (12.7 mm), nominal.
   4. Surface Finish: Abrasive.
   5. Color(s): To be selected by Architect from manufacturer's standard range.
   6. Trim Units: Matching bullnose shapes in sizes coordinated with field tile.

2.2 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
   1. ARDEX Engineered Cements; [_____]: www.ardexamericas.com/#sle.
   2. LATICRETE International, Inc; [_____]: www.laticrete.com/#sle.
   3. Sika Corp.

C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
   1. Applications: Use this type of bond coat for floor tile installation.
   2. Products:
      a. ARDEX Engineered Cements; ARDEX X 5: www.ardexamericas.com/#sle.
      b. LATICRETE International, Inc; 257 TITANIUM: www.laticrete.com/#sle.

2.3 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: Where indicated.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. ARDEX Engineered Cements; ARDEX WA: www.ardexamericas.com/#sle.
      b. H.B. Fuller Construction Products, Inc; TEC AccuColor EFX Epoxy Special Effects Grout: www.tecspecialty.com/#sle.
      c. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
      d. Sika Corp; SikaTile 825 Epoxy: www.sika.com/#sle.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Internal Relative Humidity: ASTM F2170.
      b. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Sound tile after setting. Replace hollow sounding units.

G. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.4 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over wood substrates, install in accordance with TCNA (HB) Method F141, with standard grout, unless otherwise indicated.

3.5 CLEANING

A. Clean tile and grout surfaces.

3.6 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2022.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2022.

1.4 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 4 by 4 inch (101.6 by 101.6 mm) in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 4 inches (101.6 mm) long, of suspension system main runner, cross runner, and perimeter molding.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. C1 - Basis of Design: Armstrong World Industries, Inc; Cortega with Prelude XL Fire Guard 15/16" grid: www.armstrongceilings.com/#sle.
   2. C2 - Basis of Design: Armstrong World Industries, Inc; Cortega Second Look II (2758) with Prelude XL Fire Guard 15/16" grid: www.armstrongceilings.com/#sle.

3. C3 - Basis of Design: 12x48 Tegular Edge with Silhouett XL 1/8" Reveal - as specified in Drawings.
4. Substitutions: See 01 3000 - Submittals.

2.2 ACOUSTICAL UNITS

A. Acoustical Panels: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 2, water felted.
   2. Size: 24 by 48 inches (610 by 1219 mm).
   3. Thickness: 3/4 inch (19 mm).

2.3 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

PART 3 - EXECUTION

3.1 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch (19 mm) clearance between grid ends and wall.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

F. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.

G. Do not eccentrically load system or induce rotation of runners.

3.2 INSTALLATION - ACOUSTICAL UNITS

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

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

3.3 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

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SECTION 09 6500
RESILIENT FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Resilient base for carpet installation.

1.2 REFERENCE STANDARDS

A. ASTM F1861 - Standard Specification for Resilient Wall Base 2021.

1.3 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, 4 by 4 inch (50.8 by 50.8 mm) in size illustrating color for material.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.

1. Manufacturers:
   a. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle.
   b. Substitutions: See 01 3000 - Submittals.
2. Height: 4 inch (100 mm).
3. Thickness: 0.125 inch (3.2 mm).
4. Finish: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

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

3.2 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.2 RELATED REQUIREMENTS

A. Secition 09 6500 - Resilient Flooring: Resil

1.3 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2021.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2019a.

F. CRI 104 - Standard for Installation of Commercial Carpet 2015.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2023.

1.4 SUBMITTALS

A. See Section 01 3000 Submittals, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Tile Carpeting:
   1. Basis of Design: Interface, Inc; Cambria: www.interface.com/#sle.

2.2 MATERIALS

A. Tile Carpeting: Tufted, manufactured in one color dye lot.
   1. Final style and color to be selected by Owner.
   2. Gauge: 1/10 inch (39.4 mm).
   3. Stitches: 7 per inch (27.60 per cm).
   4. Pile Weight: 12,480 oz/sq yd (462,755.60 gm/sq m).

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, [_____] color.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction alternating to next unit, set parallel to building lines.

F. Trim carpet tile neatly at walls and around interruptions.

G. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 09 9113

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Mechanical and Electrical:
      a. On the roof and outdoors, paint equipment exposed to weather or to view, including factory-finished materials.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting.

1.3 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

C. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

D. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.4 SUBMITTALS

A. See Section 01 3000 - Submittals for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, submit each color in each sheen available.
      a. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

1.5 QUALITY ASSURANCE

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

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.2 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

SECTION 09 9123

INTERIOR PAINTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Materials for backpriming woodwork.

D. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Gypsum Board Walls.
   2. Metal stairs.
   3. Exposed steel at smoke vent curb.
   4. Metal doors and frames.

E. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 5100 - Metal Stairs: Shop-primed items.

C. Section 09 9113 - Exterior Painting.

1.3 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.

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

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

D. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

E. SSPC-SP 2 - Hand Tool Cleaning 2018.

F. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.4 SUBMITTALS

A. See Section 01 3000 Submittals, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   2. Label each container with color in addition to the manufacturer's label.

1.5 QUALITY ASSURANCE

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

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Flammability: Comply with applicable code for surface burning characteristics.

C. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   3. Extend colors to surface edges; colors may change at any edge as directed by Architect.
   4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 PAINT SYSTEMS - INTERIOR

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

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SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers - Fan room, boiler room.

B. Fire extinguisher cabinets.

1.2 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Field paint finish.

1.3 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

B. FM (AG) - FM Approval Guide current edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers 2022.

D. UL (DIR) - Online Certifications Directory Current Edition.

1.4 SUBMITTALS

A. See Section 01 3000 Submittals for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

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

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.5 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   a. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

2.2 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.

C. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

D. Door Glazing: Float glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Fabrication: Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

H. Finish of Cabinet Interior: White colored enamel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers in cabinets.

END OF SECTION

SECTION 20 0000

MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Supplemental requirements in addition to Division 1 - General Requirements applicable to all Divisions 20, 21, 22, 23, 25 - Mechanical specification sections.

B. Related Sections:
1. Division 1 - General Conditions
2. 20 0000 - Mechanical General Requirements
3. 20 0513 - Common Motor Requirements
4. 20 0529 - Mechanical Hangers and Supports
5. 20 0553 - Mechanical Identification
6. 20 0700 - Mechanical Insulation
7. 20 4100 - Mechanical Demolition
8. 21 1000 - Water Based Fire Suppression Systems
9. 22 1100 - Domestic Water Piping and Specialties
10. 22 1300 - Sanitary Waste and Vent Piping and Specialties
11. 23 0131 - Duct Cleaning
12. 23 0593 - Testing, Adjusting and Balancing
13. 23 1123 - Fuel Gas Piping and Specialties
14. 23 2113 - Hydronic Piping and Specialties
15. 23 2123 - Hydronic Pumps
16. 23 3100 - Ducts and Accessories
17. 23 3400 - HVAC Fans
18. 23 3600 - Air Terminal Units
19. 23 3700 - Air Outlets and Inlets
20. 23 5216 - Condensing Boilers and Accessories
21. 23 6300 - Refrigerant Condensers
22. 23 7323 - Central Air Handling Units
23. 23 8123 - Dedicated Air-Conditioning Units
24. 23 8200 - Terminal Heating and Cooling Units
25. 25 3000 - Building Automation System Field Devices
26. 25 4000 - Variable Speed Drives
27. 25 5000 - Building Automation System
28. 25 9000 - Sequence of Operations
29. Division 26 - Electrical

1.2 NOTIFICATION OF POTENTIAL

A. Asbestos, lead and other potentially hazardous materials are present in the building that may impact the work of all trades. Regulated air contaminates, including asbestos and lead are also present in the settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to Specification Divisions 0, 1 and 2 for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with the EPA and OSHA requirements.

1.3 REFERENCES

A. Codes and Standards:
   1. Perform work in accordance with the legally enacted editions of applicable international, state and local codes with locally accepted amendments to include:
      a. 2018 International Building Code (IBC).
      b. 2018 International Mechanical Code (IMC).
      c. 2018 International Fuel Gas Code (IFGC).
      d. 2018 Uniform Plumbing Code (UPC).
      e. 2018 International Fire Code (IFC).
      f. 2018 NFPA 70, National Electric Code (NEC).
      g. ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
      h. Standard for Accessible and Usable Buildings and Facilities (ANSI A117.1-2017).
   2. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested and approved, in conformance with the current publications and standards of the following organizations:
      a. American Gas Association - AGA.
      b. American National Standards Institute - ANSI.
      c. American Society of Heating Refrigerating and Air Conditioning Engineers - ASHRAE.
      d. American Society of Mechanical Engineers - ASME.
      e. American Society for Testing and Materials - ASTM.
      f. National Electrical Manufacturers' Association - NEMA.
      g. National Fire Protection Association - NFPA.
      h. Sheet Metal and Air Conditioning Contractors National Association, Inc. - SMACNA.

B. Definitions:
   1. “Accessible” means arranged so that an appropriately dressed man 6'-2" tall, weighing 250 pounds, may approach the area in question with the tools and products necessary for the work intended; and may then position himself to properly perform the task to be accomplished, without disassembly or damage to the surrounding installation.
   2. “Authority Having Jurisdiction” is the individual official, board, department, or agency established and authorized by the political subdivision created by law to administer and enforce the provisions of the Code as adopted or amended.

3. "As Specified" denotes a product, system, or installation that:
   a. Includes salient characteristics identified in the Drawings and Specifications.
   b. Meets the requirements of the "Basis of Design".
   c. Is produced by a manufacturer listed as acceptable on the Drawings or in the Specifications.
4. "Basis of Design" refers to products around which the design was prepared. Some or all of the particular characteristics of Basis of Design products may be critical to the fit or performance of the completed installation. Such characteristics are often subtle. Where substitutions are made to products that are the Basis of Design, the Contractor is alerted that nominally acceptable substitutions may produce undesirable side effects such as products that no longer fit the space due to increased product dimensions. The Contractor is responsible for resolving impacts of substitutions. Approval of a substitution request does not relieve the Contractor of complying with the design intent and applicable Codes. Reference to a specific manufacturer's product (even as "Basis of Design") does not necessarily establish acceptability of that product without regard to compliance with other provisions of these specifications.
5. "Contracting Agency" is the Owner as defined in the General Conditions of the Contract.
6. "Demolish" means to permanently remove a component, equipment, or system and it's appurtenances with no intent for reuse and to properly disposal of it.
7. "Furnish" means to purchase material as shown and specified, and cart the material to an approved location at the site or elsewhere, as noted or agreed, to be installed by supporting crafts.
8. "Install" means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.
9. "Product" is a generic term that includes materials, equipment, fixtures and any physical item used on the project.
10. "Provide" means furnish products, labor, subcontracts, and appurtenances required and install to a complete and properly operating, finished condition.
11. "Remove" means to remove a component, equipment, or system and its appurtenances and either store it for re-installation/reuse, or turn it over to the Contracting Agency.
12. "Rough-in and Connect" means provide an appropriate system connection such as water services with stops, continuous wastes with traps, shutoff valves, and piping connections, testing, etc., for proper operation, ready for furnished products to be installed. Equipment furnished is received, uncrated, assembled and set in place by supporting crafts unless prior arrangements are made to hire the rough-in installer for this work.
13. "Serviceable" means arranged so that the component or product in question may be properly removed and replaced without disassembly, destruction or damage to the surrounding installation. "Serviceable" components shall be "accessible".
14. "Shop Drawings" are dimensioned working construction drawings drawn to scale to show an entire area of work in sufficient detail to demonstrate service and maintenance clearances and coordination of all trades.
15. "Substitution" is a product, system or installation that is not by a listed manufacturer or does not conform to all salient characteristics identified in the Project Manual, but that the Contractor warrants meets specific requirements listed in the Project Manual.
16. "System Drawing" is a diagrammatic engineered drawing that shows the interconnection and relationship between products to demonstrate how the

products interact to accomplish the function intended. Examples of system drawings include plumbing diagrams, control and instrumentation diagrams, and wiring diagrams. Some drawings, such as dimensioned and complete Fire Suppression Drawings may be both System Drawings and Shop Drawings.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Provide labor, products and services required for the complete installation, checkout, and startup of mechanical systems shown and specified. Coordinate related work, including the work of other crafts, to provide each system complete and in proper operating order.
   2. Cooperate with others involved in the project; with due regard to their work, to promote rapid completion of the entire project.
   3. Become thoroughly familiar with the local conditions under which the work is to be performed. Schedule work with regard to seasons, weather, climatic conditions, and other local conditions that may affect the progress and quality of the work.
   4. Coordinate and perform demolition in support of the project whether or not such requirements are described on the Drawings. Restore systems that are to remain but that are affected in any way by demolition work. Conduct a site visit prior to bid to determine Scope.
   5. In general, the mechanical, electrical and building automation systems are interrelated. Coordinate the interface and operation of systems so that interrelated systems operate in proper synchronization and balance.
   6. Provide labor, materials, and equipment to facilitate the commissioning process of systems and equipment within this scope of work. Perform tests and verification procedures required for the commissioning process as requested by the Contracting Agency.
   7. Work and materials shall be in accordance with requirements of the applicable State and local Codes, regulations and ordinances, and the rules and regulations of other Authorities Having Jurisdiction. Nothing in drawings and specifications shall be construed to permit work not in conformance with applicable codes, rules, and regulations.
   8. Where drawings or specifications call for a material or construction of a better quality or larger sizes than required by the above-mentioned Codes, rules and regulations, the provision of the specifications shall take precedence.
   9. Furnish without any extra charge any additional material and labor when required for compliance with the listed codes, rules and regulations, even though the work may not be mentioned in the specifications or shown on the drawings. It is the responsibility of the successful bidder to bid in accordance with the minimum requirements of the applicable codes, rules, and regulations.

1.5 PRE-INSTALLATION MEETINGS

A. Meet with and coordinate Divisions 20, 21, 22, 23, 25 work with the interrelated work of other trades including Architectural, Civil, Structural, Mechanical and Electrical to identify and resolve potential conflicts.

B. Prior to installation of any Division 20, 21, 22, 23, and 25 component, coordinate installation with trades responsible for portions of other related sections of the Project Manual.

1.6 SUBMITTALS

A. Refer to Division 1 for general submittal requirements for the items listed below, supplemented with the additional requirements listed. In addition, prepare Divisions 20, 21, 22, 23, 25 submittals in accordance with the following, to include any supplemental requirements listed in the specific specification section:

B. General:
   1. The Contracting Agency's obligation to review submittals and to return them in a timely manner is conditioned upon the prior review and approval of the submittals by the Contractor as required by the Construction Contract.
   2. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Project Manual.
      a. Submittals will not be checked for quantity, dimension, fit, or for proper technical design of manufactured equipment.
      b. Provision of a complete and satisfactory working installation is the responsibility of the Contractor.
   3. Furnish suppliers with the applicable portions of the Project Manual and review and verify that the suppliers' submittals clearly represent products which comply with the Project Manual.
   4. Master Submittal Log]
      a. Create and maintain a master submittal log for items submitted in Divisions 20, 21, 22, 23, 25, including test results, certifications, record drawings, etc.
      b. Submit master submittal log, independent of other submittals, as the first submittal for review and approval by the Contracting Agency.
      c. Update submittal log with each submittal action.
      d. Share an electronic copy with Contracting Agency and Engineer at two week intervals, or as requested by the Contracting Agency.

C. Coordination:
   1. Prior to a submittal's submission for approval, hold a meeting of all construction trades to review shop drawings and submittals. Each trade shall cross-check shop drawings and submittals for conflicts, clearances, physical space allocation and routing, discrepancies, dimensional errors, omissions, contradictions, departures from the Contract requirements, correct electrical/mechanical services and connections, and provisions for commissioning.
   2. Review, revise, correct, and appropriately annotate submittals prior to submission for approval.
   3. Keep a current copy of approved submittals and the submittal log at the job site.

D. Electronic Submittals:
   1. Provide electronic submittals in PDF format in addition to hard copy submittal. Maximum file size to be coordinated with Contracting Agency.
   2. Follow the organization and formatting required for paper submittals.
   3. Provide electronic bookmarks within the PDF document in place of tabs and sub-tabs.
   4. If individual PDF files are provided for a product or shop drawing sheet(s), organize files into folders and name files and folders to correspond with applicable specification sections or drawing titles.

5. Create PDF documents without security, to be searchable, and to allow copy and paste. For scanned documents, run the optical character recognition (OCR) function to ensure the document is searchable and can be copied and pasted.
6. Reduce PDF file size by removing data and file creation elements not needed for final file presentation.

E. Product Data:
   1. General:
      a. This section describes in detail the preparation of mechanical product submittals. Submittals not provided as described shall be rejected without review. This procedure is designed to accelerate and improve the accuracy of the technical review process, as well as, simplify the preparation of the Installation, Operation, and Maintenance Manuals (IO&Ms).
      b. Product data for each specification section shall be submitted in one complete package, except as noted in this section.
   2. Submittal Organization:
      a. Organize product submittal information in the same order as the products are specified. Provide a separate tabbed divider for each Divisions 20, 21, 22, 23, 25 specification section. Provide the typed section number on each tab.
      b. Within each section, organize product information in the same order as products are specified in Part 2 of each applicable specification section. Provide sub-tabs within each section for each separate product article. Provide the typed product article number on each tab.
      c. Provide product submittal information for each product specified in 8-1/2" x 11" format. Fold-out 11" x 17" format is also acceptable.
      d. If a particular specified product is being omitted from the product submittal or will not be used for the project, provide a single sheet within the article tab identifying the product and annotated with a brief reason why the product is not being submitted, for example: "NOT USED," NO SUBMITTAL REQUIRED," "TO BE SUBMITTED BY (PROVIDE DATE)," etc. This will inform the reviewer that the product was not overlooked.
      e. Partial submittals from individual subcontractors may be provided which cover a particular sub-contractor's scope of work. In this case, arrange partial submittals by system classification such as: PLUMBING, HEATING, FIRE SUPPRESSION, VENTILATION, BUILDING AUTOMATION SYSTEM, etc. Within each system classification, arrange product submittals by specification section, as described, such that each specification section can easily be reorganized into a master set of Divisions 20, 21, 22, 23, 25 product submittals organized by specification section. This will greatly simplify the preparation of IO&M manuals as described below.
      f. Bind product submittal information in identical 3 inch wide, hard-backed, loose-leaf, 3 ring binders with clear front and spine insert pockets. Divide information into multiple volumes so that the pages in each binder rest naturally on one side of rings.
      g. Provide a master table of contents at the front of each volume which lists the Divisions 20, 21, 22, 23, 25 specification sections and indicates which sections are located within each volume.
      h. Provide a table of contents within each section which lists the Part 2 products for that section in the same order as the applicable specification section.

i. Provide identical cover and spine inserts for each product submittal volume, to include the following typed information:
   1). The Contracting Agency Name.
   2). Project Name.
   3). Contractor Name.
   4). Subcontractor Name preparing the submittal.
   5). Date that the submittal or resubmittal was initiated.
   6). "Mechanical Product Submittals" or "Plumbing Product Submittals" etc. as appropriate.
   7). "Volume 1 of X, Volume 2 of X," etc.

3. Product Information:
   a. Indicate manufacturer's name and address, and local supplier's name, address, phone number.
   b. Indicate each product as "Basis of Design", "Specified Equal" or "Proposed Substitution."
   c. Identify catalog designation and/or model number.
   d. Provide manufacturer's product literature. Neatly annotate to indicate specified salient features, appurtenances and performance criteria for each product specified to demonstrate compliance with the Project Manual to include scheduled information, drawing information and specified information.
   e. Indicate product deviations from the Project Manual and mark out non-applicable items on generic "cut-sheets."
   f. Include manufacturer provided dimensioned equipment drawings with rough-in mechanical and electrical connections.
   g. Include operation characteristics, performance curves and rated capacities.
   h. Include motor characteristics and wiring diagrams.
   i. Include weight of equipment. Including accessories.
   j. Provide basic manufacturer's installation instructions.
4. Product Substitutions:
   a. Clearly indicate both in the section table of contents and on the individual product submittal information each proposed substitution, deviation or change from the product as described in the Project Manual.
   b. Submittal approval does not include substitutions, deviations or changes from the requirements of the Project Manual unless they are specifically itemized and approved. The term "No Exceptions Taken" will not apply to substitutions, deviations or changes not clearly identified.
   c. Provision of a satisfactory working installation of equal quality to the system as described in the Project Manual shall be the responsibility of the Contractor.
   d. Correct unapproved deviations from the Project Manual discovered in the field as directed by and at no additional cost to the Contracting Agency.
   e. Cost of any design modifications as a result of proposed product substitutions shall be borne by the Contractor.

F. System Drawings:
1. Submit System Drawings for dynamic elements/systems of the project which are performance specified to include but not limited to: Fire Suppression Systems, Building Automation Systems and stand-alone packaged equipment.
2. Prepare system drawings on full sized sheets of the same size as the original construction drawings.

3. Include with each system a sequence of operation narrative which describes each mode of system operation in sufficient detail to demonstrate compliance with the Project Manual to the satisfaction of the Contracting Agency.

G. Shop Drawings:
   1. General:
      a. The Project Manual documents are not intended for nor are they suitable for use as shop drawings. Project Manual documents shall not be utilized for the actual fabrication or installation of products or equipment.
      b. The Drawings are partly diagrammatic and do not show all offsets in piping or ducts, and may not show in minute detail all features of the installation; however, provide systems complete and in proper operating order.
      c. Locations of products are approximate unless dimensioned.
      d. Divisions 20, 21, 22, 23, 25 products and systems shall not be installed without shop drawings approved by the Contracting Agency.
      e. Rework, changes or additional engineering support required as a result of the installation of products and systems prior to the approval of applicable shop drawings by the Contracting Agency shall be provided at the Contractor's expense.
      f. Drawing symbols used for basic materials, equipment and methods are commonly used by the industry. Special items are identified by a supplementary list of graphical illustrations, or identified on the drawings or specifications.
   2. Preparation:
      a. Review each Divisions 20, 21, 22, 23, 25 specification section and identify the shop drawing requirements.
      b. Combine the shop drawing requirements first by system (i.e. ventilation system, heating system, plumbing system, etc.) and then by area (i.e. fan room, boiler room, etc.).
      c. Prepare shop drawings on full sized sheets of the same size as the original construction drawings.
      d. Arrange shop drawings to scale, showing dimensions where accuracy of location is necessary for coordination or communication purposes.
      e. Incorporate the actual dimensions and configurations of the products and systems approved through the product submittal process into the shop drawings.
      f. Provide dimensioned maintenance clearance areas around each product as recommended by the manufacturer.
      g. Coordinate Divisions 20, 21, 22, 23, 25 work with the interrelated work of other trades including Architectural, Civil, Structural, and Electrical.
      h. Identify and provide recommendations to resolve major conflicts which may impact the design of the systems as shown. Such conflicts will be resolved during the shop drawing review process.
      i. Identify locations where field coordination between various trades is necessary to avoid conflicts.
      j. Indicate elevation of piping, ductwork and equipment above or below finished floor at various locations and in sufficient detail to demonstrate clearance from structural elements and the work of other trades.
      k. Coordinate placement of openings and holes through structure, walls, floors, ceilings, and roof with Structural and Architectural.
   3. Submittal:

a. Submit dimensioned shop drawings as specified to demonstrate proper planning and sequencing of the applicable trades for the installation and arrangement of Divisions 20, 21, 22, 23, 25 with respect to other interrelated work.
b. Partial shop drawings submittals (i.e. heating system only) will be rejected without review, as the interrelationship with other related work and overall system fit cannot be evaluated.
    1). Underslab shop drawings may be submitted separately for review to accommodate the construction schedule.
c. It is assumed that shop drawings submitted for review have been thoroughly prepared and coordinated and that the products and systems can and shall be installed as shown. Conflicts which are not clearly identified and annotated on the submitted shop drawings are assumed not to exist.
d. Installation conflicts arising from the failure to properly coordinate the work of related trades shall be provided at the Contractor's expense.

H. Certificates:
1. Review the submittal requirements for Certificates for each Divisions 20, 21, 22, 23, 25 specification section.
2. Submit copies of certificates as specified. This information may be included within the Installation, Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

I. Test and Evaluation Reports:
1. Review the submittal requirements for Test and Evaluation Reports for each Divisions 20, 21, 22, 23, 25 specification section.
2. Submit copies of reports as specified. Also include these reports within the Installation, Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

J. Installation, Operations and Maintenance (IO&M) Manuals:
1. Review the submittal requirements for IO&M manuals for each Divisions 20, 21, 22, 23, 25 specification section.
2. Begin the preparation of the mechanical IO&M manuals with a complete and fully approved set of mechanical product data submittals organized, annotated and with the product information as indicated within the "Product Data" submittals article above and in each Divisions 20, 21, 22, 23, 25 section.
3. Next, augment each individual product submittal with the written installation, operations and maintenance information for each approved product. This type of information is not applicable (or available) for bulk commodity or simplistic products such as copper pipe, basic pipe hangers or equipment tags, etc.
4. Annotate the installation, operations and maintenance information to indicate applicable information for the specific equipment model(s) installed.
5. Maintenance information shall include:
    a. Preventive maintenance requirements for each product, including the recommended frequency of performing each preventive maintenance task.
    b. Instructions for troubleshooting, minor repair and adjustments required for preventive maintenance routines, limited to repairs and adjustments that may be performed without special tools or test equipment and that require no extensive special training or skills.

c. Information of a maintenance nature covering warranty items, etc., that have not been discussed in the manufacturers' literature.
d. Information on the spare and replacement parts for each product and system. Properly identify each part by part number and manufacturer.
e. Recommended spare parts list.

6. Organize the IO&M manual information by specification section (not by sub-contractor) with a tabbed divider separating each section. Provide the typed section number on each tab.
7. Within each section, organize the product information in the same order as the products are specified in Part 2 of each applicable section. Provide sub-tabs within each section for each product. Provide the typed product article number on each tab.
8. Bind the information in identical 3 inch wide; hard-backed, loose-leaf, 3 ring binders with clear front and spine insert pockets. Divide information into multiple volumes so that the pages in each binder rest naturally on one side of rings.
9. Provide a master table of contents at the front of each volume which lists the Divisions 20, 21, 22, 23, 25 specification sections and indicates which sections are located within each volume.
10. Provide a table of contents within each section which lists the Part 2 products for that section in the same order as the applicable specification section.
11. Provide identical cover and spine inserts for each IO&M manual volume, to include the following typed information:
    a. The Contracting Agency Name.
    b. Project Name.
    c. "Mechanical Installation, Operations and Maintenance Manual".
    d. "Volume 1 of X, Volume 2 of X," etc.
12. Submit copies of Operation and Maintenance Manuals in electronic format (Adobe PDF).

1.7 CLOSEOUT SUBMITTALS

A. Warranty Documentation:
1. Review the manufacturer's warranty requirements for each Divisions 20, 21, 22, 23, 25 specification section. Unless stated otherwise, provide 1-year warranty.
2. Submit required warranty documentation to the applicable Manufacturer's Representative to validate standard manufacturer's warranty for each required product. Obtain written confirmation of receipt from each applicable Manufacturer's Representative.
3. Provide Contracting Agency one copy of submitted warranty documentation and written confirmation of receipt for each applicable Manufacturer's Representative. This information may be included within the Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.
4. Provide statement of Contractor's warranty of workmanship, labor, and materials, as described under Article 1.12 Warranty below.

B. Record Documentation:
1. General: As the Work progresses, neatly annotate a designated and otherwise unused set of Divisions 20, 21, 22, 23, 25 Contract Drawings to show the actual locations and routing of Divisions 20, 21, 22, 23, 25 Work and the terminal connection points to related Work. As a minimum, include the following:
    a. Annotate record drawings to incorporate each applicable addendum.

b. Annotate record drawings as directed by each applicable Request for Information (RFI) and accepted Change Order Proposal.
c. Modify record drawings to show actual equipment sizes and locations and pipe and duct routing. Revise pipe and duct sizes as appropriate.
d. Provide dimensioned locations for permanently concealed piping and ductwork (i.e. piping cast in concrete or buried underground/underslab).
e. Show the actual locations of system isolation valves, especially valves which are concealed above ceilings and behind access panels.

2. Preparation:
   a. Neatly annotate record drawings to provide clear interpretation to support electronic drafting by a third party.
   b. Tape electronic sketches from addendums and/or RFIs directly to the record drawings as overlays.
   c. Annotate the record drawings in colored pencil using the same symbols and abbreviations as indicated in the Divisions 20, 21, 22, 23, 25 legends and schedules of the Contract Drawings.
      1). Red to add information.
      2). Green to delete information.
      3). Blue to provide additional clarifying information which is not to be drafted.
   d. After submittal to the Contracting Agency, provide additional clarification, information or rework as necessary to support the accurate interpretation and electronic drafting of the record drawings.
3. Submittals:
   a. Provide dimensioned underslab record drawings to the Contracting Agency prior to placing the slab. For slabs placed in multiple sections, provide record drawings for the applicable slab sections to the Contracting Agency prior to each pour.
   b. Provide complete record drawings for concealed areas (i.e. above lay-in and hard ceilings and inside walls) to the Contracting Agency prior to concealment.
   c. Provide the remaining portion of the record drawings for exposed areas to the Contracting Agency prior to the final completion of the project.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts:
1. Furnish spare parts for systems and equipment as listed in applicable sections of Divisions 20, 21, 22, 23, 25.
2. Clearly label each part with name, manufacturer's part number, system and/or equipment where used and location.
3. Deliver parts to location and person designated by the Contracting Agency, in durable storage boxes.
4. Group cartons containing smaller items by system or application and deliver in an appropriate number of storage boxes.

B. Extra Stock Materials:
1. Furnish extra stock as listed in applicable sections of Divisions 20, 21, 22, 23, 25.
2. Clearly label with name, manufacturer's part number, system and/or equipment where used and location.

3. Deliver to location and person designated by the Contracting Agency, in durable storage boxes.

C. Tools: Provide three sets of special tools and testing and monitoring equipment as listed in applicable sections of Divisions 20, 21, 22, 23, 25.

1.9 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturers: Companies specializing in manufacturing the Products specified in the Divisions 20, 21, 22, 23, 25 sections with minimum 3 years documented experience.
2. Fabricators: Companies specializing in fabricating the Products specified in the Divisions 20, 21, 22, 23, 25 sections with minimum 3 years documented experience.
3. Installers: Perform the Work using qualified workmen that are experienced and usually employed in the trade.
4. Testing Agencies: Products requiring electrical connection shall be listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and as indicated.

B. Product Testing and Certification:
1. Nationally Recognized Testing Laboratory (NRTL) Labeling: Electrical equipment and conductors shall be “Approved,” “Certified,” “Identified,” or “Listed” and “Labeled” to establish that the electrical equipment is safe, free of electrical shock and fire hazard, and suitable for the purpose for which it is intended to be used. The manufacturer shall have the specific authorization of one of the Occupational Safety and Health Administration (OSHA) approved Nationally Recognized Testing Laboratories (NRTLs) in accordance with the applicable national standards to label the equipment as suitable.
2. Where the words Listed, UL Listed, UL Labeled, Underwriters Laboratories, Inc., UL, or variations of this terminology, appear under this Division of the Specifications or the associated drawings, it is understood that a comparable testing agency as defined by NRTL above is acceptable.
3. Such testing and certification is generally applicable to products within the following categories:
   a. Life safety and fire suppression.
   b. Fuel burning equipment, except certain classes of power or industrial equipment for which other recognized certification applies as well.
   c. Factory fabricated and wired electrical control panels and packaged equipment with factory installed electrical controls or panels.
   d. Components for life safety systems, fuel systems and medical gas systems.
4. The listing under Paragraph ‘3’ above is provided for illustration of requirements and is not exclusive. Provide products that have been tested and listed for the intended application when such products are available unless the Contracting Agency has provided written exemption on an itemized basis.
5. Provide electrical products listed and labeled by UL, FM, ETL or other approved NRTL. If listing and labeling is not available, stamp the submittal for these products by an Alaska Registered Professional Engineer approved by the Authority Having Jurisdiction, at no additional cost.

6. Where interpretation is required, the Contracting Agency will provide direction and will be the sole judge in cases of compliance with this subsection.

1.10 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Verify products are new and delivered in original factory packaging/crating and are free from damage and corrosion.
   2. Replace products delivered to job site that does not comply with above requirements at no expense to Owner.
   3. Remove damaged, or otherwise unacceptable, products from the project site when directed by the Contracting Agency.

B. Storage and Handling Requirements:
   1. Store products in covered storage area protected from the elements, outside the general construction area until installed. Maintain ambient conditions required by manufacturer of each product.
   2. Store products in original factory packaging until actual installation.
   3. Handle items carefully to avoid breaking, chipping, denting, scratching, or other damage.
   4. Replace damaged items with same item in new condition.

1.11 WARRANTY

A. See Division 1 for general warranty requirements.

B. Warranty workmanship, labor, and materials for a period of one year from the date of final acceptance, without limitation, except where longer warranty periods are specified in a specific Section under this Division, or in the General Conditions of the Contract. Promptly coordinate and perform Warranty work at the Contractor's sole expense.

C. Submit necessary documentation to each appropriate Manufacturer's Representative to validate manufacturer's warranty.

D. Provide one copy of warranty documentation and confirmation receipt from the Manufacturer's Representative.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:
   1. Cover and protect open ends and individual components of the ventilation and piping systems during construction when dust, dirt, debris, overspray, or other potential construction contaminates could enter the air distribution system or elements (ducts, fans, VAV boxes, silencers, etc.).
   2. Provide temporary construction filters over return airshaft openings and at air handling unit return air dampers.

B. Demolition/Removal:
   1. Examination:
      a. Drawings involving existing conditions are based on building record drawings and limited field observation.
      b. Conduct a site inspection prior to submission of Bid to become thoroughly familiar with the Scope of Work.
      c. Report discrepancies to the Contracting Agency before disturbing existing installation.
      d. Verify field measurements, locations, sizes, and routing arrangements and site conditions.
      e. Commencement of demolition implies Contractor accepts existing conditions.
   2. Preparation:
      a. In buildings that will remain occupied during construction, coordinate with the Contracting Agency in advance before scheduling disruption of services.
      b. This facility will remain occupied during construction. Coordinate with the Contracting Agency in advance before scheduling disruption of services.
      c. Accommodate the Contracting Agency's normal business schedule to the maximum extent possible.
      d. Provide temporary mechanical systems to maintain existing systems in service during construction. Submit plan for providing temporary services for approval.
      e. Cover and protect open ends and individual components of the ventilation and piping systems during construction when dust, dirt, debris, overspray, or other potential construction contaminates could enter the air distribution system or elements (ducts, fans, VAV boxes, silencers, etc.).
      f. Provide temporary construction filters over return air openings and at air handling unit return air dampers.
      g. When work must be performed on operating equipment or systems, use personnel experienced in the operation of the specific equipment affected.
      h. Submit work plan and schedule for approval prior to beginning work.
      i. Notify the Contracting Agency and the Fire Department Agencies at least 24 hours before partially or completely disabling Fire Suppression, Alarm, or Notification Systems.
   3. Execution:
      a. Remove, relocate, and extend existing installations to accommodate new construction as shown and as required for phasing or final systems operations.
      b. Disconnect and remove abandoned fixtures, terminal units and other products. Remove abandoned controls and associated wiring to source of signal and supply.
      c. Remove abandoned piping and ductwork back to source of supply or other point as shown, and cap tight to accept normal system test pressures.
      d. Remove exposed abandoned or indicated for demolition controls, equipment, pipes and ducts, including abandoned items above ceiling finishes. Cut concealed pipes and ducts flush with walls and floors. Remove brackets, stems, hangers and other accessories. Fill and repair surfaces to match surrounding finish work.
      e. Repair damaged surfaces, insulation, ceiling tiles, and fireproofing. Plug, patch, repair holes, and surfaces. Repair assemblies to match existing fire,

temperature, and/or smoke ratings. Refinish surface to match surrounding finish work.

f. Seal room penetrations to maintain pressure relationships to adjacent spaces.
g. Maintain access to existing mechanical and electrical installations that remain active. Modify installation or provide access panels as appropriate; coordinate with the Contracting Agency.
h. Turn salvaged items over to the Contracting Agency as noted on the Drawings. Dispose of items that the Contracting Agency does not desire to retain at a legal disposal site.
i. Recover refrigerant charge from existing units to be demolished in accordance with EPA section 608 of the Clean Air Act of 1990. Remove recovered refrigerant from the premises.

3.2 INSTALLATION

A. Special Techniques:
1. Provide temporary heating to maintain the building at 65 degrees F.
2. Provide temporary ventilation with filtration in interior building locations that will remain occupied during normal working hours when the normal means of ventilation is inoperable.

B. Interface with Other Work:
1. Electrical Work:
a. Coordinate with Division 26
b. See Section 20 0513 - Common Motor Requirements for additional requirements..
c. Suggested Coordination Schedule: The Contractor is responsible to provide heating, ventilating, and plumbing equipment motors and controls, including fire suppression controls. Unless otherwise indicated on the Drawings, it is recommended that motors and controls be furnished, set in place, and wired in accordance with the following schedule. “CC” applies to either a Control subcontractor working as a sub to the General Contractor or to the Divisions 20, 21, 22, 23, 25 Mechanical subcontractor. Coordinate work between subcontractors.

MC - Divisions 20, 21, 22, 23, 25-Mechanical CC - Divisions 20, 21, 22, 23, 25-Controls EC - Divisions 26, 27 and 28-Electrical	Furnished By	Set in Place By	Power By	Control By
Equipment Motors	MC	MC	EC	CC
*Magnetic motor starters:				
Automatic controlled, w/ or w/o HOA switches	EC	EC	EC	CC
Automatic controlled, w/ or w/o HOA switches, and that are furnished as part of factory wired equipment	MC	MC	EC	MC
*Manual Motor Starters:				

MC - Divisions 20, 21, 22, 23, 25-Mechanical CC - Divisions 20, 21, 22, 23, 25-Controls EC - Divisions 26, 27 and 28-Electrical	Furnished By	Set in Place By	Power By	Control By
Manually controlled	EC	EC	EC	EC
Manually controlled, and that are furnished as part of factory wired equipment	MC	MC	EC	MC
Combination disconnect and motor starter	EC	EC	EC	CC
Motor Control Centers	EC	EC	EC	CC
Variable Speed Drives	MC	EC	EC	CC
Push-button stations, pilot lights, contactors, multi-speed switches	EC	EC	EC	EC
Disconnect switches, thermal overload switches, manual operating switches	EC	EC	EC	--
Multi-speed switches furnished as part of factory wired equipment	MC	MC	EC	MC
Temperature control relays, transformers, electric thermostats, time clocks, etc., that are not part of factory furnished equipment	CC	CC	CC	CC
Remote bulb thermostats, motor valves, controls, which are an integral part of factory furnished mechanical equipment.	MC	MC	EC	MC
Fire sprinkler suppression controls	MC	MC	EC	MC
Duct smoke detectors, including relays for fan shutdown	MC	MC	EC	EC
Fire/Smoke Dampers	MC	MC	EC	EC
Control Systems	CC	CC	CC	CC
Damper & Valve Actuators (120 v)	CC	CC	EC	CC
Damper & Valve Actuators (24 v)	CC	CC	CC	CC
Master Building Power quality monitors (loss/reversal)	EC	EC	EC	CC
Boiler and water heater controls, boiler burner control panels, internally wired	MC	MC	EC	MC
Electric Generator(s)				
Genset(s)	EC	EC	EC	EC
Fuel Lines	MC	MC	--	--
Day Tank (if separately furnished)	MC	MC	EC	MC
Silencer	EC	MC		

* Provide starters in accordance with Division 26. Note that a thermal overload relay in each phase is required for each starter (packaged equipment included).

d. Coordination with Room Numbering:
   1). Certain systems provided under this Division rely on identification systems that are based on room names or numbers.
   2). The numbering scheme indicated in this Project Manual is based on room numbers assigned during the design process.
   3). The Contracting Agency reserves the right to change the numbers prior to Substantial Completion, and the final names and numbers will not necessarily match those found in the Project Manual.
   4). Obtain from The Contracting Agency the final room numbers prior to commencing the numbering of Divisions 20, 21, 22, 23, 25 systems.
   5). Tag and label system equipment and devices in accordance with the final numbering scheme at no additional cost.

3.3 REPAIR/RESTORATION

A. Touch-up, repair or replace product components broken during installation or startup with new replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

C. Clean and repair existing identification tags/labels, hangers, supports, insulation, materials, instrumentation, and equipment that remain or are to be reused or are affected by this work. Materials and equipment which require major repair may be replaced at the Contractor's option.

D. Plug, patch and repair surfaces, adjacent construction, and finishes damaged during demolition and new work. Restore to original condition or better including fire, smoke or temperature ratings or listings. Retexture surfaces to match surrounding surfaces. Repaint affected surfaces, with extent of paint to include adjacent surfaces to next wall or other clean break to avoid mismatched finish. Replace cracked or damaged ceiling tiles. Repair fire proofing, assembly fire ratings, and construction resistant to the passage of smoke.

3.4 SITE QUALITY CONTROL

A. Site Tests and Inspections:
   1. The Contracting Agency may inspect and approve sample installation of systems and equipment prior to general installation of units.
   2. Schedule, obtain, and pay for fees and/or services required by the local Authorities Having Jurisdiction and by these specifications, to test the mechanical systems.
   3. Notify the Contracting Agency a minimum of 24 hours in advance of tests. Certify in writing that specified tests have been made in accordance with the specifications.
   4. Immediately correct deficiencies that are discovered during the tests and repeat tests until system is approved. Do not cover or conceal piping, equipment or other portions of the mechanical installations until satisfactory tests are made and approved.
   5. Under the direction of the Contractor and in the presence of the Contracting Agency, place the entire mechanical installation and/or any portion thereof in operation to demonstrate satisfactory operation.

6. Arrange for the Contracting Agency to witness tests. The Contracting Agency may waive witnessing any specific test at its discretion.

B. Non-Conforming Work:
   1. Expediently remove and provide new for work not conforming to the Project Manual upon discovery; including warranty and discovery periods.
   2. Warranty period shall start over for replaced equipment and installation from the date of accepted by the Contracting Agency.

C. Manufacturer Services:
   1. Authorized manufacturer's representative shall be on-site for testing, start-up, functional check-out, and commissioning of equipment and systems.
   2. Procurement, installation, start-up, and warranty services to be provided by manufacturer's authorized representative and service company.
   3. Equipment, devices, hardware, and software to be approved for application, and of current production. Original manufacturer's parts, hardware, software, and support to be available for ten years after installation.

3.5 CLEANING

A. Upon completion of installation and prior to initial operation, remove debris, and clean and wipe down equipment, piping, ductwork and floor to eliminate dust and dirt.

3.6 CLOSEOUT ACTIVITIES

A. Demonstration: Provide demonstration, conducted by authorized factory start-up personnel, to the Contracting Agencies authorized personnel as listed in each individual specification section.

B. Training: In addition to training specified in each individual specification section, provide 8 additional hours of operational instruction conducted by qualified personnel, covering any of the mechanical systems and installation requested by the Contracting Agency to its authorized maintenance personnel.

3.7 PROTECTION

A. Provide finished products with protective covers during balance of construction.

B. Provide open duct ends, grilles and diffusers with protective covers during balance of construction.

C. Provide open pipe ends with protective caps during balance of construction.

END OF SECTION 20 0000

SECTION 20 0513

COMMON MOTOR REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements, products and methods of execution relating to electric motors in general and shall apply to motors furnished as integral parts of equipment specified in this and other Divisions.

1.2 REFERENCES

A. Codes and Standards:
   1. See section 20 0000 - Mechanical General Requirements.
   2. National Electrical Manufacturers Association, NEMA, Standards Publication Motors and Generators, MG-1.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide product performance characteristics as specified or scheduled on drawings.

1.4 PRE-INSTALLATION MEETINGS

A. See section 20 0000 - Mechanical General Requirements.

1.5 SUBMITTALS

A. See section 20 0000 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
   1. Provide a tabular listing of motors including the following information: Tag (from drawings), location, function, actual nameplate FLA, fuse size used, overload relay used, and overload setting.
   2. Make copy of list available during Substantial Completion observation by the Contracting Agency. Include list in Operations and Maintenance Manuals.

1.6 CLOSEOUT SUBMITTALS

A. See section 20 0000 - Mechanical General Requirements.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. See section 20 0000 - Mechanical General Requirements.

1.8 QUALITY ASSURANCE

A. See section 20 0000 - Mechanical General Requirements.

B. Certifications: Motors shall conform to governing NEMA Standards and ASA Form C-50 for rotating machinery.

1.9 DELIVERY, STORAGE AND HANDLING

A. See section 20 0000 - Mechanical General Requirements.

1.10 WARRANTY

A. Manufacturer Warranty: See section 20 0000 - Mechanical General Requirements, for general mechanical warranty requirements.

PART 2 - PRODUCTS

2.1 SUPPLY VOLTAGE

A. Supply voltage shall be determined from the electrical plans where nominal utility voltage will be indicated.

B. Motor voltage shall be stamped on the nameplate and relate to the nominal voltage as follows:

THREE PHASE MOTORS	
Nominal Volts	Motor Ratings
208 volts	200V, 208V, or 208/220V
240 volts	220V or 208/220V
480 volts	460V
SINGLE PHASE MOTORS	
Nominal Volts	Motor Ratings
120 volts	115V or 115/230V
240 volts	230V or 115/230V
208 volts	200V or 208V

Note: Provide nameplate indicating that voltage for a motor operating at 208 VAC is suitable.

C. Voltage variation: Motors shall be designed to operate within the parameters of these requirements at rated load and with a voltage variation from the name plate voltage of plus or minus ten percent.

D. Motors shall operate successfully at rated load and at rated voltage with a maximum frequency variation of five percent above or below rated frequency.

E. Motors shall operate successfully at rated load with a combined maximum variation in the voltage and frequency of five percent above or below rated voltage and rated frequency.

F. Motors that operate with Variable Speed Drive (VSD) controllers shall be suitable for the application.
   1. Motors operated using PWM type VSDs: Conform to NEMA MG 1 Part 31 requirements.
   2. Motors operated using six-step type VSDs: Conform to NEMA MG 1 Part 30 or Part 31 requirements.

2.2 LOCKED ROTOR CURRENT

A. No motor above 15 HP shall have a locked rotor current in excess of NEMA code letter "G". Smaller motors may have a higher locked rotor rating, but in no case exceeding the recommended NEMA rating as related to motor size.

2.3 MOTOR INSULATION

A. Unless otherwise specified, motor insulation shall be NEMA Class "B" (or better). Based on 40 degrees C. maximum ambient, and 90 degrees C. maximum rise, total maximum operating temperature shall not exceed 130 degrees C.

2.4 MOTOR LOADING

A. No motors shall be subjected to loads exceeding the motor nameplate rating, under any normal operating condition.

2.5 MOTOR RATING

A. Motors are sized in conformity with the manufacturer's published information and shall not be interpreted as the final requirement. Check each motor for adequacy in relation to the specific application.

B. Motors indicated as being connected to variable speed drives (VSD) shall be rated for VSD service.

2.6 HIGH EFFICIENCY AC MOTORS

A. Furnished high efficiency electric motors for equipment that:
   1. Require a three horsepower or larger drive motor.
   2. Have duty cycles classified as continuous.

B. Efficiency of the motors shall be determined by NEMA Standard MG 1 - 12.536 and shall have efficiencies equal to or better than:

Motor Size	Nominal Efficiency
Through 3 HP	89 percent
Over 3 HP through 10 HP	91 percent

Motor Size	Nominal Efficiency
Over 10 HP through 30 HP	93 percent
Over 30 HP through 60 HP	94 percent
Over 60 HP through 100 HP	95 percent
Over 100 HP	95 percent

2.7 MOTOR HOUSING FEATURES

A. Open drip-proof, totally enclosed fan cooled (TEFC), or explosion-proof, as appropriate for the use intended and the environment where installed, or as noted. Provide totally enclosed fan cooled motors for equipment below grade, located outdoors, or operating in damp or dust-laden locations. Provide a continuous moisture drain that is screened against insect entry for totally enclosed motors.

B. Oversized external conduit boxes at least one size larger than NEMA standard.

2.8 SHAFT GROUNDING RINGS

A. Motors operated on variable frequency drives shall be equipped with a maintenance-free, conductive microfiber shaft grounding ring (SGR) to meet NEMA MG-1, 3.4.4.4.3 requirements, with a minimum of two rows of circumferential microfibers to discharge damaging shaft voltages away from the bearings to ground. SGR's Service Life: Designed to last for service life of motor. Provide AEGIS SGR Conductive MicroFiber Shaft Grounding Ring, or approved equal.

B. Application Note: Motors up to 100 HP shall be provided with one shaft grounding ring installed on either the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor with the exception of line contact bearings in the drive end of the machine. In this case the line contact bearing shall be electrically insulated and the AEGIS Bearing Protection Ring installed on the opposite drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the shaft grounding ring manufacturer's recommendations.

2.9 HIGH FREQUENCY BONDING

A. Motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection. Provide AEGIS HF Ground Straps, or equal.

B. Application Note: High frequency grounding straps shall be used to ensure the proper grounding of inverter driven induction motor frames.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions: Cover motors to protect them from construction dirt and debris.

3.2 INSTALLATION

A. Special Techniques:
   1. Installation of motors shall be as required by the driven equipment. Make sure motor design and characteristics are suitable for the application.
   2. Electrical connections for motors shall conform to NEC Articles 430 and 440 as applicable, and to any state and local code having jurisdiction.
   3. Unless furnished as part of a complete package including disconnects and control, and/or motor fuse protection, protect motors by Bussmann Fusetron Dual-Element Time Delay fuses, or approved equal.
   4. Megger motor windings prior to starting. Include log of megger readings in the Operations and Maintenance manuals.
   5. Verify correct rotation of motors.
   6. Comply with Article 460 of the National Electrical Code for installation of power factor correction capacitors.
   7. Motor sizes shown on the Drawings are estimates based upon the mechanical design. Where motors actually furnished are of a different size than those shown, motor circuit components (starters, disconnects, overcurrent devices, and conductors) shall be revised to suit the motors actually furnished, without increase in the Contract amount. Similarly, motor overcurrent device sizes shown on the Drawings or specified are based upon estimated motor code letters, overcurrent device manufacturers' recommendations, and full-load currents from the NEC Tables. Where the motors actually furnished require different sizing, the sizes of the overcurrent devices shall be adjusted to conform to the NEC, without increase in the Contract amount.

3.3 SHAFT GROUNDING RINGS (MOTORS WITH VARIABLE FREQUENCY DRIVES)

A. Shaft grounding rings (SGR) shall be factory installed inside the motors by the manufacturer wherever possible. SGRs may be field installed by installing contractor subject to Engineer's approval. Provide AEGIS SGR Colloidal Silver Shaft Coating, or approved equal, on shafts prior to rings installation, per SGR manufacturer's recommendations, after first cleaning shafts.

B. Install and test SGRs in accordance with manufacturer's recommendations. Install the SGR so that the aluminum frame maintains an even clearance around the shaft. Conductive microfibers shall be in full circumferential contact with conductive metal surface of the shaft. Do not use thread lock to secure the mounting screws as it may compromise the conductive path to ground. If thread lock is required, use a small amount of EP2400 AEGIS Conductive Epoxy, or approved equal, to secure the screws in place.

C. Shafts shall be clean and free of any coatings, paint, or other nonconductive material (clean to bare metal). Depending upon the condition of the shaft, it may require using emery cloth or Scotch-Brite. If the shaft is visibly clean, a non-petroleum based solvent may be used to remove any residue. Check the conductivity of the shaft using an ohm meter. Ohms test: Place the positive and negative meter leads on the shaft at a place where the microfibers will contact the shaft. Each motor will have a different reading but in general one should have a maximum reading of less than 2 ohms. If the reading is higher, clean the shaft again and retest.

D. After motors with SGRs are fully installed in the field (in equipment, assemblies, or individually), for both factory installed SGRs and field installed SGRs, test for a conductive path to ground using an Ohm meter. Place one probe on metal frame of SGR and one probe on motor frame. Motor must be grounded to common earth ground with variable frequency drive according to applicable standards. Verify that SGR installations and test readings comply with SGR manufacturer's requirements.

3.4 HIGH FREQUENCY BONDING (MOTORS WITH VARIABLE FREQUENCY DRIVES)

A. Motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection. Provide AEGIS HF Ground Straps, or approved equal. After motors with SGRs are fully installed in the field (in equipment, assemblies, or individually), for both factory installed SGRs and field installed SGRs, test for a conductive path to ground using an Ohm meter.

3.5 REPAIR/RESTORATION

A. Repair any components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

END OF SECTION 20 0513

SECTION 20 0529

MECHANICAL HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. General hanger and support requirements for building service piping and mechanical equipment.
2. Performance based seismic restraint requirement for non-structural mechanical systems and components.
3. Penetrations, sleeves and seals.

B. Related Sections:
1. 22 1100 - Domestic Water Piping and Specialties
2. 22 1300 - Sanitary Waste and Vent Piping and Specialties
3. 23 1123 - Fuel Gas Piping and Specialties
4. 23 2113 - Hydronic Piping and Specialties
5. 23 2123 - Hydronic Pumps
6. 23 3400 - HVAC Fans
7. 23 3600 - Air Terminal Units
8. 23 5216 - Condensing Boilers and Accessories
9. 23 6300 - Refrigerant Condensers
10. 23 7323 - Central Air Handling Units

1.2 REFERENCES

A. Codes and Standards:
1. See 20 000 – Mechanical General Requirements.
2. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
4. SMACNA HVAC Duct Construction Standards - Metal and Flexible (current edition).
5. ASCE 7-10 Minimum Design Loads for Buildings and Other Structures.

B. Abbreviations, Acronyms and Definitions:
1. Refer to Section 20 0000 - Mechanical General Requirements for general mechanical related definitions.
2. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

1.3 DESCRIPTION

A. Design Requirements:
1. Equipment and piping system support:
   a. Select and apply pipe hangers and supports per MSS SP69 using stock or production parts whenever possible.
   b. Design support spacing such that free span of piping does not exceed Code or MSS SP69 criteria (whichever is most restrictive).

c. Calculate required supporting force at each hanger location to confirm hanger type and hanger rod diameter selection.
d. Provide hangers such that equipment connection points do not carry connected piping load.

2. Seismic restraint systems:
   a. Refer to the structural drawings and specifications.
   b. For design not included on the structural drawings: Provide certified seismic control anchoring and support system products and certified application design and installation supervision services from a single pre-approved product manufacturer. The applications design may also be provided by an approved Alaska licensed professional structural engineer (PE).
   c. It is the design intent to anchor, brace and support the facilities mechanical equipment, system piping to the buildings structure such that the systems will remain in place and operational following a design seismic or high wind event.
3. Building Design Criteria:
   a. Wind design data: See Structural Drawings.
   b. Seismic design data: See Structural Drawings.
   c. Component Importance Factors, Ip
      1). Fuel gas system: Ip = 1.5
      2). Piping Importance Factor: Ip = 1.0
      3). All other components: Ip = 1.0.

B. Performance Requirements:
1. Provide hangers and supports which allow for the free expansion and contraction of system piping without transferring tensile and compressive stresses to adjacent supports or connected equipment. Provide additional expansion loops, pipe anchor and pipe guide assemblies as required.
2. Coordinate hanger and support anchor locations and embedment depth requirements with structural.
3. Provide flexible connectors for piping systems which pass through seismic building joints. Design flexible connects for design building offset plus 100 percent safety factor.
4. Support fire suppression system piping and equipment accordance with the provisions of Section 21 1000 - Water Based Fire Suppression Systems.
5. Support plumbing piping in accordance with this section and Uniform Plumbing Code requirements; whichever is more restrictive. In case of conflicts, follow UPC guidance.
6. Support ductwork in accordance with Section 23 3100 - Ducts and Accessories.
7. Special Performance Requirements for Open Ceiling Spaces:
   a. Coordinate the support of piping, ductwork, lighting and electrical cabling in open ceiling spaces (utilizing the shop drawing review process) to provide a uniform and symmetrical appearance.
   b. In general, utilize trapeze hanger style support systems with hangers equally spaced based on the limiting component being supported. Provide hanger rods vertical and straight. Trim hanger rood ends to provide a “finished” appearance.

C. Additional Seismic/Wind Load Performance Requirements:
1. Design seismic and/or wind load restraint devices for non-structural mechanical and electrical equipment and building systems including pad-mounted equipment

located within and exterior to the building as required by the Authority Having Jurisdiction.
2. Submit seismic calculations for review and approval, which confirm the seismic support design for equipment and building systems requiring seismic restraint.
3. Equipment with factory mounted internal vibration and seismic restraint devices shall meet the vibration and seismic control requirements of this section.

1.4 SUBMITTALS

A. See Section 20 0000 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
1. Provide manufacturers catalog data, including load capacity, embedment depth.
2. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

C. Shop Drawings:
1. Provide shop drawings for housekeeping pads and roof curbs (with dimensioned penetrations) and field fabricated support systems.

D. Seismic/Wind Load Calculations
1. Submit sealed structural engineering calculations, drawings, and details to support the product restraint selection and installation configuration for each seismic / wind load restraint application.
2. Coordination and approval of non-structural element attachment techniques and design loads with the project's structural design Engineer of Record.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. General:
1. Piping and support systems shall be malleable iron, steel or copper.
2. Ferrous hangers and supports installed outdoors or in unheated spaces shall be hot dipped galvanized.
3. Select and apply pipe hangers and supports per MSS SP58.
   a. Use stock or production parts whenever possible.
   b. Calculate weight balance to determine the required supporting force at each hanger location and to eliminate pipe weight load at each equipment connection.
4. Fabricate and install pipe hangers and supports per MSS SP58 recommended practices.
5. Hangers shall be designed to securely lock using a mechanical fastener. Hangers and supports using gravity type locking are not acceptable. For example, adjustable swivel ring Type 6 is not allowed.
6. Pre-engineered support systems such as Unistrut, Super-Strut, B-Line and K-Line may be used in accordance with manufacturers load limits.
7. Manufacturers: Grinnell, M-CO Michigan Hanger Company, Kin Line.

B. Plumbing Piping:
   1. Conform to the Uniform Plumbing Code requirements.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Adjustable swivel ring; split ring.
   3. Hangers for DWV and Cold Pipe Sizes two inch and over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe sizes two to four inch: Carbon steel, adjustable, clevis.
   5. Hangers for Hot Pipe Sizes six inches and over: Adjustable steel yoke, cast iron roll, double hanger.
   6. Multiple or Trapeze Hangers under six inches: Steel channels with welded spacers and hanger rods.
   7. Multiple or Trapeze Hangers for Hot Pipe Sizes six inches and over: Steel channels with welded spacers and hanger rods, cast iron roll.
   8. Wall Supports: Welded steel bracket and wrought steel clamp.
   9. Wall Support for Hot Pipe Sizes six inches and over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
   10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
   11. Floor Support for Hot Pipe Sizes up to four inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
   12. Floor Support for Hot Pipe Sizes six inches and over: Adjustable cast iron roll and stand, steel screws, and steel support.
   13. Vertical Support: Steel riser clamp.
   14. Provide copper plated hangers and supports for copper piping. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Hydronic Piping:
   1. Conform to ASME B31.9 and the International Mechanical Code.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Adjustable swivel ring; split ring.
   3. Hangers for Cold Pipe Sizes two inches and over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe sizes two to four inch: Carbon steel, adjustable, clevis.
   5. Hangers for Hot Pipe sizes six inches and over: Adjustable steel yoke, cast iron roll, double hanger.
   6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   7. Multiple or Trapeze Hangers for Hot Pipe Sizes six inches and over: Steel channels with welded spacers and hanger rods, cast iron roll.
   8. Wall Support: Welded steel bracket and wrought steel clamp.
   9. Wall Support for Hot Pipe Sizes six inches and over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
   10. Vertical Support: Steel riser clamp.
   11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
   12. Floor Support for Hot Pipe Sizes up to four inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
   13. Floor Support for Hot Pipe Sizes six inches and over: Adjustable cast iron roll and stand, steel screws, and steel support.
   14. Provide copper plated hangers and supports for copper piping. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Refrigerant Piping:
   1. Conform to ASME B31.5.

2. Hangers for pipe sizes 1/2 to 1-1/2 inch: Adjustable swivel ring, split ring.
3. Hangers for pipe sizes two inches and over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support: Welded steel bracket and wrought steel clamp.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
8. Provide copper plated hangers and supports for copper piping. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.2 ACCESSORIES

A. Hanger Rods: Mild steel, threaded both ends, threaded one end, or continuous threaded.

B. Escutcheons: Nickel or chrome plate with screws or springs for holding plate in position.

C. Pipe Protection Saddles: Shop fabricated, or purchase specially manufactured saddles specifically designed for the intended use. Provide saddles where roller type support is used, or where the pipe hanger is installed outside the insulation for protection of insulating jacket.

D. Outdoor applications: Metal components shall be galvanized.

2.3 INSERTS

A. Provide inserts to match the load bearing capacity of hangers scheduled in Part 3.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four inches.

C. Concrete deck inserts: Galvanized rod, steel plate, similar to Kin-Line figure 293.

D. Screw insert for concrete: Malleable iron similar to Grinnell figure 152.

2.4 PRE-ENGINEERED SUPPORT SYSTEMS

A. Manufacturers:
1. Unistrut.
2. Super-Strut.
3. B-Line.
4. K-Line.
5. Erico.

B. Materials:
1. Cold worked steel.
2. Type 304 stainless steel: Use for PVC, liquid-tight flex, or plastic-coated conduit installed to wood construction in outdoor, damp, corrosive or marine environments.

C. Finish:
   1. Heated indoor areas: Pre-galvanized zinc coating.
   2. Outdoor areas: Hot dipped galvanized finish. In addition, coat hot dipped galvanized finish channel field cuts with zinc rich paint provide by the support system manufacturer.
   3. Painted areas: Paintable galvanizing or phosphatized and primed.
   4. Surface metal raceways: U.L. Listed epoxy coating.

D. Channel:
   1. Standard Size: 1-5/8 inch x 1-5/8 inch. Gauge thickness as required for attached load.
   2. Standard Hole Pattern: Slotted. Provide solid channel in exposed public areas.

E. Nuts and Hardware:
   1. Channel nuts: Hardened steel (ASTM-A675 and ASTM A36).
   2. Bolts, screws and nuts: Hardened steel (ASTM-A307, ASTM A563 and SAE J429).
   3. Finish: Electroplated zinc.

F. Fittings: Plate steel (ASTM A635). Epoxy or electroplated zinc coating.

G. Mechanical Accessories: Provide accessories from the support system manufacturer designed for the specific equipment to be supported to include but not limited to:
   1. Splice and gusset plates.
   2. Corner angles.
   3. Specialized support brackets.
   4. Beam clamps with restraints.
   5. Column supports.
   6. Strut pipe clamps.
   7. Straps.
   8. Brackets.

2.5 PIPING ROOF SUPPORTS (NON-PENETRATING)

A. Manufacturers:
   1. Cooper Industries (Dura-Blok).
   2. Miro Industries, Inc.
   3. Pipe Pier.

B. Resilient, non-abrasive, UV resistant base. Galvanized steel channel and clamps. Zinc plated, adjustable hardware. Compatible with roof system.

C. Roof supports shall be provided to maintain piping a minimum of 3-1/2 inches above the roof surface.

2.6 EQUIPMENT ROOF CURBS

A. Field fabricated by architect Architectural. Coordinate size and location.

2.7 SEISMIC RESTRAINT SYSTEMS

A. Approved Manufacturers
   1. Amber Booth
   2. Vibro-Acoustics.
   3. International Seismic Application Technology (ISAT).
   4. Mason Industries
   5. Approved equal.

B. Provide structurally engineered equipment and building system seismic restraints in accordance with approved product manufacturers written installation instructions and seismic restraint manufacturer's product application and design recommendations.

2.8 SLEEVES, ACOUSTICAL SEALS AND FIRE-STOPPING

A. See Part 3 - PENETRATIONS.

B. Sleeves for pipes through fire rated and fire resistive floors and walls, and fire proofing: UL listed prefabricated fire rated sleeves and seals.

2.9 WALL/FLOOR PENETRATION WATER SEALS

A. Mechanical seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.

B. EPDM seals.

C. 316 Stainless steel bolts and nuts.

D. Hot-dipped galvanized or coated sleeve with full water stop flange with continuous weld on both sides.

E. Manufacturer: Metraflex, Thunderline, Crouse-Hinds, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Installer: Perform work by experienced personnel previously engaged in construction and under the supervision of a qualified installation supervisor.

3.2 PREPARATION

A. Prior to installation, prepare detailed shop drawings of the planned installation of hanger and support products specified by this section. Coordinate the location, type and size of hangers and supports, housekeeping pads (thickness/perimeter overhang dimensions) and roof curbs with Architectural and Structural elements utilizing the shop drawing review process.

B. Submit shop drawings required by this section coordinated with the seismic design.

3.3 INSTALLATION

A. Special Techniques:
   1. Pipe Hanger and Support Installation:
      a. Install hangers and supports in accordance with manufacturer's instructions, applicable Code requirements and approved shop drawings.
      b. Support horizontal piping as scheduled.
      c. Independently support piping at equipment, so that the equipment supports no weight.
      d. Insulated piping shall have insulation saddles or 18 gauge steel insulation shields combined with sections of calcium silicate or cellular glass. Cold piping shall always be supported over the insulation and vapor barrier. Subject to approval, hot piping may be insulated around the supports.
      e. Trapeze hangers shall be used when more than three pipes run parallel and at same elevation. Provide rollers for hot pipes. Design rods and cross members to support three times the weight of pipes and contents plus 250 pounds.
      f. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
      g. Place hangers within 12 inches of each horizontal elbow.
      h. Use hangers with 1-1/2 inch minimum vertical adjustment.
      i. Support horizontal cast iron pipe adjacent to each hub, with five feet maximum spacing between hangers.
      j. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
      k. Support riser piping independently of connected horizontal piping.
      l. Provide saddles where roller type support is used, or where the pipe hanger is installed outside insulation for protection of insulating jacket.
   2. Equipment Bases and Support Installation:
      a. For cast-in-place concrete requirements refer to Division 3 - Concrete.
      b. Provide 5-1/2 inch. Provide 12 inches typical perimeter overhang.
      c. Provide 3-1/2 inch (2x4 form) concrete housekeeping pads for floor mounted central air handling units. Provide 12 inches typical perimeter overhang.
      d. Construct field fabricated equipment bases and supports from steel members and/or pre-engineered support systems. Prime and paint bases and supports black in accordance with Division 9 - Finishes. Pre-engineered support systems which are factory coated are not required to be painted.
   3. Roof Curb Installation:
      a. Coordinate with Architectural for roof curb locations and dimensional and support requirements for roof mounted equipment.
   4. Mechanical Equipment Installation:
      a. Provide hardware and accessories necessary to mount fixtures and equipment. Adapt to field conditions.
      b. Securely fasten fixtures and equipment to the building structure in accordance with the manufacturer's installation recommendations.
      c. Provide fabricated steel supports frames and bases for equipment not directly mounted on floor. For belt driven equipment provide rigid structural base in common with motor to maintain belt tension.
      d. Provide steel base plates for floor mounted fixtures and equipment to distribute the weight such that the floor load is not more than 100 PSF, unless special structural reinforcement is submitted for approval.

e. At wall attached fixtures and equipment weighing less than 50 pounds, provide backing plates at least 1/8 by 10 inch square sheet steel or two by 10 inch fire retardant treated wood securely built into the structural walls. Submit attachment details of heavier equipment for approval.
f. Painted fabricated steel support black in accordance with Division 9 - Finishes.

5. Penetrations:
   a. Coordinate mechanical penetrations with architectural and structural construction details prior to installation. Set sleeves in position in concrete formwork. Provide reinforcement around sleeves as required.
   b. Provide compatible materials, fasteners, adhesives, sealants, and other products required for proper installation.
   c. Provide penetrations through roof, exterior walls and floors (See floor penetration seals) to be weather and watertight.
   d. Fire-Stopping: Provide UL rated fire-stopping assemblies for rated roof, wall and floor penetrations in accordance with Division 7.
   e. Pipe and Duct Sleeves/Framed Openings:
      1). Provide sleeves for pipe and round ducts less than 16 inches diameter passing through floors, walls, ceilings, or roofs. Fabricate sleeves in non-load bearing walls from 20 gauge galvanized sheet steel conforming to ASTM A924 / A924M. Fabricate sleeves in load-bearing walls from standard-weight galvanized steel pipe conforming to ASTM A53 / A53M. Provide 1 inch clearance between the pipe or duct and sleeve opening. Oversize sleeves for cold piping to allow continuous insulation through sleeve.
      2). Provide framed openings for round ducts 16 inch diameter and greater and rectangular ductwork passing through floors, walls, ceilings, or roofs. Provide structural steel members for framed openings conforming to ASTM A36 / A36M. Provide 1 inch clearance between the duct and framed opening.
      3). Provide closure collars not less than 4 inches wide on each side of duct wall or floor penetration where sleeves or framed openings are provided. Fabricate collars for round and rectangular ducts with a minimum dimension less than 16 inches from 20 gauge galvanized steel. Fabricate collars for round and rectangular ducts with a minimum dimension of 16 inches or greater from 18 gauge galvanized steel.
      4). Provide escutcheons for piping and conduit passing through walls, floors and ceilings in finished areas, below counters and inside closets and casework subject to view when doors are open. Size escutcheons to cover sleeves. Secure escutcheons in position.
   f. Wall Penetration Seals:
      1). Provide pre-engineered wall penetration water seal systems for exterior wall penetrations.
      2). Select appropriate wall penetration sealing systems based on pipe/conduit material and nominal pipe/conduit size in accordance with the manufacturer's selection charts.
      3). Install piping/conduit and sealing system prior to waterproofing the wall. Grout void between water seal and outside face of foundation wall to provide continuous bearing surface for waterproofing fabric.
   g. Floor Penetration Seals:

1). Provide pre-engineered floor penetration water seal systems for floor penetrations in rooms where a pipe leak/failure could result in water damage to adjacent spaces (i.e. mechanical rooms located above the ground floor or basement) and other areas as noted.
2). Floor penetrations to include but not limited to: Building service piping, conduit, ductwork and building automation system wiring.
3). Extend floor penetration sleeves 2 inches above finished floor.

6. Roof Flashing: Provide EDPM pipe penetration and roof curb flashing in accordance with Section 07 5000 - Single-Ply EDPM Membrane Roofing, as an integral part of the roofing system.

B. Vibration, Seismic and Wind Restraint
1. Install vibration isolators, seismic control, and wind restraint systems in compliance with the manufacturer's written instructions, and certified and approved application engineering installation details.
2. Install vibration isolators, seismic control, and wind restraints so as not to stress or misalign equipment, piping, raceways, and ductwork.
3. Provide flexible connections for conduit, ducts, and piping for vibration isolated equipment.
4. Coordination installation to not degrade acoustical penetrations and vibration controls for ducts, pipes, and raceways.
5. Do not install rigid connections between isolated equipment and building structure that degrades the noise and/or vibration controls.
6. Submit equipment loads for pre-approval by the project Structural Engineer prior to equipment installation to avoid overstressing of the building structure. Coordinate seismic restraints with project Structural Engineer and incorporate requirements.
7. Seismic restraint systems shall not interfere with installation or maintenance access to other building systems.
8. Provide general bracing from structural beam flanges, upper truss cords in bar joist construction, cast in place inserts, or wedge type drill-in concrete anchors.
9. Restraining straps or J-bolts shall be used as secondary restraint on beam clamps that support dead loads. Beam claps lacking secondary restraint features shall not be used.
10. Install seismic cable assemblies taut on non-vibration isolated systems and with a slight amount of slack for vibration isolated systems to avoid short circuiting of isolated equipment and piping.
11. Seismic single arm braces may be used in place of cables on rigidly attached systems and in place of cables on isolated systems when resilient bushings are used.

C. Interface with Other Work: Coordinate and sequence installation of hangers and supports with trades responsible for portions of this and other related sections of the Project Manual.

3.4 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

3.5 SITE QUALITY CONTROL

A. Non-Conforming Work: Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

3.6 CLEANING

A. Waste Management: After construction is completed, clean and wipe down exposed surfaces.

3.7 ATTACHMENTS

A. Tables:
1. Pipe Support: Provide pipe support spacing as indicated in the table below, except where spacing is more restrictive by Code.

PIPE SIZE (Inches)	HANGER SPACING MAX (Feet)			
	Steel		Copper	Polyethylene (1)
	Water Filled	Gas Filled		
1/2	7	9	5	
3/4	7	9	5	
1	7	9	6	
1-1/4	7	9	7	
1-1/2	9	12	8	4
2	10	13	8	4-1/2
2-1/2	*11*	14	9	
3	12	15	10	5
4	14	17	12	6
6	17	21	14	
8	19	24	16	

(Based on Table 4, MSS SP-58, except for PE piping)
(1)(Based on manufacturer's data)

END OF SECTION 20 0529

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