

SECTION 09 21 16.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section Includes: Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.
 - 1. LEED Submittals (Projects authorized for LEED certification only):
 - a. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - b. "Product Certificates for Credit MR 5" Subparagraph below applies to LEED-NC, LEED-CS, and LEED for Schools.
 - c. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - d. "Product Certificates for Credit MR 5" Subparagraph below applies to LEED-CI. Retain option for Credit MR 5, Option 2.
 - e. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured[**and regionally extracted and manufactured**] materials. Include statement indicating cost for each regionally manufactured material.
 - f. First subparagraph below applies to LEED-CI Credit MR 5, Option 1 and Option 2.
 - g. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.

- h. First subparagraph below applies to LEED-CI Credit MR 5, Option 2.
- i. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.
- j. "Laboratory Test Reports for Credit EQ 4" Subparagraph below applies to LEED for Schools.
- k. Laboratory Test Reports for Credit EQ 4: For gypsum board shaft wall systems, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For shaft wall assemblies , from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

- B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.
- C. Low-Emitting Materials: Gypsum shaft wall assemblies shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated .
- B. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated .
 - 2. Minimum Base-Metal Thickness: As indicated .
- C. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
 - 1. Minimum Base-Metal Thickness: As indicated .
- D. Elevator Hoistway Entrances: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches, matching studs in depth, and not less than 0.033 inch thick.
- E. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than percent by weight.
- B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles of Project site.
- D. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- E. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following :

- a. [Georgia-Pacific Gypsum LLC](#), Subsidiary of Georgia Pacific; ToughRock Fireguard Shaftliner.
 - b. [National Gypsum Company](#); Gold Bond Brand Fire-Shield Shaftliner.
 - c. [USG Corporation](#); Sheetrock Brand Gypsum Liner Panel.
 - d. Substitute: see Section 01 25 00 – Substitution Procedures.
2. Thickness: 1 inch.
 3. Long Edges: Double bevel.
- F. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Georgia-Pacific Gypsum LLC](#), Subsidiary of Georgia Pacific; Dens-Glass Ultra Shaftliner.
 - b. [National Gypsum Company](#); Gold Bond Brand Fire-Shield Shaftliner XP.
 - c. [USG Corporation](#); Sheetrock Brand Mold Tough Gypsum Liner Panel.
 - d. Substitute: see section 01 25 00 – Substitution Procedures.
 2. Thickness: 1 inch.
 3. Long Edges: Double bevel.
 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- G. Gypsum Board: As specified in Section 09 29 00 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

- A. Recycled Content of Steel: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 unless otherwise indicated.
- C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Fire Trak Corp.](#); Fire Trak System attached to studs with Fire Trak Posi Klip.
 - b. [GCP Applied Technologies](#); FlameSafe FlowTrak System.
 - c. [Metal-Lite, Inc.](#); The System.
 - d. Substitutions: see Section 01 25 00 – Substitution Procedures.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09 29 00 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
 - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.
- E. Sound Attenuation Blankets: As specified in Section 09 29 00 "Gypsum Board."
- F. Acoustical Sealant: As specified in Section 09 29 00 "Gypsum Board."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 07 81 00 "Applied Fireproofing."

- B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 - 1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
 - 2. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints at locations indicated on Drawings while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
- H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
- I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16.23

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
- B. Related Requirements:
 - 1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs and ceiling joists.

1.3 ACTION SUBMITTALS

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

1.4 LEED Submittals (Projects authorized for LEED certification only):

- A. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.5 INFORMATIONAL SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 , hot-dip galvanized unless otherwise indicated.
- C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: As indicated on Drawings .
 - b. Depth: As indicated on Drawings .
 - 2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: As indicated on Drawings .
 - b. Depth: As indicated on Drawings .
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

- a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) ClarkDietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) Telling Industries Superior Metal Trim; Superior Flex Track System (SFT)
 - 3) Telling Industries; Vertical Slip Track .
 - 4) Substitutions: See section 01 25 00 – Substitution Procedures.

- E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 1. Products: Subject to compliance with requirements, provide one of the following :
 - a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
 - b. GCP Applied Technologies; FlameSafe FlowTrak System.
 - c. Metal-Lite, Inc.; The System.
 - d. Substitute: see Section 01 25 00 – Substitute Procedures.

- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: As indicated on Drawings .

- G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: As indicated on Drawings .
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Minimum Base-Metal Thickness: As indicated on Drawings .
 2. Depth: As indicated on Drawings .

- I. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 1. Configuration: Asymmetrical or hat shaped.

- J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
 1. Depth: As indicated on Drawings .
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

- K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Cast-in-place anchor, designed for attachment to concrete forms .
 - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, in size indicated on Drawings .
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
 - 1. Depth: As indicated on Drawings .
- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings .
 - b. Depth: As indicated on Drawings .
 - 3. Dimpled Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings .
 - b. Depth: As indicated on Drawings .
 - 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings .

5. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

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

a. Armstrong World Industries, Inc.; Drywall Grid Systems.

b. Chicago Metallic Corporation; Drywall Grid System.

c. USG Corporation; Drywall Suspension System.

d. Substitute: see Section 01 25 00 – Substitute Procedures.

2.4 AUXILIARY MATERIALS

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

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

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

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

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

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

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Furring Members:
1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches o.c.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

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

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Exterior gypsum board for ceilings and soffits.
 - 3. Texture finishes.
- B. Related Requirements:
 - 1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
 - 2. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
 - 3. Section 09 30 00 "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals (Projects authorized for LEED certification only):
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. "Product Certificates for Credit MR 5" Subparagraph below applies to LEED-NC, LEED-CS, and LEED for Schools.
 - 3. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material

manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. "Product Certificates for Credit MR 5" Subparagraph below applies to LEED-CI. Retain option for Credit MR 5, Option 2.
5. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured[**and regionally extracted and manufactured**] materials. Include statement indicating cost for each regionally manufactured material.
6. First subparagraph below applies to LEED-CI Credit MR 5, Option 1 and Option 2.
7. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
8. First subparagraph below applies to LEED-CI Credit MR 5, Option 2.
9. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.
10. "Product Data for Credit IEQ 4.1" Subparagraph below applies to LEED-NC, LEED-CI, and LEED-CS; coordinate with requirements for adhesives.
11. Product Data for Credit IEQ 4.1: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.
12. "Laboratory Test Reports for Credit IEQ 4" Subparagraph below applies to LEED for Schools.
13. Laboratory Test Reports for Credit IEQ 4: For adhesives used to laminate gypsum board panels to substrates, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles of Project site.
- D. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - 1. [Georgia-Pacific Gypsum LLC.](#)
 - 2. [National Gypsum Company.](#)
 - 3. [USG Corporation.](#)
 - 4. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
- B. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
 - 1. Thickness: 1/4 inch.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- D. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 3.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch, regular type or 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Georgia-Pacific Gypsum LLC; Fireguard C.](#)
 - b. [National Gypsum Company; Gold Bond Fire-Shield C.](#)
 - c. [USG Corporation; Firecode C Core.](#)
 - d. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
- B. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Georgia-Pacific Gypsum LLC; DensArmour Plus.](#)
 - b. [National Gypsum Company; Gold Bond e2XP Interior Extreme.](#)
 - c. [Temple-Inland Inc; GreenGlass Interior Gypsum Board.](#)
 - d. **Substitutions:** See Section 01 25 00 – Substitution Procedures.
 2. Core: As indicated .
 3. Long Edges: Tapered.
 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- C. Acoustically Enhanced Gypsum Board: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [National Gypsum Company; Sound Break.](#)
 - b. [Quiet Solution, Quiet Rock.](#)
 - c. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
 2. Core: As indicated .
 3. Long Edges: Tapered.

2.5 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Exterior Gypsum Soffit Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Georgia-Pacific Gypsum LLC; ToughRock Soffit Board.](#)
 - b. [National Gypsum Company; Gold Bond Brand Exterior Soffit Board.](#)
 - c. [USG Corporation; Sheetrock Exterior Gypsum Ceiling Board.](#)
 - d. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
 2. Core: As indicated .

- B. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Georgia-Pacific Gypsum LLC; Dens-Glass Gold.](#)
 - b. [National Gypsum Company; Gold Bond, e\(2\)XP.](#)
 - c. [USG Corporation; Securock Glass Mat Sheathing.](#)
 - d. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
 2. Core: As indicated .
- C. Cellulose Fiber-Reinforced Gypsum Sheathing Board: ASTM C 1278/C 1278M, gypsum sheathing, with manufacturer's standard edges.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [USG Corporation; Fiberock Aqua-Tough.](#)
 - b. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
 2. Type and Thickness: Regular, 1/2 inch thick.
 3. Size: 48 by 96 inches .

2.6 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [CertainTeed Corp.; GlasRoc Tile Backer.](#)
 - b. [Georgia-Pacific Gypsum LLC; DensShield Tile Backer.](#)
 - c. **Substitutions:** see section 01 25 00 – Substitution Procedures.
 2. Core: As indicated on Drawings .
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Custom Building Products; Wonderboard .](#)
 - b. [National Gypsum Company, Permabase Cement Board.](#)
 - c. [USG Corporation; DUROCK Cement Board.](#)
 - d. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
 2. Thickness: As indicated.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet .
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc .
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

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

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Fry Reglet Corp.](#)
 - b. [Gordon, Inc.](#)
 - c. [Pittcon Industries.](#)
 - d. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified .

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: 10-by-10 self-adhesive glass mesh.
2. Exterior Gypsum Soffit Board: 10-by-10 self-adhesive glass mesh.

3. Glass-Mat Gypsum Sheathing Board: 10-by-10 self-adhesive glass mesh.
 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound
- D. Joint Compound for Exterior Applications:
1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 2. Cementitious Backer Units: As recommended by backer unit manufacturer.
 3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Accumetric LLC; BOSS 826 Acoustical Sound Sealant.](#)
 - b. [Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.](#)
 - c. [USG Corporation; SHEETROCK Acoustical Sealant.](#)
 - d. **Substitutions:** see Section 01 25 00 – Substitution Procedures.
 2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 07 21 00 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
1. Wallboard Type: As indicated on Drawings .
 2. Type X: As indicated on Drawings .
 3. Flexible Type: As indicated on Drawings .
 4. Ceiling Type: As indicated on Drawings .
 5. Abuse-Resistant Type: As indicated on Drawings .
 6. Moisture- and Mold-Resistant Type: As indicated on Drawings .
 7. Type C: As indicated on Drawings .
 8. Glass-Mat Interior Type: As indicated on Drawings .
 9. Acoustically Enhanced Type: As indicated on Drawings .
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws .

- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. Curved Surfaces:
 - 1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
 - 2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 - 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- C. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings .
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.

2. Bullnose Bead: Use at outside corners where indicated .
 3. LC-Bead: Use at exposed panel edges .
 4. L-Bead: Use where indicated .
 5. U-Bead: Use at exposed panel edges .
 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges .
- E. Aluminum Trim: Install in locations indicated on Drawings .

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile or where indicated on Drawings .
 3. Level 3: Where indicated on Drawings .
 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated .
 - a. Primer and its application to surfaces are specified in other Section 09 91 23 "Interior Painting." Level 5 is suitable for surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting. It is considered a high-quality gypsum board finish.
 5. Level 5: Where indicated on Drawings .
 - a. Primer and its application to surfaces are specified in other Section 09 91 23 "Interior Painting."
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 00 - TILING

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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Stone thresholds.
 - 3. Waterproof membrane.
 - 4. Crack isolation membrane.
 - 5. Metal edge strips.
- B. Related Sections:
 - 1. Section 07 14 13 "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for waterproofing under thickset mortar beds.
 - 2. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 3. Section 09 63 40 "Stone Flooring" for stone thresholds.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile".
- C. Module Size: Actual tile size plus joint width indicated.

- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.5.
 - 2. Step Treads: Minimum 0.5.
 - 3. Ramp Surfaces: Minimum 0.8.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.
 - 3. Stone thresholds in 6-inch lengths.
 - 4. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 1. Stone thresholds.
 2. Waterproof membrane.
 3. Crack isolation membrane.
 4. Cementitious backer units.
 5. Metal edge strips.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup of each type of floor tile installation.
 2. Build mockup of each type of wall tile installation.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site .
 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Tile Type [CT-<#>]: Factory-mounted unglazed ceramic mosaic tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Keystones by Daltile; Division of Dal-Tile International Inc. or comparable product by one of the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Crossville, Inc.
 - c. Substitutions: see Section 01 25 00 – Substitution Procedures.
2. Composition: Impervious natural clay or porcelain .
3. Module Size: 1 by 1 inch .
4. Thickness: 1/4 inch.
5. Face: Pattern of design indicated, with cushion edges.
6. Surface: Smooth, without abrasive admixture.
7. Tile Color and Pattern: As selected by Architect from manufacturer's full range .
8. Grout Color: As selected by Architect from manufacturer's full range .
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cove: Cove, module size 1 by 1 inch .
 - b. Base Cap for Portland Cement Mortar Installations: Bead (bullnose), module size 1 by 1 inch .
 - c. Base Cap for Thin-Set Mortar Installations: Surface bullnose, module size 1 by 1 inch .
 - d. Wainscot Cap for Portland Cement Mortar Installations: Bead (bullnose), module size 1 by 1 inch .
 - e. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 1 by 1 inch .
 - f. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
 - g. External Corners for Portland Cement Mortar Installations: Bead (bullnose), module size 1 by 1 inch .
 - h. External Corners for Thin-Set Mortar Installations: Surface bullnose, module size 1 by 1 inch .
 - i. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
 - j. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

B. Tile Type [CT-<#>]: Unglazed square-edged quarry tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Quarry Tile by Daltile; Division of Dal-Tile International Inc. or comparable product by one of the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Summitville Tiles, Inc.
 - c. Substitutions: see Section 01 25 00 – Substitution Procedures.
 2. Face Size: 6 by 6 inches .
 3. Thickness: 3/8 inch .
 4. Wearing Surface: Nonabrasive, smooth .
 5. Tile Color and Pattern: As selected by Architect from manufacturer's full range .
 6. Grout Color: As selected by Architect from manufacturer's full range .
 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved with surface bullnose top edge, face size 6 by 6 inches .
 - b. Wainscot Cap: Surface bullnose, face size 6 by 6 inches .
 - c. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
- C. Tile Type [CT-<#>]: Unglazed paver tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Identity by Daltile; Division of Dal-Tile International Inc. or comparable product by one of the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Crossville, Inc.
 - c. Substitutions: see Section 01 25 00 – Substitution Procedures.
 2. Composition: Impervious natural clay or porcelain .
 3. Face Size: 11-13/16 by 11-13/16 inches .
 4. Thickness: 3/8 inch .
 5. Face: Pattern of design indicated, with square or cushion edges .
 6. Tile Color and Pattern: As selected by Architect from manufacturer's full range .
 7. Grout Color: As selected by Architect from manufacturer's full range .
 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cove: Cove, module size same as adjoining flat tile .
 - b. Base Cap for Portland Cement Mortar Installations: Bead (bullnose), module size same as adjoining flat tile .
 - c. Base Cap for Thin-Set Mortar Installations: Surface bullnose, module size same as adjoining flat tile .
 - d. Wainscot Cap for Portland Cement Mortar Installations: Bead (bullnose), module size same as adjoining flat tile .

- e. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size same as adjoining flat tile .
- f. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
- g. External Corners for Portland Cement Mortar Installations: Bead (bullnose), module size same as adjoining flat tile .
- h. External Corners for Thin-Set Mortar Installations: Surface bullnose, module size same as adjoining flat tile .
- i. Internal Corners: Cove, module size same as adjoining flat tile .
- j. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

D. Tile Type [CT-<#>]: Glazed wall tile .

1. Basis-of-Design Product: Subject to compliance with requirements, provide Stratford Place by DalTile; Division of Dal-Tile International Inc. or comparable product by one of the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Crossville, Inc.
 - c. Substitutions: see Section 01 25 00 – Substitution Procedures.
2. Module Size: 6 by 6 inches .
3. Thickness: 5/16 inch.
4. Face: Plain with modified square edges or cushion edges .
5. Tile Color and Pattern: As selected by Architect from manufacturer's full range .
6. Grout Color: As selected by Architect from manufacturer's full range .
7. Mounting: Factory, back mounted.
8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base for Portland Cement Mortar Installations: Coved, module size 6 by 6 inches
 - b. Base for Thin-Set Mortar Installations: Straight, module size 6 by 6 inches .
 - c. Wainscot Cap for Portland Cement Mortar Installations: Bullnose cap, module size 6 by 6 inches .
 - d. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 6 by 6 inches .
 - e. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
 - f. External Corners for Portland Cement Mortar Installations: Bullnose shape with radius of at least 3/4 inch unless otherwise indicated.
 - g. External Corners for Thin-Set Mortar Installations: Surface bullnose, same size as adjoining flat tile.
 - h. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
 2. Description: Match Architect's sample.

2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
1. Products: Subject to compliance with requirements, provide the following provide one of the following :
 - a. Noble Company (The); Nobleseal TS.
 - b. Substitutions: see Section 01 25 00 – Substitution Procedures.
- C. PVC Sheet: Two layers of PVC sheet heat-fused together and to facings of nonwoven polyester; 0.040-inch nominal thickness.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Compotite Corporation; Composeal Gold.
 - b. Substitutions: see Section 01 25 00 – Substitution Procedures.
- D. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
1. Products: Subject to compliance with requirements, provide one of the following :
 - a. Schluter Systems L.P.; KERDI.
 - b. Substitutions: see Section 01 25 00 – Substitution Procedures.
- E. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, SBS-modified-bituminous sheet with woven reinforcement facing; 0.040-inch nominal thickness.
1. Products: Subject to compliance with requirements, provide the following :
 - a. National Applied Construction Products, Inc.; Strataflex.
 - b. Substitutions: see section 01 25 00 – Substitution Procedures.

- F. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

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

- a. Bostik, Inc.; Hydroment Blacktop 90210.
- b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
- c. MAPEI Corporation; Mapelastatic AquaDefense with MAPEI Reinforcing Fabric.
- d. Mer-Kote Products, Inc.; Hydro-Guard 2000.
- e. Summitville Tiles, Inc.; S-9000.
- f. Substitutions: see section 01 25 00 – Substitution Procedures.

- G. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

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

- a. Bostik, Inc.; Durabond D-222 Duraguard Membrane .
- b. Laticrete International, Inc.; Latapoxy 24hr HydroProofing .
- c. MAPEI Corporation; AquaDefense.
- d. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.
- e. TEC; a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.
- f. **<Insert manufacturer's name; product name or designation>**Substitutions: see section 01 25 00 – Substitution Procedures.

- H. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.

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

- a. Boiardi Products; a QEP company; Elastiment 323 Cement Based Waterproofing, Anti-Fracture/Crack Suppression Membrane.
- b. C-Cure; UltraCure 971.
- c. MAPEI Corporation; Mapelastatic 315.
- d. Substitutions: see section 01 25 00 – Substitution Procedures.

2.5 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.

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

- a. Noble Company (The); Nobleseal CIS.

- b. Substitutions: see section 01 25 00 – Substitution Procedures.
- C. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.
- 1. Products: Subject to compliance with requirements, provide one of the following :
 - a. MAPEI Corporation; Mapeguard 2.
 - b. National Applied Construction Products, Inc.; Strataflex.
 - c. Substitutions: see section 01 25 00 – Substitution Procedures.
- D. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
- 1. Products: Subject to compliance with requirements, provide one of the following :
 - a. Bostik, Inc.; Hydroment Blacktop 90210.
 - b. Laticrete International, Inc.; Laticrete Blue 92 Anti-Fracture Membrane .
 - c. MAPEI Corporation; Mapelastic AquaDefense with MAPEI Reinforcing Fabric.
 - d. Mer-Kote Products, Inc.; Hydro-Guard 2000.
 - e. Summitville Tiles, Inc.; S-9000.
 - f. Substitutions: see section 01 25 00 – Substitution Procedures.
- E. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.
- 1. Products: Subject to compliance with requirements, provide one of the following :
 - a. C-Cure; UltraCure 971.
 - b. MAPEI Corporation; Mapelastic 315.
 - c. Substitutions: see section 01 25 00 – Substitution Procedures.

2.6 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
- 1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
 - 2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
 - 3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
- B. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 - a. Bostik, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.
- C. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 - a. Bostik, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. **<Insert manufacturer's name>**Substitutions: see section 01 25 00 – Substitution Procedures.
 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- D. Medium-Bed, Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4, ISO C2TS1. Provide product that is approved by manufacturer for application thickness of 5/8 inch
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 - a. Bostik, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Substitute: see section 01 25 00 – Substitution Procedures.
 2. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.
- E. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3[.], with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 - a. Bostik, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.

- d. Substitutions: see section 01 25 00 – Substitution Procedures.
- F. Organic Adhesive: ANSI A136.1, Type I[.], with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 - a. Bostik, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.

2.7 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
- C. Polymer-Modified Tile Grout: ANSI A118.7.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
- D. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Laticrete International, Inc.

- c. MAPEI Corporation.
- d. Substitutions: see section 01 25 00 – Substitution Procedures.

E. Grout for Pregrouted Tile Sheets: Same product used in factory to pregrout tile sheets.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

- 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
- 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

- 1. Products: Subject to compliance with requirements, provide one of the following :
 - a. Bonsal American; an Oldcastle company; Pro Spec Grout Sealer.
 - b. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
 - c. TEC; a subsidiary of H. B. Fuller Company; Grout Guard Penetrating Silicone Grout Sealer.
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with adhesives bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

- 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors composed of tiles 8 by 8 inches or larger.
 - f. Tile floors composed of rib-backed tiles.

- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

- 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
- 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

- 1. Ceramic Mosaic Tile: 1/16 inch.
- 2. Quarry Tile: 3/8 inch.

3. Paver Tile: 3/8 inch.
4. Glazed Wall Tile: 1/16 inch.
5. Decorative Thin Wall Tile: 1/16 inch.

- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
 2. Do not extend cleavage membrane waterproofing or crack isolation membrane under thresholds set in dry-set portland cement or latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane waterproofing or crack isolation membrane with elastomeric sealant.
- J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

- A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 EXTERIOR TILE INSTALLATION SCHEDULE

- A. Exterior Floor Installations:
 - 1. Tile Installation: Cement mortar bed (thickset) over waterproof membrane on concrete ; TCA F101 and ANSI A108.1A .
 - a. Thin-Set Mortar for Cured-Bed Method: Dry-set portland cement mortar.
 - b. Grout: Standard sanded cement grout.

3.9 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation: Cement mortar bed (thickset) with cleavage membrane; TCA F111 and ANSI A108.1A .
 - a. Thin-Set Mortar for Cured-Bed Method: Dry-set portland cement mortar.
 - b. Grout: Standard sanded cement grout.

END OF SECTION 09 30 00

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals (Projects authorized for LEED certification only):
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

"Product Data for Credit EQ 4.1" Subparagraph below applies to LEED-NC, LEED-CI, and LEED-CS; coordinate with requirements for sealants.

- 2. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.

"Laboratory Test Reports for Credit EQ 4" Subparagraph below applies to LEED for Schools.

- 3. Laboratory Test Reports for Credit EQ 4: For **[ceiling systems] [and] [sealants]**, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

Retain "Samples" Paragraph below for single-stage Samples, with a subordinate list if applicable. Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs for two-stage Samples.

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

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - 4. Perimeter moldings.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 5 percent of quantity installed, rounded to the nearest full box.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 5 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 5 percent of quantity installed.
 - 4. Impact Clips: Equal to 5 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

Retain "Fire-Resistance Ratings" Paragraph below only if products specified are part of a fire-resistance-rated assembly. Indicate rating, testing agency, and testing agency's design designation on Drawings.

- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

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

2.2 ACOUSTICAL PANELS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Source Limitations:
 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 2. Suspension System: Obtain each type from single source from single manufacturer.

Retain "Recycled Content" Paragraph below to specify recycled content if applying for LEED Credit MR 4.

- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- D. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.
- F. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 ACOUSTICAL PANELS ACT-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc. Ultima Open Plan, Item 1942, or comparable product by one of the following:
 1. CertainTeed Corp.
 2. USG Interiors, Inc.; Subsidiary of USG Corporation.
 3. See section 01 25 00 – substitution Procedures.

Do not assume that every combination of fire-resistance rating, classification, pattern, color, light reflectance, acoustical rating, edge detail, thickness, and size listed under each product description is available. Before retaining salient characteristics, verify availability with manufacturers.

Retain option in "Classification" Paragraph below along with permitted fire-resistance-rated suspension system if fire-rated assembly is required for Project. Indicate rating, testing agency, and testing agency's design designation on Drawings.

- B. Classification: Provide[**fire-resistance-rated**] panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type IV, mineral fiber base with membrane-faced overlay; Form 2, cloth.
 - 2. Pattern: E (lightly textured).
- C. Color: White.
- D. LR: Not less than 0.89 .
- E. NRC: Not less than 0.75.
- F. CAC: Not less than 35.
- G. AC: Not less than 170.
- H. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.
- I. Thickness: 3/4 inch.
- J. Modular Size: 24 by 24 inches.
- K. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL PANELS ACT-2

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide Armstrong World Industries, Inc. Optima Open Plan, Item 3355, or comparable product by one of the following:
 - 1. [CertainTeed Corp.](#)
 - 2. [USG Interiors, Inc.; Subsidiary of USG Corporation.](#)
 - 3. See section 01 25 00 – substitution Procedures.

Do not assume that every combination of fire-resistance rating, classification, pattern, color, light reflectance, acoustical rating, edge detail, thickness, and size listed under each product description is available. Before retaining salient characteristics, verify availability with manufacturers.

Retain option in "Classification" Paragraph below along with permitted fire-resistance-rated suspension system if fire-rated assembly is required for Project. Indicate rating, testing agency, and testing agency's design designation on Drawings.

- B. Classification: Provide[**fire-resistance-rated**] panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay; Form 2, cloth .
 - 2. Pattern: E (lightly textured).

- C. Color: White.
- D. LR: Not less than 0.90.
- E. NRC: Not less than 0.90.
- F. CAC: Not less than 25.
- G. AC: Not less than 200.
- H. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.
- I. Thickness: 1 inch.
- J. Modular Size: 24 by 24 inches.
- K. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.5 ACOUSTICAL PANELS ACT-3

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide Armstrong World Industries, Inc. Cortega UH Pattern, or comparable product by one of the following:
 - 1. [CertainTeed Corp.](#)
 - 2. [USG Interiors, Inc.; Subsidiary of USG Corporation.](#)
 - 3. Substitutions: See Section 01 25 00 – Substitution Procedures.

Retain option in "Classification" Paragraph below along with permitted fire-resistance-rated suspension system if fire-rated assembly is required for Project. Indicate rating, testing agency, and testing agency's design designation on Drawings.

- B. Classification: Provide **fire-resistance-rated** panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 - 2. Pattern: CD (perforated, small holes and fissured).
- C. Color: White.
- D. LR: Not less than 0.82.
- E. NRC: Not less than 0.55.
- F. CAC: Not less than 33.

- G. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.

Retain one of two "Thickness" paragraphs below.

- H. Thickness: 5/8 inch.
- I. Modular Size: 24 by 24 inches.
- J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.6 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

Retain "High-Humidity Finish" Subparagraph below if required. Finish is generally applicable to hot-dip galvanized steel with G60 (Z180) or greater coating and aluminum systems with anodized finish. ASTM C 635/C 635M requires salt-spray testing and high-humidity testing. On Drawings, show where high-humidity finishes are required.

1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated.

"Anchors in Concrete" Subparagraph below does not apply to power-actuated fasteners. Delete if no anchorage to concrete is required or if power-actuated fasteners are acceptable. Verify safety factor with Project's structural engineer. Revise testing methods below if required by authorities having jurisdiction.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **[five]** <Insert safety factor> times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

Retain an option in "Type" Subparagraph below; verify suitability with Project's structural engineer.

- a. Type: **[Cast-in-place]** **[Postinstalled expansion]** **[Postinstalled bonded]** anchors.

Retain one of three "Corrosion Protection" subparagraphs below or, if more than one is required, indicate by inserting location of each on Drawings. Zinc plating of mild class indicated protects against corrosion from an indoor atmosphere with rare condensation and subject to minimum wear or abrasion; revise thickness to suit more corrosive conditions or use stainless steel or nickel-copper alloy, depending on conditions. If postinstalled expansion anchors are used to attach nickel-copper-alloy wire hangers and braces, consider retaining nickel-copper anchors after verifying availability with manufacturers.

- b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
- c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
- d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.

Retain "Power-Actuated Fasteners in Concrete" Subparagraph below if power-actuated fasteners are allowed. Verify safety factor with Project's structural engineer.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **[10]** **<Insert safety factor>** times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

Retain one of "Zinc-Coated, Carbon-Steel Wire," "Stainless-Steel Wire," or "Nickel-Copper-Alloy Wire" subparagraphs below unless more than one type of wire is required. If more than one type of wire is required, indicate location of each on Drawings. See Evaluations for discussion on corrosion resistance of hangers and fasteners. Revise hangers to strap type if required by authorities having jurisdiction or by local union regulations.

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.

Retain second option in "Size" Subparagraph below if required by authorities having jurisdiction or if desired for extra security and quality (including corrosion allowance). Because large sizes are difficult to work with, their use could result in poor leveling tolerance.

4. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than **[0.106-inch-]** **[0.135-inch-]** **<Insert dimension>** diameter wire.

- E. Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate lateral forces.

- F. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

Retain "Impact Clips" Paragraph below if required. Indicate location on Drawings or by inserts.

- G. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

Retain "Clean-Room Gasket System" Paragraph below if required. Verify, with manufacturers, product availability and compatibility of gasket type with panels and suspension system specified. Indicate location on Drawings or by inserts.

- H. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including [manufacturer's standard] [closed-cell PVC] [neoprene] [antimicrobial] gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

2.7 METAL SUSPENSION SYSTEM Type 1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc. Silhouette XL 1/8" Reveal, or comparable product by one of the following:
 - 1. CertainTeed Corp.
 - 2. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - 3. Substitutions: See Section 01 25 00 – Substitution Procedures..
- B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 9/16-inch- wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: butt-edge type.
 - 3. Face Design: Flanges formed with an integral center reveal.
 - 4. Cap Material: Steel cold-rolled sheet.
 - 5. Cap Finish: Painted white .

2.8 METAL SUSPENSION SYSTEM Type 2

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc. Suprafine XL, or comparable product by one of the following:
 - 1. CertainTeed Corp.
 - 2. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - 3. Substitutions: See Section 01 25 00 – Substitution Procedures..
- B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip

galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 9/16-inch- wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white .

2.9 METAL EDGE MOLDINGS AND TRIM

Retain "Manufacturers" Paragraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
1. [Armstrong World Industries, Inc.](#)
 2. [CertainTeed Corp.](#)
 3. [USG Interiors, Inc.; Subsidiary of USG Corporation.](#)
 4. Substitutions: See Section 01 25 00 – Substitution Procedures.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member .
 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.10 ACOUSTICAL SEALANT

- A. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. [Pecora Corporation](#); AC-20 FTR Acoustical and Insulation Sealant.
 - b. [USG Corporation](#); SHEETROCK Acoustical Sealant.
 2. [Acoustical Sealant for Concealed Joints:](#)

- a. [Henkel Corporation](#); OSI Pro-Series SC-175 Acoustical Sound Sealant.
 - b. [Pecora Corporation](#); AIS-919.
 - c. [Tremco, Inc.](#); Tremco Acoustical Sealant.
- B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
 2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
 3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M , according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

[Retain "Fire-Rated Assembly" Subparagraph below if applicable.](#)

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

Retain option in first subparagraph below only if fire-resistance-rated ceilings are retained.

2. Splay hangers only where required [**and, if permitted with fire-resistance-rated ceilings,**] to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.

Retain first subparagraph below unless attaching to the roof deck is permitted by the structural engineer and authorities having jurisdiction. Revise if structural members are spaced too far apart for hangers and another method is required. For alternatives that may need to be detailed on Drawings, consult structural engineer and see CISCA's guidelines.

8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant where required on drawings in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
 - F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 2. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

Retain first subparagraph below for clean-room requirements.

5. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.

Retain subparagraph below for fire-resistance-rated assemblies.

6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.

Verify loadings in two subparagraphs below with structural engineer based on ceiling loadings and seismic zone where Project is located. CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 & 4" requires hanger wire attachment devices to be "capable of supporting 100 lbf (445 N)."

- a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

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SECTION 09 63 40 - STONE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).
 - 2. The University of Houston's Supplemental General Conditions and Special Conditions for Construction.

1.2 SUMMARY

- A. Section Includes:
 - 1. Dimension stone exterior flooring.
 - 2. Dimension stone interior flooring.
 - 3. Dimension stone stair treads and risers.
- B. Related Requirements:
 - 1. Section 07 14 13 "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for waterproofing, protection board and pedestals under stone flooring.
 - 2. Section 07 92 00 "Joint Sealants" for sealing control and expansion joints in stonework with elastomeric sealants.
 - 3. Section 09 30 00 "Tiling."

1.3 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
 - 1. Show locations and details of joints both within stone flooring and between stone flooring and other finish materials.
 - 2. Show direction of veining, grain, or other directional patterns.

- C. Samples for Initial Selection: For joint materials involving color selection.
- D. Samples for Verification:
 - 1. For each stone type indicated, in sets of Samples not less than 12 inches square. Include at least two or more Samples in each set and show the full range of color and other visual characteristics in completed Work.
 - 2. For each color of grout required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Material Test Reports:
 - 1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, according to referenced ASTM standards. Base reports on testing within previous three years.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stone flooring to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone flooring.
- B. Installer Qualifications: A firm or individual experienced in installing stone flooring similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
 - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 - 2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

- B. Mark stone units, on surface that is concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.8 FIELD CONDITIONS

- A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F during installation and for seven days after completion.
- B. Cold-Weather Requirements for Exterior Stone Flooring: 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 ACI 530.1/ASCE 6/TMS 602.
- C. Hot-Weather Requirements for Stone Flooring: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. Maintain temperature of materials below 100 deg F.
 - 2. Do not apply mortar to substrates with temperatures of 100 deg F and above.
 - 3. When the ambient temperature exceeds 90 deg F, fog spray installed stone flooring until damp at least three times a day until flooring is three days old.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single quarry with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
 - 2. Make stone slabs available for examination by Architect.
 - a. Architect will select aesthetically acceptable slabs and will indicate aesthetically unacceptable portions of slabs.
 - b. Segregate slabs selected for use on Project and mark backs indicating approval.

2.2 GRANITE

- A. Material Standard: Comply with ASTM C 615.

- B. Description: As indicated on Drawings
- C. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.3 LIMESTONE

- A. Material Standard: Comply with ASTM C 568.

Usually retain one of three options in "Classification" Subparagraph below. If naming varieties and sources, specifying a classification may be unnecessary but would provide additional quality control and a salient characteristic to use in determining if another variety or source is equivalent. First option generally applies to very porous limestone, such as shell limestone; second, to oolitic limestone; and third, to dolomitic limestone.

1. Classification: II Medium Density.
2. Stone Abrasion Resistance: Minimum value of 10 , based on testing according to ASTM C 241/C 241M or ASTM C 1353.

If retaining "Description" Paragraph below, retain one of three options. Coordinate below with "Classification" Subparagraph above. Description can serve as a salient characteristic if varieties other than those named are allowed and can be deleted if only specific named varieties are allowed.

- B. Description: Oolitic limestone.
- C. Varieties and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.

Select and Standard grades are hard to get in large sizes; gray is more plentiful than buff. Verify availability with producers.

1. Indiana Oolitic Limestone Grade and Color: As indicated on Drawings according to grade and color classification established by ILI.
- D. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.4 QUARTZ-BASED STONE

- A. Material Standard: Comply with ASTM C 616, Classification I Sandstone .
 1. Stone Abrasion Resistance: Minimum value of 10 , based on testing according to ASTM C 241/C 241M or ASTM C 1353.
- B. Finish: As indicated on Drawings .
- C. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.5 SLATE

- A. Material Standard: Comply with ASTM C 629, Classification II Interior.
 - 1. Stone Abrasion Resistance: Minimum value of 8 , based on testing according to ASTM C 241/C 241M or ASTM C 1353.
- B. Description: slate with a fine, even grain and unfading color, from clear, sound stock.
- C. Finish: As indicated .
- D. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.6 TRAVERTINE

- A. Material Standard: Comply with ASTM C 1527, Classification II Interior.
 - 1. Stone Abrasion Resistance: Minimum value of 10 , based on testing according to ASTM C 241/C 241M or ASTM C 1353.
- B. Cut: Vein.
- C. Filling: Fill pores on faces of stone with cementitious filler of color selected by Architect .
- D. Finish: As indicated .
- E. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.7 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following :

- a. [Essroc, Italcementi Group; Saylor's Plus.](#)
 - b. [Holcim \(US\) Inc.](#); Rainbow Mortamix Custom Color Cement/Lime.
 - c. [Lafarge North America](#); Eaglebond.
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in stone masonry mortar.
1. Products: Subject to compliance with requirements, provide one of the following :
 - a. [Davis Colors; True Tone Mortar Colors.](#)
 - b. [Lanxess Corporation](#); Bayferrox Iron Oxide Pigments.
 - c. [Solomon Colors; SGS Mortar Colors.](#)
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
- E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.
1. Products: Subject to compliance with requirements, provide one of the following :
 - a. [Holcim \(US\) Inc.](#); Rainbow Mortamix Custom Color Cement/Lime.
 - b. [Lafarge North America](#); Eaglebond.
 - c. [Lehigh Cement Company](#); Lehigh Custom Color Portland/Lime Cement.
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
- F. Aggregate: ASTM C 144; except for joints narrower than 1/4 inch , use aggregate graded with 100 percent passing No. 16 sieve.
1. White Aggregates: Natural white sand or ground white stone.
 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.
- G. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part of or all gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 - a. [Bostik, Inc.](#)
 - b. [Laticrete International, Inc.](#)
 - c. [MAPEI Corporation.](#)
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
- H. Thin-Set Mortar:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Bostik, Inc.](#)
 - b. [Laticrete International, Inc.](#)
 - c. [MAPEI Corporation.](#)
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
 2. Dry-Set Portland Cement Mortar: ANSI A118.1, packaged.
 3. Latex-Portland Cement Mortar: ANSI A118.4, consisting of the following:
 - a. Prepackaged Dry-Mortar Mix: Factory-prepared, packaged mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
 - b. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of packaged dry-mortar mix and styrene-butadiene-rubber or acrylic-resin liquid-latex additive.
- I. Water: Potable.

2.8 GROUT

- A. Grout Colors: As selected by Architect from manufacturer's full range.
- B. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate to produce required color.
- C. Standard Cement Grout: ANSI A118.6, packaged.
 1. Unsanded grout mixture for joints 1/8 inch and narrower.
 2. Sanded grout mixture for joints wider than 1/8 inch.
- D. Polymer-Modified Cement Grout: ANSI A118.7, packaged.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Bostik, Inc.](#)
 - b. [Laticrete International, Inc.](#)
 - c. [MAPEI Corporation.](#)
 - d. Substitutions: see section 01 25 00 – Substitution Procedures.
 2. Polymer Type: Acrylic resin or ethylene vinyl acetate, in dry, redispersible form, packaged with other dry ingredients.
 3. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to packaged dry-grout mix.
 4. Unsanded grout mix for joints 1/8 inch and narrower.
 5. Sanded grout mix for joints wider than 1/8 inch.

- E. Water-Cleanable Epoxy Grout: ANSI A118.3 packaged, chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Bostik, Inc.](#)
 - b. [Laticrete International, Inc.](#)
 - c. [MAPEI Corporation.](#)
 - d. **Substitutions:** see section 01 25 00 – Substitution Procedures.

2.9 WATERPROOF MEMBRANES

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
 - 1. **Products:** Subject to compliance with requirements, provide the following :
 - a. [Noble Company \(The\)](#); Nobleseal TS.
 - b. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- C. PVC Sheet: Two layers of PVC sheet heat-fused together and to facings of nonwoven polyester; 0.040-inch nominal thickness.
 - 1. **Products:** Subject to compliance with requirements, provide the following :
 - a. [Compotite Corporation](#); Composeal Gold.
 - b. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- D. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
 - 1. **Products:** Subject to compliance with requirements, provide the following :
 - a. [Schluter Systems L.P.](#); KERDI.
 - b. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- E. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, SBS-modified-bituminous sheet with woven reinforcement facing; 0.040-inch nominal thickness.
 - 1. **Products:** Subject to compliance with requirements, provide the following :
 - a. [National Applied Construction Products, Inc.](#); Strataflex.
 - b. **Substitutions:** see section 01 25 00 – Substitution Procedures.

- F. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Bostik, Inc.](#); Hydroment Blacktop 90210.
 - b. [Laticrete International, Inc.](#); Laticrete 9235 Waterproof Membrane.
 - c. [MAPEI Corporation](#); Mapelastic AquaDefensewith MAPEI Reinforcing Fabric.
 - d. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- G. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Bostik, Inc.](#); Durabond D-222 Duraguard Membrane Hydroment Gold.
 - b. [Laticrete International, Inc.](#); Latapoxy 24hr HydroProofing .
 - c. [MAPEI Corporation](#); Mapelastic AquaDefense.
 - d. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- H. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.
1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. [Boiardi Products, a QEP company](#); Elastiment 323 Cement Based Waterproofing, Anti-Fracture/Crack Suppression Membrane.
 - b. [C-Cure](#); UltraCure 971.
 - c. [MAPEI Corporation](#); Mapelastic 315.
 - d. **Substitutions:** see section 01 25 00 – Substitution Procedures.

2.10 ACCESSORIES

- A. Paver Pedestals: Manufacturer's standard paver support assembly, including fixed-height pedestals, shims, and spacer tabs for joint spacing of 1/8 inch or .
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Hanover Architectural Products](#).
 - b. [Tremco Incorporated](#).
 - c. [Wausau Tile, Inc.; Terra-Paving Div.](#)
 - d. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- B. Temporary Spacers: Resilient plastic, nonstaining to stone, sized to suit joint thickness.
- C. Cleavage Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
- D. Reinforcing Wire: Galvanized, welded, 0.062-inch- diameter wire; 2-by-2-inch mesh; comply with ASTM A 185/A 185M and ASTM A 82/A 82M except for minimum wire size.
- E. Divider Strips and Edging: Metal or combination of metal and PVC or neoprene base, designed specifically for flooring applications, in longest lengths available, and as follows:

1. Exposed-Edge Material: Stainless steel; ASTM A 666, Type 302.
 2. Cross-Section Profile: Angle or L-shape .
 3. Height: Match stone thickness .
 4. Exposed-Edge Width: 1/8 inch .
 5. Control-Joint Filler: Neoprene.
- F. Abrasive Inserts for Stair Treads: Abrasive strips consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder, fabricated for installing in routed grooves of stair treads to provide slip resistance. Provide epoxy-resin installation adhesive compatible with inserts.
1. Width: 1/4 inch .
 2. Depth: 1/2 inch .
 3. Length: 4 inches less than stair width .
- G. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer and by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- H. Floor Sealer: Colorless, slip- and stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Bostik, Inc.](#)
 - b. [Custom Building Products.](#)
 - c. [Summitville Tiles, Inc.](#)
 - d. **Substitutions:** see section 01 25 00 – Substitution Procedures.

2.11 MORTAR AND GROUT MIXES

- A. Mortar: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use calcium chloride.
 2. Combine mortar materials and thoroughly mix in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.
- B. Portland Cement-Lime Setting Mortar: ASTM C 270, Proportion Specification, Type N for interior applications and Type S for exterior applications. Use amount of water to produce a stiff mixture with a moist surface when bed is ready to receive stone.

- C. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions and to produce a stiff mixture with a moist surface when bed is ready to receive stone.
- D. Mortar-Bed Bond Coat: Mix neat cement and water to a creamy consistency.
- E. Cement-Paste Bond Coat: Mix either neat cement or cement and sand with water to a consistency similar to that of thick cream.
- F. Latex-Modified Portland Cement Bond Coat: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- G. Joint Grout: Comply with mixing requirements in referenced ANSI standards and with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive stone flooring and conditions under which stone flooring will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone flooring.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone flooring.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum concrete substrates to remove dirt, dust, debris, and loose particles.
- B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- C. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- D. Before setting stone, clean dirty or stained stone surfaces by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 INSTALLATION, GENERAL

- A. Do necessary field cutting as stone is set. Cut lines straight and true and finish field-cut edges to match shop-cut edges.
 - 1. Use power saws with diamond blades to cut stone except for stone that is specified to have rough-split edges.
- B. Set stone to comply with requirements indicated.
- C. Scribe and field cut stone as necessary to fit at obstructions. Produce neat joints of size specified or indicated.
- D. Provide control and expansion joints of widths and at locations indicated. Keep control and expansion joints free of mortar, grout, and other rigid materials.

3.4 INSTALLATION TOLERANCES

- A. Variation in Line: For positions shown in plan for edges of flooring, ramps, steps, changes in color or finish, and continuous joint lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.
- B. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/16 inch or one-fourth of nominal joint width, whichever is less.
- C. Variation in Surface Plane: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum from level or slope indicated.
- D. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch difference between planes of adjacent units.

3.5 INSTALLATION OF STONE BONDED TO CONCRETE

- A. Saturate concrete with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
- B. Apply mortar-bed bond coat to damp concrete and broom to provide an even coating that completely covers the concrete. Do not exceed 1/16-inch thickness. Limit area of mortar-bed bond coat to avoid its drying out before placing setting bed.
 - 1. Place reinforcing wire mesh over concrete, lapped at joints by at least one full mesh and supported so mesh becomes embedded in middle of mortar bed. Hold edges back from vertical surfaces about 1/2 inch.
- C. Apply mortar bed immediately after applying mortar-bed bond coat. Spread, tamp, and screed to uniform thickness at elevations required for setting stone to finished elevations indicated.

- D. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.
- E. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform 1/16-inch- thick bond coat to mortar bed or to back of each stone unit.
- F. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with mortar bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.
- G. Rake out joints to depth required to receive grout as units are set.

3.6 INSTALLATION OF STONE OVER WATERPROOFING

- A. See waterproofing Section for installation of waterproofing and protection board.
 - 1. Carefully place stone and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with stone flooring.
- B. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
- C. Place reinforcing wire fabric over waterproofing , lapped at least one full mesh at joints and supported so mesh becomes embedded in middle of mortar bed. Hold edges back from vertical surfaces and control and expansion joints about 1/2 inch.
- D. Place mortar bed over waterproofing with reinforcing wire fabric fully embedded in middle of mortar bed. Spread, tamp, and screed to uniform thickness at elevations required for setting stone to finished elevations indicated.
- E. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.
- F. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform 1/16-inch- thick bond coat to mortar bed or to back of each stone unit.
- G. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with mortar bed and to bring finished surfaces within indicated tolerances. Set each unit in a single

operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.

- H. Rake out joints to depth required to receive grout as units are set.

3.7 INSTALLATION OF STONE FLOORING ON PEDESTALS OVER WATERPROOFING

- A. See waterproofing Section for installation of waterproofing and protection board.
- B. Accurately install pedestals and other accessories to elevations required. Adjust for final level and slope with shims.
- C. Loosely lay stone flooring units on pedestals, maintaining a uniform, open joint width. Tightly seat stone units against spacers to eliminate lateral movement or drift of flooring assembly. Align joint patterns parallel in each direction.
 - 1. Lay out stone units to avoid less than half-width units at perimeter or other terminations.
- D. Install stone flooring units to not vary more than 1/16 inch in elevation between adjacent units.

3.8 STONE THRESHOLD INSTALLATION

- A. At locations adjacent to stone flooring, install stone thresholds in same type of setting bed as abutting stone flooring unless otherwise indicated.
 - 1. Set thresholds in thin-set, latex-portland cement mortar to comply with ANSI A108.5 at locations where mortar bed would otherwise be exposed above other adjacent flooring.
- B. At locations not adjacent to stone flooring, install stone thresholds in thin-set, latex-portland cement mortar to comply with ANSI A108.5 .

3.9 STONE STAIR TREAD AND RISER INSTALLATION

- A. Install stone stair treads and risers to comply with "Installation of Stone Bonded to Concrete" Article.

3.10 GROUTING

- A. Grout stone joints to comply with ANSI A108.10 and with manufacturer's written instructions.
 - 1. Do not use sanded grout for polished stone.

2. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care not to smear grout on adjoining stone and other surfaces. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free of drying cracks.

- B. Grout stone joints with water-cleanable epoxy grout to comply with ANSI A108.6 and with manufacturer's written instructions.

3.11 ADJUSTING AND CLEANING

- A. Remove and replace stonework of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective joints.
3. Stone flooring and joints not matching approved Samples and mockups.
4. Stonework not complying with other requirements indicated.

- B. Replace in a manner that results in stonework matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

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

- D. Clean stonework after setting and grouting are complete. Use procedures recommended by stone fabricator for application types.

- E. Apply sealer to cleaned stonework according to sealer manufacturer's written instructions.

3.12 PROTECTION

- A. Prohibit traffic from installed stone for a minimum of 72 hours.

- B. Protect installed stonework during construction with nonstaining kraft paper. Where adjoining areas require construction work access, cover stonework with a minimum of 3/4-inch untreated plywood over nonstaining kraft paper.

END OF SECTION 09 63 40

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Resilient base.
2. Resilient stair accessories.
3. Resilient molding accessories.

- B. Related Sections:

1. Section 09 65 16 "Resilient Sheet Flooring" for resilient sheet floor coverings.
- 2.
3. Section 09 65 19 "Resilient Tile Flooring" for resilient floor tile.

1.3 ACTION SUBMITTALS

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

- B. LEED Submittals (projects authorized for LEED certification only):

1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Samples for Initial Selection: For each type of product indicated.

- D. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than **12 inches (300 mm)** long, of each resilient product color, texture, and pattern required.

- E. Product Schedule: For resilient products. [**Use same designations indicated on Drawings.**]

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than [**10 linear feet (3 linear m)**] <Insert length> for every [**500 linear feet (150 linear m)**] <Insert length> or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F (10 deg C)** or more than **90 deg F (32 deg C)**.

1.7 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than [**70 deg F (21 deg C)**] <Insert temperature> or more than [**95 deg F (35 deg C)**] <Insert temperature>, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than [**55 deg F (13 deg C)**] <Insert temperature> or more than [**95 deg F (35 deg C)**] <Insert temperature>.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE <Insert drawing designation>

A. Resilient Base:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Armstrong World Industries, Inc.](#)
 - b. [Johnsonite.](#)
 - c. [Roppe Corporation, USA.](#)
 - d. Substitute: see section 01 25 00 – Substitution Procedures.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: [Type TS (rubber, vulcanized thermoset)] [Type TP (rubber, thermoplastic)] [Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic)].
2. Manufacturing Method: [Group I (solid, homogeneous)] [Group II (layered)] [Group I (solid, homogeneous) or Group II (layered)].
3. Style: [Cove (base with toe)] [Straight (flat or toeless)] [Butt to (fit-to-floor)] <Insert special style>.

C. Minimum Thickness: [0.125 inch (3.2 mm)] [0.080 inch (2.0 mm)] <Insert thickness>.

D. Height: [2-1/2 inches (64 mm)] [4 inches (102 mm)] [6 inches (152 mm)] [As indicated on Drawings].

E. Lengths: [Cut lengths, 48 inches (1219 mm) long] [Coils in manufacturer's standard length] [Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length].

F. Outside Corners: [Job formed] [Preformed] [Job formed or preformed].

G. Inside Corners: [Job formed] [Preformed] [Job formed or preformed].

H. Finish: [Satin] [Matte] [Low luster] [As selected by Architect from manufacturer's full range].

I. Colors and Patterns: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from full range of industry colors].

2.2 RESILIENT STAIR ACCESSORIES <Insert drawing designation>

A. Resilient Stair Treads:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Burke Flooring Products; Division of Burke Industries, Inc.](#)

- b. [Johnsonite](#).
- c. [Roppe Corporation, USA](#).
- d. Substitute: see section 01 25 00 – Substitution Procedures.

B. Resilient Stair Treads Standard: ASTM F 2169.

1. Material Requirement: [Type TV (vinyl, thermoplastic)] [Type TS (rubber, vulcanized thermoset)] [Type TP (rubber, thermoplastic)] [Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic)].
2. Surface Design:
 - a. Class 1, Smooth (flat).
 - b. Class 2, Pattern: [Raised-disc design] [Raised-square design] [Raised-chevron design] [Raised-diamond design] [Raised-rib design] [Raised-rib design with abrasive strips] <Insert pattern>.
3. Manufacturing Method: [Group 1, tread with embedded abrasive strips] [Group 2, tread with contrasting color for the visually impaired].

C. Nosing Style: [Square, adjustable to cover angles between 60 and 90 degrees] [Square] [Round].

D. Nosing Height: [1-1/2 inches (38 mm)] [2 inches (51 mm)] [2-3/16 inches (56 mm)] <Insert dimension>.

E. Thickness: [1/4 inch (6 mm) and tapered to back edge] <Insert thickness>.

F. Size: Lengths and depths to fit each stair tread in [one piece] [one piece or, for treads exceeding maximum lengths manufactured, in equal-length units].

G. Risers: Smooth, flat, [coved-toe, 7 inches (178 mm) high by length matching treads] [toeless, height and length to cover risers]; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

1. Thickness: [0.125 inch (3.2 mm)] [0.080 inch (2.0 mm)] <Insert thickness>.

H. Stringers: Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

I. Colors and Patterns: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from full range of industry colors].

2.3 RESILIENT MOLDING ACCESSORY <Insert drawing designation>

A. Resilient Molding Accessory:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - a. [Burke Flooring Products; Division of Burke Industries, Inc.](#)
 - b. [Johnsonite.](#)
 - c. [Roppe Corporation, USA.](#)
 - d. Substitute: see section 01 25 00 – Substitution Procedures.
- B. Description: **[Cap for cove carpet] [Cap for cove resilient floor covering] [Carpet bar for tackless installations] [Carpet edge for glue-down applications] [Nosing for carpet] [Nosing for resilient floor covering] [Reducer strip for resilient floor covering] [Joiner for tile and carpet] [Transition strips] <Insert description>.**
- C. Material: **[Vinyl] [Rubber].**
- D. Profile and Dimensions: **[As indicated] <Insert profile and dimensions>.**
- E. Colors and Patterns: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from full range of industry colors].**

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)[, **except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less**].
 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer[**and as follows**]. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]** <Insert emission> in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum **[75 percent]** <Insert acceptable percentage> relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of **[carpet] [resilient floor covering]** that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
1. Apply **[one]** **[two]** **[three]** **<Insert requirement>** coat(s).
- E. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 16 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl sheet floor covering, **[with] [and] [without]** backing.
 - 2. Rubber sheet floor covering, **[with] [and] [without]** backing.
- B. Related Sections:
 - 1. Section 09 65 13 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.
 - 2. Section 09 65 19 "Resilient Tile Flooring" for resilient floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals (Projects authorized for LEED certification only):
 - 1. Product Data for Credit IEQ 4.1: For **[adhesives] [and] [chemical-bonding compounds]**, documentation including printed statement of VOC content.
 - 2. Product Data for Credit IEQ 4.3: For adhesives **[and chemical-bonding compounds]**, documentation including printed statement of VOC content.
 - 3. Product Data for Credit IEQ 4.3: For resilient sheet flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.
 - 4. Laboratory Test Reports for Credit IEQ 4: For adhesives **[flooring system] [and] [chemical-bonding compounds]**, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.
- D. Samples for Initial Selection: For each type of floor covering indicated.
- E. Samples for Verification: In manufacturer's standard size, but not less than [**6-by-9-inch (150-by-230-mm)**] <Insert size> sections of each different color and pattern of floor covering required.
1. For heat-welding bead, manufacturer's standard-size Samples, but not less than [**9 inches (230 mm)**] <Insert dimension> long, of each color required.
- F. Seam Samples: For seamless-installation technique indicated and for each floor covering product, color, and pattern required; with seam running lengthwise and in center of [**6-by-9-inch (150-by-230-mm)**] <Insert size> Sample applied to a rigid backing and prepared by Installer for this Project.
- G. Product Schedule: For floor coverings. [**Use same designations indicated on Drawings.**]
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For qualified Installer.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For each type of floor covering to include in maintenance manuals.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Floor Covering: Furnish quantity not less than [**10 linear feet (3 linear m)**] <Insert length> for every [**500 linear feet (150 linear m)**] <Insert length> or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation [**and seaming method**] indicated.
1. Engage an installer who employs workers for this Project who are trained or certified by floor covering manufacturer for installation techniques required.

- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for floor coverings including[**resilient base and**] accessories.
 - a. Size: Minimum **100 sq. ft. (9.3 sq. m)** for each type, color and pattern [**in locations indicated**] [**in locations directed by Architect**] **<Insert location requirements>**.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F (10 deg C)** or more than **90 deg F (32 deg C)**. Store rolls upright.

1.9 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than [**70 deg F (21 deg C)**] **<Insert temperature>** or more than [**85 deg F (29 deg C)**] **<Insert temperature>**, in spaces to receive floor coverings during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than [**55 deg F (13 deg C)**] **<Insert temperature>** or more than [**95 deg F (35 deg C)**] **<Insert temperature>**.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. FloorScore Compliance: Resilient sheet flooring shall comply with requirements of FloorScore Standard.
- B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 VINYL SHEET FLOOR COVERING

- A. **Products:** Subject to compliance with requirements, provide one of the following :
 - 1. [Armstrong World Industries, Inc.](#); <Medintech>.
 - 2. [Forbo Flooring, Inc.](#); Forza.
 - 3. [Tarkett, Inc.](#); Aria.
 - 4. Substitute: see section 01 25 00 – Substitution Procedures.
- B. Vinyl Sheet Floor Covering with Backing: ASTM F 1303.
 - 1. Type (Binder Content): Type II, minimum binder content of 34 percent.
 - 2. Wear-Layer Thickness: Grade 1.
 - 3. Overall Thickness: 1/8 inch minimum.
 - 4. Backing Class: Class A (fibrous) .
- C. Wearing Surface: Color and pattern throughout .
- D. Sheet Width: As standard with manufacturer .
- E. Seaming Method: Heat welded, solid vinyl bead, in color matching field color .
- F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 RUBBER SHEET FLOOR COVERING

- A. **Products:** Subject to compliance with requirements, provide one of the following :
 - 1. [Johnsonite](#); Rondel Speckled.
 - 2. [PRF USA Inc.](#); **Activa**.
 - 3. [R.C.A. Rubber Company \(The\)](#); Flexi Flor.
 - 4. Substitute: see section 01 25 00 – Substitution Procedures.
- B. Rubber Sheet Floor Covering with Backing: ASTM F 1860.
 - 1. Type: Type I, homogeneous rubber sheet with backing .
 - 2. Wear-Layer Thickness: As standard with manufacturer .

3. Overall Thickness: 1/8 inch minimum.
 4. Backing Type: Fibrous) .
- C. Hardness: Not less than required by ASTM F 1860 .
- D. Wearing Surface: Color and pattern throughout.
1. Molded-Pattern Figure: Raised discs .
- E. Sheet Width: As standard with manufacturer .
- F. Seaming Method: Heat welded .
- G. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 RESILIENT BASE

- A. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set style cove, and as follows:
1. Height: 4 inch.
 2. Thickness: 0.125 inch thick.
 3. Finish: Matte.
 4. Length: Roll
 5. Color: Black, unless otherwise indicated.
 6. Accessories: Premolded external corners and end stops.
 7. Manufacturers:
 - a. Johnsonite, Inc: www.johnsonite.com.
 - b. Roppe Corp: www.roppe.com.
 - c. Substitutions: See Section 01 60 00 – Product Requirements.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.
1. Adhesives shall have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: Match floor field covering .
 2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
 - a. VOC Content: Not more than 510 g/L. when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Bonding compound shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Integral-Flash-Cove-Base Accessories:
1. Cove Strip: 1-inch (25-mm) radius provided or approved by manufacturer.
 2. Cap Strip: Square metal, vinyl, or rubber cap provided or approved by manufacturer.
 3. Corners: Metal inside and outside corners and end stops provided or approved by manufacturer.
- E. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer[**and as follows**]. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]** <Insert emission> in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum **[75 percent]** <Insert acceptable percentage> relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor coverings until they are same temperature as space where they are to be installed.
 1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 FLOOR COVERING INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Unroll floor coverings and allow them to stabilize before cutting and fitting.
- C. Lay out floor coverings as follows:
 1. Maintain uniformity of floor covering direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least **6 inches (152 mm)** away from parallel joints in floor covering substrates.
 3. Match edges of floor coverings for color shading at seams.
 4. Avoid cross seams.
- D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.

- G. Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
 - 2. Chemically-Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless floor covering. Prepare seams and apply compound to produce tightly-fitted seams without gaps, overlays, or excess bonding compound on floor covering surfaces.
- J. Integral-Flash-Cove Base: Cove floor coverings [**6 inches (152 mm)**] [**dimension indicated**] <Insert dimension> up vertical surfaces. Support floor coverings at horizontal and vertical junction by cove strip. Butt at top against cap strip.
 - 1. Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering installation:
 - 1. Remove adhesive and other blemishes from floor covering surfaces.
 - 2. Sweep and vacuum floor coverings thoroughly.
 - 3. Damp-mop floor coverings to remove marks and soil.
- C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor covering before applying liquid floor polish.
 - 1. Apply [**one**] [**two**] [**three**] <Insert requirement> coat(s).
- E. Cover floor coverings until Substantial Completion.

END OF SECTION 09 65 16

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010(UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid vinyl floor tile.
 - 2. Rubber floor tile.
 - 3. Vinyl composition floor tile.
- B. Related Sections:
 - 1. Section 09 65 13 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.
 - 2. Section 09 65 16 "Resilient Sheet Flooring" for resilient sheet floor coverings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- D. Seam Samples: For seamless-installation technique indicated and for each flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

- E. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MATERIALS MAINTENANCE SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 SOLID VINYL FLOOR TILE

- A. **Products:** Subject to compliance with requirements, provide one of the following :
 - 1. [Amtico, Mannington Commercial](#); <Insert product name or designation>.
 - 2. [Armstrong World Industries, Inc.](#); Vinyl Tile.
 - 3. [Tarkett, Inc.](#); Aria.
 - 4. Substitutions: see Section 01 25 00 – Substitution Procedures.
- B. Tile Standard: ASTM F 1700.
 - 1. Class: Class I, monolithic vinyl tile .
 - 2. Type: Type A, smooth surface .
- C. Thickness: 0.125 inch .
- D. Size: 12 by 12 inches .
- E. Colors and Patterns: [As selected by Architect from full range of industry colors].

2.3 RUBBER FLOOR TILE

- A. **Products:** Subject to compliance with requirements, provide one of the following :
 - 1. [Burke Mercer Flooring Products, Division of Burke Industries Inc.](#); Flecksible.
 - 2. [Flexco](#); Spextones.
 - 3. [Johnsonite](#); Cityscape Speckled Rubber Tile.
 - 4. Substitutions: see Section 01 25 00 – Substitution Procedures.
- B. Tile Standard: ASTM F 1344, Class I-A, homogeneous rubber tile, solid color .

- C. Hardness: Not less than 85 as required by ASTM F 1344, measured using Shore, Type A durometer per ASTM D 2240 .
- D. Wearing Surface: Molded pattern.
 - 1. Molded-Pattern Figure: Raised discs .
- E. Thickness: 0.125 inch .
- F. Size: 12 by 12 inches .

2.4 VINYL COMPOSITION FLOOR TILE

- A. Products: Subject to compliance with requirements, provide one of the following :
 - 1. Armstrong World Industries, Inc.; Excelon.
 - 2. Mannington Mills, Inc.; Essentials.
 - 3. Tarkett, Inc.; .
 - 4. Substitutions: see Section 01 25 00 – Substitution Procedures.
- B. Tile Standard: ASTM F 1066, Homogenous, with color extending throughout thickness .
- C. Wearing Surface: Smooth .
- D. Thickness: 0.125 inch .
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: [As selected by Architect from full range of industry colors].

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 - 1. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
 - b. Rubber Floor Adhesives: Not more than 60 g/L.
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
- C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until they are same temperature as space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis in pattern indicated .
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.

- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coat(s).
- E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 66 23 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Poured-in-place resinous matrix epoxy terrazzo flooring [**and base**].
2. Poured in place integral formed terrazzo wall base. [**Pre-cast terrazzo wall base units.**]
3. [**Pre-cast terrazzo tread units**] [**Pre-cast terrazzo tread & riser units**]
4. Joint, edge, and termination strips.

- B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for sealants installed with terrazzo.
2. Section 03 30 00 "Cast-in-Place Concrete."
 - a. Concrete sub-floor to be level (maximum variation not to exceed ¼ inch in 10 feet) and to have a steel trowel finished surface. No curing agents or other additives which could prevent bonding should be used.
 - b. The slab should have an efficient moisture barrier placed directly under the concrete slab when placed directly on grade. Saw cutting of control joints must be done between 12-24 hours after placement of the structural concrete.
 - c. Shotblast or rough grind area to receive Terrazzo according to manufacturer's recommendations.

1.3 DEFINITIONS

- A. Aggregate: Marble chips [**or other types of aggregate**].

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [**Project site**] <Insert location>.

1. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

- b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- c. Review special terrazzo designs and patterns.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals (Projects authorized for LEED certification only):
 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
 3. Product Data for Credit IEQ 4.3: For sealers, documentation including printed statement of VOC content.
 4. Product Data for Credit IEQ 4.3: For terrazzo flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.
 5. Laboratory Test Reports for Credit IEQ 4: For **[adhesives] [and] [flooring system]**, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
 1. Divider strips.
 2. Control-joint strips.
 3. Expansion-joint strips.
 4. Accessory strips.
 5. Abrasive strips.
 6. Stair treads, risers, and landings.
 7. Precast terrazzo jointing and edge configurations.
 8. Terrazzo patterns.
 9. **<Insert requirements>**.
- D. Samples: For each exposed product and for each color and texture specified, **[6 inches (150 mm)] <Insert dimension>** in size.
- E. Samples for Initial Selection: NTMA color plates showing the full range of colors and patterns available for each terrazzo type.
- F. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and

proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:

1. Terrazzo: [~~6-inch~~ (150-mm-)] <Insert dimension> square Samples.
2. Precast Terrazzo: [~~6-inch~~ (150-mm-)] <Insert dimension> square Samples.
3. Accessories: [~~6-inch~~ (150-mm-)] <Insert dimension> long Samples of each exposed strip item required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each type of terrazzo material or product, from manufacturer.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is a contractor member of NTMA.
 1. Installation shall be performed by an applicator with minimum 3 years experience in work of similar nature and scope. Installer must be approved by the manufacturer of the floor surfacing materials. The contractor shall furnish a written statement from the manufacturer that the installer is acceptable.
- B. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.
- C. Suppliers shall provide materials in accordance with NTMA standards.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups for terrazzo including accessories.
 - a. Size: Minimum **100 sq. ft. (9 sq. m)** of typical poured-in-place flooring condition for each color and pattern [**in locations indicated**] [**in locations directed by Architect**] <Insert location requirements>.
 - b. Include [**base**] [**first three stair treads**] <Insert item>.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Maintain temperature above 50 deg F (10 deg C) for 48 hours before and during terrazzo installation.
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. FloorScore Compliance: Terrazzo floors shall comply with requirements of FloorScore Standard.
- C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 MATERIALS

- 1. Topping: Comply with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo system indicated for matrix and aggregate proportions and mixing.
 - a. Terrazzo Topping Thickness: **[As indicated] <Insert dimension>**.

- b. Formulated Mix Color and Pattern: [As selected by Architect from NTMA standard-terrazzo plates] [As selected by Architect from NTMA Venetian-terrazzo plates] <Insert NTMA color plate designation>.
- c. Custom Mix Color and Pattern: [Match Architect's sample] [Match existing] <Insert custom design-mix attributes>.

B. Materials:

- 1. Epoxy resin mixed according to manufacturer's recommendation and tested without aggregate added. All specimens cured for 7days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2 R.H. The product shall meet the following requirements:

Property	Test Method	Requirement
Hardness	ASTM D-2240 using Shore D Durometer	60-85
Tensile Strength	ASTM D- D-638 run at .2" min. Specimen made using "C" die listed in ASTM D-412	3,000 psi Minimum
Compressive Strength	ASTM D-695 Specimen "B" cylinder	10,000 psi Minimum
Chemical Resistance	ASTM D-1308 seven days at room temperature by immersion method have no deleterious effects:	The following contaminants used: Distilled Water 1% Soap Solution Mineral Water 10% Sodium Hydroxide Isopropanol.....10% Hydrochloric Acid Ethanol 30% Sulfuric Acid .025 Detergent Solution5% Acetic Acid

- 2. Epoxy Resin mixed according to manufacturer's recommendations and blended with 3 volumes of Georgia White marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to 3.02 C-2-Finishing to a nominal 1/4" thickness. All specimens cured 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2% R.H. The finished epoxy terrazzo shall meet the following requirements:
 - a. Flammability: When tested in accordance with ASTM-D-635, the Epoxy terrazzo shall comply with the following value: Self-extinguishing, extent of burning 0.25 inches maximum.
 - b. Thermal Coefficient of Linear Expansion: when tested in accordance with ASTM-D-696, the Epoxy terrazzo will comply with the following value: 25 x 10-6 inches per inch per degrees to 140 degrees Fahrenheit maximum. Temperature range - 12 degrees to 140 degrees Fahrenheit.
 - c. Bond Strength: When tested in accordance with Field Test Method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin Title No. 59-43 (Pages 1139-1141) the Epoxy terrazzo shall comply with the following value:
 - 1) 100% concrete failure minimum, with 300 PSI minimum tensile strength.
 NOTE: THIS TEST IS INTENDED TO EVALUATE THE BOND TO THE CONCRETE SUBFLOOR. A 100% CONCRETE FAILURE INDICATES A GOOD BOND.

3. Marble Chips:
 - a. Size: To conform to NTMA gradation standards.
NOTE: SEE PRODUCT INFORMATION.
 - b. Abrasion and Impact resistance when testing in accordance with ASTM C 131-89 shall not exceed 40% loss.
 - c. 24 Hour absorption rate not to exceed 0.75 percent.
 - d. Chips shall contain no deleterious or foreign matter.
 - e. Dust content less than 1% by weight.

2.3 PRECAST TERRAZZO

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- B. Manufacturers: Subject to compliance with requirements, provide by one of the following:
 1. [Precast Terrazzo Enterprises, Inc.](#)
 2. [Romoco Precast Terrazzo Products, subsidiary of Roman Mosaic & Tile Company](#)
 3. [Wausau Tile, Inc.; Terra Paving Products Division.](#)
 4. Substitutions: see section 01 25 00 – Substitution Procedures.
- C. Precast Terrazzo Base <Insert designation>: Minimum **3/4-inch- (19-mm-)** thick, reinforced, portland cement terrazzo units cast in maximum lengths possible, but not less than **36 inches (900 mm)**. Comply with NTMA's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.
 1. Type: **[As indicated] [Coved with minimum 3/4-inch (19-mm) radius] [Straight] [Splayed] <Insert requirements>.**
 2. Top Edge: **[Straight, unfinished] [Beveled with polished top surface] [Radius edge with polished top surface] <Insert requirements>.**
 3. Metal Toe Strip: **[Zinc] [Brass].**
 4. Outside Corner Units: With finished returned edges at outside corner.
 5. Color, Pattern, and Finish: **[As selected by Architect from full range of industry colors] [Match Architect's sample] [Match adjacent poured-in-place terrazzo flooring] <Insert requirements>.**
- D. Precast Terrazzo Units <Insert designation>: Minimum **[3/4-inch- (19-mm-)] <Insert dimension>** thick, reinforced, portland cement terrazzo units. Comply with NTMA's written recommendations for fabricating precast terrazzo units in sizes and profiles indicated. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer. Finish exposed-to-view edges and reveals to match face finish. Ease exposed edges to **1/8-inch (3.2-mm)** radius.
 1. Tiles.
 2. Planks.
 3. Stair treads [**and landings**].

4. Thresholds.
5. Sills.
6. Benches.
7. Planters.
8. Countertops.
9. Shower bases.
10. <Insert item>.
11. Color, Pattern, and Finish: [As selected by Architect from full range of industry colors] [Match Architect's sample] [Match adjacent poured-in-place terrazzo flooring] <Insert requirements>.

2.4 STRIP MATERIALS

- A. Standard Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
1. Material: [As indicated] [White-zinc alloy] [Brass] <Insert requirements>.
 2. Depth: [As indicated] [3/4 inch (19 mm)] [1-1/4 inches (32 mm)] [2 inches (51 mm)] <Insert dimension>.
 3. Width: [As indicated] [0.05 inch (1.27 mm)] [1/8 inch (3.2 mm)] [1/4 inch (6.4 mm)] <Insert dimension>.
- B. Heavy-Top Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
1. Base-Section Material: [As indicated] [White-zinc alloy] [Galvanized steel] <Insert requirements>.
 2. Top-Section Material: [As indicated] [White-zinc alloy] [Brass] [Plastic, in color selected from full range of industry colors] <Insert requirements>.
 3. Depth: [As indicated] [3/4 inch (19 mm)] [1-1/4 inches (32 mm)] [2 inches (51 mm)] <Insert dimension>.
 4. Top-Section Width: [As indicated] [1/8 inch (3.2 mm)] [1/4 inch (6.4 mm)] [1/2 inch (12.7 mm)] <Insert dimension>.
- C. Heavy-Top Angle Divider Strips: One-piece, L-type angle strips with anchoring device and in depth required for topping thickness indicated.
1. Material: [As indicated] [White-zinc alloy] [Brass] [Plastic, in color selected from full range of industry colors] <Insert requirements>.
 2. Top-Section Width: [As indicated] [1/8 inch (3.2 mm)] [1/4 inch (6.4 mm)] [3/8 inch (9.5 mm)] [1/2 inch (12.7 mm)] <Insert dimension>.
- D. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- E. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:

1. Base-bead strips for exposed top edge of terrazzo base.
2. Edge-bead strips for exposed edges of terrazzo.
3. Nosings for terrazzo stair treads and landings.
4. <Insert requirements>.

F. Abrasive Strips: [**Three-line**] [**Two-line**] [**One-line**] [**Abrasive nosing strip and two-line**] <Insert requirements> abrasive inserts at nosings. Silicon carbide or aluminum oxide, or combination of both, in epoxy-resin binder and set in channel.

1. Width: [**1/2 inch (12.7 mm)**] <Insert dimension>.
2. Depth: As required by terrazzo thickness.
3. Length: [**4 inches (100 mm) less than stair width**] [**As indicated**] <Insert dimension>.
4. Color: [**As selected by Architect from full range of industry colors**] <Insert requirements>.

2.5 MISCELLANEOUS ACCESSORIES

A. Strip Adhesive: Recommended by manufacturer for this use.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Anchoring Devices:

1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and as required for secure attachment to substrate.
2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.

C. Isolation and Expansion-Joint Material: Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, and non-outgassing in unruptured state; butyl rubber; rubber; or cork; [**in width indicated**] [**minimum 1/2 inch (12.7 mm) wide**] <Insert dimension>.

D. Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by cleaner manufacturer for use on terrazzo type indicated.

E. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
2. Acid-Base Properties: With pH factor between 7 and 10.
3. Shall not discolor or amber.
4. Flash point: ASTM D-56, 80 degrees Fahrenheit minimum, where applicable.

5. U/L listed as "Slip Resistant."
6. Sealers shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
 1. Roughen concrete substrates before installing terrazzo system according to NTMA's written recommendations.
- B. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 1. Moisture Testing: Perform tests indicated below.
 - a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]** <Insert rate> in 24 hours.
 - 1) Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)]** <Insert area>, and perform not less than two tests in each installation area and with test areas evenly spaced in installation areas.
 - b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum **[75]** <Insert number> percent relative-humidity-level measurement.
 - c. Test Method: Test for moisture content by **[method recommended in writing by terrazzo manufacturer]** <Insert test method>. Proceed with installation only after substrates pass testing.
- C. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.

1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

3.3 INSTALLATION, GENERAL

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Installation Tolerance: Limit variation in terrazzo surface from level to **[1/4 inch in 10 feet (6.4 mm in 3 m)]** <Insert dimensions>; noncumulative.
- C. Strip Materials:
 1. Divider and Control-Joint Strips:
 - a. Locate divider strips **[over each edge of steel beams and girders] [centered over steel beams and joists] [directly over control joints, breaks, and saw cuts in concrete slabs] [in locations indicated]** <Insert requirements>.
 - b. Install control-joint strips **[back to back and directly above concrete-slab control joints] [in locations indicated]** <Insert requirements>.
 - c. Install control-joint strips with **[1/4-inch (6.4-mm)]** <Insert dimension> gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 2. above concrete-slab expansion joints.
 3. Accessory Strips: Install as required to provide a complete installation.
 4. Abrasive Strips: Install with surface of abrasive strip positioned **[1/16 inch (1.6 mm)]** <Insert dimension> higher than terrazzo surface.

3.4 POURED-IN-PLACE TERRAZZO INSTALLATION

- A. Pour in place and seed additional aggregates in matrix to uniformly distribute granular material and produce a surface with a minimum of 70 percent aggregate exposure. Cure and finish terrazzo according to NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.
- B. Grinding: Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

3.5 PRECAST TERRAZZO INSTALLATION

- A. Install precast terrazzo units using method recommended by NTMA and manufacturer unless otherwise indicated.

- B. Do not install units that are chipped, cracked, discolored, or improperly finished.
- C. Seal joints between units with **[cement grout matching terrazzo matrix] [joint sealant] <Insert requirements>**.

3.6 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate including areas that emit a "hollow" sound if tapped. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.7 CLEANING AND PROTECTION

- A. Terrazzo Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.
 - 2. Wash surfaces with cleaner immediately after final cleaning of terrazzo flooring according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing:
 - 1. Seal surfaces according to NTMA's written recommendations.
 - 2. Apply sealer according to sealer manufacturer's written instructions.
- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 66 13

SECTION 09 68 13R – CARPET

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the specification standards for modular and broadloom carpet. It includes construction, submittals, installation and warranty information regarding both modular and broadloom carpets.
- B. Related Requirements:
 - 1. Section **02 41 19 "Selective Structure Demolition"** for removing existing floor coverings.
 - 2. **[Section 09 65 13 "Resilient Base and Accessories"] [Section 09 65 19 "Resilient Tile Flooring"]** for resilient wall base and accessories installed with carpet tile.

1.2 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: During a regular scheduled construction meeting where a UH FPC Project Manager is in attendance, the following items shall be addressed prior to the installation of modular or broadloom carpet.
 - 1. Review methods and procedures related to modular and broadloom carpet installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - d. Review of submitted installation drawings indicating all carpets on project, patterns and/or layouts, seaming diagrams and flooring transitions.

1.3 ACTION SUBMITTALS

- A. Product Data
 - 1. Include Manufacturer's written specification and warranty information in its entirety regarding the specified carpet to be installed on the project. The specification must clearly state the Manufacturer's name, style/collection, pattern and color of the product. It must also include all physical attributes e.g. durability, fade resistance) of the product within the specification.
 - 2. Include installation recommendations for each type of substrate related to the project. All installations shall adhere to the Manufacturer's recommendations.

B. LEED Submittals (Projects authorized for LEED certification only)

1. Product Data for Credit EQ 4.3:

- a. For modular and broadloom carpet, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.
- b. For installation adhesive, documentation including printed statement of VOC content.
- c. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for [Bronze, 28 to 36] [Silver, 37 to 51] [Gold, 52 to 70] points, based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.
- d. Laboratory Test Reports for Credit EQ 4: For carpet and installation adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: (must include the following details)

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Type of subfloor.
3. Type of installation.
4. Carpet Specifications.
5. Pattern type, location, and direction.
6. Pile direction.
7. Type, color, and location of insets and borders.
8. Type, color, and location of edge, transition, and other accessory strips.
9. Transition details to other flooring materials.
10. Carpet type, color, and dye lot.
11. Locations where dye lot changes occur.
12. Transition details to other flooring materials.

D. Samples: For each of the following products and for each color and texture required. Label each sample with Manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in Schedules.

1. Carpet Tile: (2) - Full-size Samples.
2. Broadloom: (2) - 12" square Samples.
3. Exposed edge, Transition strips and other accessory stripping: 12" long sample.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

- B. Product Test Reports: Tests performed by a qualified testing agency on the specified products.
- C. Sample Warranty

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Include the following:
 - 1. Manufacturer's methods for maintaining carpet, including cleaning and stain-removal products and procedures. Manufacturers recommended maintenance schedule.
- B. Warranty: Full warranty information from the manufacturer. Must include "Proof of Purchase" indicating original install dates.

1.6 RECLAIMING PROCESS

- A. When a project involves removal of existing carpet the Architect must discuss the reclaiming options with the UH FPC Project Manager. Currently most Fiber and Carpet Manufacturer's offer a reclaiming program. The Architect should document the approved reclamation procedures in the Construction Documents. The Architect shall specify that the Contractor provide a certificate of completion for the reclamation.

1.7 MAINTENANCE MATERIAL (ATTIC STOCK) SUPPLY

- A. Furnish extra materials, from the same product run and dye lot that match products installed. Carpet should be in its original packaging with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. Attic stock shall be provided for each carpet type.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: The Architect shall request evidence of the qualifications of the installation company. Installers shall have experience in similar installation methods.
- B. Architect shall review all required shop drawings under section 1.3 Action Submittal.
- C. Fire-Test-Response Ratings: Where indicated, provide carpet identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- D. Mockups: The Project Architect or the UH FPC Project Manager may require a mockup for certain carpet applications. Verify with both Architect and UH FPC Project Manager if mockup/mockups are necessary.

1.9 WARRANTY REQUIREMENTS

- A. Warranty for Modular Carpet: The Warranty information listed below are the minimums that the University of Houston will allow. Manufacturer agrees to repair or replace components of modular carpet installation that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Minimum 15 years from date of UH occupancy. Chairpads shall not be required to maintain warranty.
 2. Back Delamination – lifetime.
 3. Edge Ravel – lifetime.
 4. Static Protection –lifetime.
 5. Wear – surface wear shall not be greater than 10% by weight for the first 15 years.
- B. Warranty for Broadloom Carpet: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Minimum 10 years from date of UH occupancy. Chairpads shall not be required to maintain warranty.
 2. Back Delamination – lifetime.
 3. Edge Ravel – lifetime.
 4. Static Protection –lifetime.
 5. Wear – surface wear shall not be greater than 10% by weight for the first 15 years.

PART 2 - PRODUCT SPECIFICATIONS

- 2.1 MODULAR CARPET –Required in all areas carpet unless noted otherwise below under Section 2.2 – Broadloom Carpet.
- A. Listed below are the minimum specifications for modular carpet.
1. Fiber: UH FPC prefers to use Type 6,6 Nylon fibers. The University understands that with technology many Manufacturers offer quality Type 6 options. The following Type 6 Nylon fibers may be considered: Mannington’s Quantum Nylon, Interface Aquafil, Lee’s Smartstrand, Tandus Dynex SD, Shaw Eco-Solution Q.Dynex SD® Nylon
 2. Dye Method: 100% Solution Dyed. Antron Legacy w/ Duracolor may be used.
 3. Pile Weight: 17 oz
 4. Pile Construction: Loop construction. Under certain circumstances the University will consider a mixed loop and tipsheer but must have approval from UH FPC.
 5. Gauge: 1/10”
 6. Construction: Tufted or Woven
 7. Density: High Traffic Areas & Dormitories 6,500; All other areas 5,500
 8. Backing: High performance backing with moisture barrier
 9. Size: 18”x18” or 24”x24”
 10. Recycled Content: 25%
 11. Applied Soil-Resistance Treatment: Each manufacturer has their own unique soil-resistance treatment system. Please review the Manufacturer’s method with the UH FPC Project Manager prior to the selection.

12. Flammability: Radiant Panel Test ASTM E-648, Class 1. Methenamine Pill Test, ASTM-D 285-96, shall pass FF1-70 or FF2-70. Smoke Density ASTM E-662 rating must be less than 450 in flaming mode. Verify that all Flammability guidelines meet the most strenuous regulations.

2.2 BROADLOOM CARPET – May be used in office suites and other areas approved by UH FPC.

- A. Listed below are the minimum specifications for broadloom carpet.
 1. Fiber: UH FPC prefers to use Type 6,6 Nylon fibers w/ anti-stain protection. Only the following Type 6 Nylon fibers may be considered: Mannington's Quantum Nylon, Aquafil, Lee's Smartstrand, Tandus Dynex SD, Shaw Eco-Solution Q.
 2. Dye Method: 100% Solution Dyed. Antron Legacy w/ Duracolor, may be used.
 3. Pile Weight: 24 oz
 4. Pile Construction: Loop Construction. Under certain circumstances the University will consider a mixed loop and tipsheer but must have approval from FPC.
 5. Gauge: 1/10"
 6. Construction: Tufted or Woven
 7. Density: High Traffic Areas & Dormitories 6,500; All other areas 5,500
 8. Recycled Content: 25%
 9. Backing: Unitary performance backing. Backing must be approved by UH FPC.
 10. Applied Soil-Resistance Treatment: Each manufacturer has their own unique soil-resistance treatment system. Please review the Manufacturer's method prior to the selection with the UH FPC Project Manager.
 11. Flammability: Radiant Panel Test ASTM E-648, Class 1. Methenamine Pill Test, ASTM-D 285-96, shall pass FF1-70 or FF2-70. Smoke Density ASTM E-662 rating must be less than 450 in flaming mode. Verify that all Flammability guidelines meet the most strenuous regulations.

2.3 WALK-OFF CARPET TILE

- A. Provide walk-off carpet at all main building entrances. Architect to specify exact locations and UH FPC Project Manager must approve.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness

- characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. For wood subfloors, verify the following:
- 1. Underlayment over subfloor complies with requirements specified in Section 06 10 00 "Rough Carpentry."
 - 2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- D. For metal subfloors, verify the following:
- 1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- E. For painted subfloors, verify the following:
- 1. Perform bond test recommended in writing by adhesive manufacturer.
- F. For raised access flooring systems, verify the following:
- 1. Access floor substrate is compatible with carpet tile and adhesive if any.
 - 2. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than [**1/8 inch (3 mm)**] <Insert dimension>, protrusions more than **1/32 inch (0.8 mm)**, and substances that may interfere with adhesive bond or show through surface.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIELD CONDITIONS AND INSTALLATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with Manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
- B. Use trowelable leveling and patching compounds, according to Manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by Manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by Manufacturer.

- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by Adhesive Manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.
- F. Comply with Manufacturer's requirements for temperature, humidity, ventilation limitations and installation methods for the particular subfloor or substrate. If the manufacturer does not have a set standard, reference the Carpet and Rug Institute Carpet Installation Standard 2011, First Edition.
- G. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- H. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet Manufacturer.
- I. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.
- J. All installation must meet the Manufacturer's guidelines. This is extremely important when concerning the warranty of the product.
- K. Installation Method: A "NO-Glue Grid" method of installation is preferred if feasible and available on modular carpet only. Other adhesives shall be of low odor/solvent content. Verify that the installation method and only use products recommended by the Manufacturer. Self-stick method type must be approved by UH FPC.
- L. Maintain dye lot consistency throughout the project.
- M. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by Manufacturer.
- N. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- O. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- P. Stagger joints of modular carpet so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.3 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet according to manufacturer's guidelines.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet Manufacturer.

END OF SECTION 09 68 13

09 72 00 - WALL COVERINGS

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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl wall covering.
 - 2. Textile wall covering.
- B. Related Sections:

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. LEED Submittals: (Projects authorized for LEED certification only):
 - 1. Certificates for [**Credit MR 6**] [**Credit MR 7**]: Chain-of-custody certificates indicating that wood-veneer wall coverings comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
 - 2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
 - 3. Product Data for Credit IEQ 4.2: For paints and coatings, documentation including printed statement of VOC content.
 - 4. Laboratory Test Reports for Credit IEQ 4: For [**wall covering systems**] [**adhesives**] [**and**] [**paints and coatings**], documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, veneer matching, seams and termination points.
- D. Samples for Initial Selection: For each type of wall covering indicated.
- E. Samples for Verification: Full width by 36-inch- long section of wall covering.
 - 1. Sample from same print run or dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
 - 2. Sample from same flitch to be used for the Work, with specified finish applied.
- F. Product Schedule: For wall coverings.[**Use same designations indicated on Drawings.**]

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

1.7 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.
- B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Wall covering system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 WALL COVERINGS

- A. General: Provide rolls of each type of wall covering from same print run or dye lot.

2.3 TEXTILE WALL COVERING

- A. Wall-Covering Standard: Provide mildew-resistant strippable wall coverings that comply with ASTM F 793 for Category I, Decorative Only Category II, Decorative with Medium Serviceability products.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Design Tex; www.designtex.com.
 - b. National Wallcovering; www.nationalwallcovering.com.
 - c. Tri-Kes: Cirqa; www.tri-kes.com.
 - d. Substitutions: See Section 01 25 00 – Substitution Procedures.

- B. Test Responses:
 - 1. Colorfastness to Wet and Dry Crocking: Passes AATCC 8, Grade 3, minimum.
 - 2. Colorfastness to Light: Passes AATCC 16, Option 1 or 3, Grade 4, minimum, at 40 hours.
- C. Total Weight Excluding Coatings: 20 oz, Type II.
- D. Width: <52 / 54>.
- E. Repeat: Random .
- F. Applied Backing Material: Osnaburg.
- G. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range.

2.4 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer.
 - 1. Adhesive shall have VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 09 91 23 "Interior Painting" "" and recommended in writing by wall-covering manufacturer for intended substrate.
- C. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.

- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 5. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.
- G. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.3 INSTALLATION

- A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.
- B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
- D. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
- E. Match pattern 72 inches above the finish floor.
- F. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 FIELD FINISHING OF WOOD-VENEER WALL COVERINGS

- A. Apply wall-covering manufacturer's standard stain and polyurethane system according to coating manufacturer's written instructions to produce finish that is consistent in color and gloss and matches approved Samples.
- B. Apply no fewer than two finish coats.

3.5 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00

SECTION 097513 - STONE PANELING

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 anchored stone paneling for the following interior applications:
 - 1. Wall paneling.
 - 2. Column facing.
 - 3. Units with carving or inscriptions.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing concrete inserts for anchoring stone paneling.
 - 2. Section 042000 "Unit Masonry" for installing masonry inserts for anchoring stone paneling.
 - 3. Section 079200 "Joint Sealants" for sealing expansion joints in stone paneling.
 - 4. Section 093033 "Stone Tiling" for stone wall tile.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

1.4 ACTION SUBMITTALS

- A. Product Data: For each[**variety of stone,**] stone accessory, and manufactured product.
- B. LEED Submittals:
 - 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured[**and regionally extracted and manufactured**] materials. Include statement indicating cost for each regionally manufactured material.

- a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
 - b. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.
3. Product Data for Credit IEQ 4.1: For sealants, documentation including printed statement of VOC content.
 4. Laboratory Test Reports for Credit IEQ 4.1: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Show fabrication and installation details for stone paneling system, including dimensions and profiles of stone units.
1. Show locations and details of joints both within stone paneling system and between stone paneling system and other finish materials.
 2. Show locations and details of anchors, including locations of supporting construction.
 3. Show direction of veining, grain, or other directional pattern.
 4. Include large-scale shaded drawings of [**decorative surfaces**] [**and**] [**inscriptions**].
- D. Samples for Initial Selection: For joint materials involving color selection.
- E. Samples for Verification:
1. For each stone type indicated, in sets of Samples not less than **12 inches (300 mm)** square. Include [**two**] [**three**] [**four**] [**five**] <**Insert number**> or more Samples in each set and show the full range of variations in appearance characteristics in completed Work.
 2. For each color of [**grout**] [**pointing mortar**] [**and**] [**sealant**] required.
 3. For [**carving**] [**and**] [**inscriptions**].
- F. Delegated-Design Submittal: For stone paneling assembly.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [**Installer**] [**fabricator**] [**professional engineer**].
- B. Material Test Reports:
1. Stone Test Reports: For[**each**] stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous [**three**] [**five**]<**Insert number**> years.
 2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stone paneling to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone paneling similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of stone paneling.
- C. Installer Qualifications: A firm or individual experienced in installing stone paneling similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockups for the following kinds of stone paneling:
 - a. Typical stone wall paneling, not less than 72 inches (1800 mm) long by 96 inches (2400 mm) high.
 - b. Typical stone wainscot paneling, not less than 72 inches (1800 mm) long by full wainscot height.
 - c. Typical column facing, one complete column.
 - d. Grouting or pointing of joints.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Sealant Adhesion and Compatibility Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.

1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.
- C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.
- D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.10 FIELD CONDITIONS

- A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F (10 deg C) during installation and for seven days after completion.
- B. Field Measurements: Verify dimensions of construction to receive stone paneling by field measurements before fabrication and indicate measurements on Shop Drawings.

1.11 COORDINATION

- A. Coordinate installation of inserts that are to be embedded in concrete or masonry and similar items to be used by stone paneling Installer for anchoring and supporting stone paneling. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.
- B. Time delivery and installation of stone paneling to avoid extended on-site storage and to coordinate with work adjacent to stone paneling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain **[each variety of]** stone, **[regardless of finish,]** from a single quarry, **[whether specified in this Section or in another Section of the Specifications,]** with resources to provide materials of consistent quality in appearance and physical properties.
1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
 2. Make quarried blocks available for examination by Architect.
 3. Make stone slabs available for examination by Architect.

- a. Architect will select aesthetically acceptable slabs[**and will indicate aesthetically unacceptable portions of slabs**].
 - b. Segregate slabs selected for use on Project and mark backs indicating approval.
 - c. Mark and photograph aesthetically unacceptable portions of slabs as directed by Architect.
- B. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Section 044200 "Exterior Stone Cladding."

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stone paneling system.
- B. General: Design stone anchors and anchoring systems according to ASTM C 1242.
- C. Seismic Performance: Stone paneling system shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7] <Insert requirement>.
1. Component Importance Factor: [1.5] [1.0].

2.3 GRANITE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 615.
- B. Regional Materials: Granite shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Granite shall be fabricated within 500 miles (800 km) of Project site.
- D. Description: Uniform, [fine] [medium]-grained, [white] [pink] [gray] [black] <Insert color> stone[**without veining**].
- E. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- F. Cut: [Vein] [Fleuri].
1. Orientation of Veining: [Horizontal] [Vertical] [As indicated].
- G. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- H. Finish: [Polished] [Honed] [Thermal] [As indicated] [Match Architect's sample] <Insert finish>.

- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.4 LIMESTONE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 568.
 1. Classification: [**I Low**] [**II Medium**] [**III High**] Density.
- B. Regional Materials: Limestone shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.
- C. Regional Materials: Limestone shall be fabricated within **500 miles (800 km)** of Project site.
- D. Description: [**Dolomitic**] [**Oolitic**] [**Shell**] limestone.
- E. Varieties and Sources: Subject to compliance with requirements, [**provide the following**] [**provide one of the following**] [**available stone varieties that may be incorporated into the Work include, but are not limited to, the following**]:
 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- F. Varieties and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
 1. Indiana Oolitic Limestone Grade and Color: [**Select, buff**] [**Select, gray**] [**Standard, buff**] [**Standard, gray**] [**Rustic, buff**] [**Rustic, gray**] [**Variegated**], according to grade and color classification established by ILI.
- G. Cut: [**Vein**] [**Fleuri**].
 1. Orientation of Veining: [**Horizontal**] [**Vertical**] [**As indicated**].
- H. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- I. Finish: [**Smooth**] [**Sand rubbed**] [**Machine tooled, four bats per 1 inch (25 mm)**] [**Machine tooled, six bats per 1 inch (25 mm)**] [**Machine tooled, eight bats per 1 inch (25 mm)**] [**As indicated**] [**Match Architect's sample**] <Insert finish> [, matching standard ILI finish].
- J. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.5 MARBLE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 503[, **Classification I Calcite**] [, **Classification II Dolomite**] [, **Group A**] [, **Group B**] [, **Group C**] [, **Group D**].
- B. Regional Materials: Marble shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.

- C. Regional Materials: Marble shall be fabricated within 500 miles (800 km) of Project site.
- D. Description: Uniform, fine- to medium-grained, [white] <Insert color> stone with only slight veining.
- E. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- F. Cut: [Vein] [Fleuri].
 - 1. Orientation of Veining: [Horizontal] [Vertical] [As indicated].
- G. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- H. Finish: [Polished] [Honed] [As indicated] [Match Architect's sample] <Insert finish>.
- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.6 QUARTZ-BASED STONE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 616, [Classification I Sandstone] [Classification II Quartzitic Sandstone] [Classification III Quartzite] [, except for minimum free silica content].
- B. Regional Materials: Quartz-based stone shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Quartz-based stone shall be fabricated within 500 miles (800 km) of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- E. Finish: [Sand rubbed] [Natural cleft] [Thermal] [As indicated] [Match Architect's sample] <Insert finish>.
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.7 SERPENTINE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 1526, [Classification I Exterior] [Classification II Interior].
- B. Regional Materials: Serpentine shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Serpentine shall be fabricated within 500 miles (800 km) of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- F. Finish: [Polished] [Honed] [As indicated] [Match Architect's sample] <Insert finish>.
- G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.8 SLATE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 629, [Classification I Exterior] [Classification II Interior].
- B. Regional Materials: Slate shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Slate shall be fabricated within 500 miles (800 km) of Project site.
- D. Description: [Black] [Blue-black] [Gray] [Blue-gray] [Green] [Purple] [Mottled purple and green] [Red] slate with a fine, even grain[and unfading color,] from clear, sound stock.
- E. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- F. Finish: [Honed] [Sand rubbed] [Natural cleft] [As indicated] [Match Architect's sample] <Insert finish>.
- G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.9 TRAVERTINE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 1527, [Classification I Exterior] [Classification II Interior].
- B. Regional Materials: Travertine shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Travertine shall be fabricated within 500 miles (800 km) of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- E. Cut: [Vein] [Fleuri].
 - 1. Orientation of Veining: [Horizontal] [Vertical] [As indicated].
- F. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- G. Filling: Fill pores on faces of stone with cementitious filler of color [selected by Architect] [matching Architect's sample].
- H. Finish: [Polished] [Honed] [As indicated] [Match Architect's sample] <Insert finish>.
- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.10 OTHER STONE <Insert drawing designation>

- A. Material Standards:
 - 1. Maximum Absorption per ASTM C 97/C 97M: <Insert required value>.
 - 2. Minimum Compressive Strength per ASTM C 170/C 170M: <Insert required value>.
 - 3. Minimum Flexural Strength per ASTM C 880/C 880M: <Insert required value>.
- B. Regional Materials: Stone shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Stone shall be fabricated within 500 miles (800 km) of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.

- E. Finish: [**Polished**] [**Honed**] [**Sand rubbed**] [**Natural cleft**] [**As indicated**] [**Match Architect's sample**] <Insert finish>.
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.11 SETTING MATERIALS

- A. Molding Plaster: ASTM C 59/C 59M.
- B. Portland Cement: ASTM C 150, Type I or Type II.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Aggregate: ASTM C 144.
- E. Water: Potable.

2.12 GROUT

- A. Grout Colors: [**Match stone**] [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**].
- B. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate to produce required color.
- C. Standard Cement Grout: ANSI A118.6, packaged.
 - 1. Grout Type: [**Sanded**] [**Unsanded**].
- D. Polymer-Modified Tile Grout: ANSI A118.7, packaged.
 - 1. **Manufacturers:** Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [Bostik, Inc.](#)
 - b. [C-Cure.](#)
 - c. [Custom Building Products.](#)
 - d. [DAP Inc.](#)
 - e. [Jamo Inc.](#)
 - f. [Laticrete International, Inc.](#)
 - g. [MAPEI Corporation.](#)
 - h. [Mer-Krete Systems; ParexLahabra, Inc.](#)
 - i. [Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.](#)
 - j. [Southern Grouts & Mortars, Inc.](#)

- k. [Summitville Tiles, Inc.](#)
 - l. [TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.](#)
 - m. <Insert manufacturer's name>.
2. Polymer Type: [Acrylic resin] [or] [ethylene vinyl acetate], in dry, redispersible form, packaged with other dry ingredients.
 3. Polymer Type: [Acrylic resin] [or] [styrene-butadiene rubber] in liquid-latex form for addition to packaged dry-grout mix.
 4. Grout Type: [Sanded] [Unsanded].
- E. Water-Cleanable Epoxy Grout: ANSI A118.3, packaged, chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.
1. **Manufacturers:** Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Boiardi Products; a QEP company.](#)
 - b. [Bostik, Inc.](#)
 - c. [C-Cure.](#)
 - d. [Custom Building Products.](#)
 - e. [Jamo Inc.](#)
 - f. [Laticrete International, Inc.](#)
 - g. [MAPEI Corporation.](#)
 - h. [Mer-Krete Systems; ParexLahabra, Inc.](#)
 - i. [Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.](#)
 - j. [Summitville Tiles, Inc.](#)
 - k. [TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.](#)
 - l. <Insert manufacturer's name>.

2.13 POINTING MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.
1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Pigments shall have a record of satisfactory performance in mortar.
1. **Products:** Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Davis Colors; True Tone Mortar Colors.](#)

- b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors; SGS Mortar Colors.
 - d. **<Insert manufacturer's name; product name or designation>.**
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime.
- E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Use a mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight.
- 1. **Products:** Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - b. Lafarge North America Inc.; Eaglebond.
 - c. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
 - d. **<Insert manufacturer's name; product name or designation>.**
- F. Aggregate: ASTM C 144, except with 100 percent passing **No. 16 (1.18-mm)** sieve.
- 1. White Aggregates: Natural white sand or ground white stone.
 - 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.
- G. Water: Potable.

2.14 SEALANTS

- A. Joint Sealants: Manufacturer's standard sealants of characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and will not stain the stone they are applied to.
- 1. Use mildew-resistant joint sealant at plumbing fixtures and for control and expansion joints in toilet rooms[**and other wet locations**].
 - 2. Mildew-Resistant Joint Sealant: **[Mildew resistant, single component, nonsag, neutral curing, silicone] [Single component, nonsag, mildew resistant, acid curing, silicone] <Insert joint sealant>.**
 - 3. Joint Sealant: **[Latex] [Acrylic based] [Butyl rubber based] [Single component, nonsag, neutral curing, silicone; Class 25] <Insert joint sealant>.**
 - 4. VOC Content: **[250] <Insert value> g/L.**
 - 5. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 6. Colors: Provide colors of exposed sealants to match other joints in stone adjoining sealed joints unless otherwise indicated.
- B. Sealant for Filling Kerfs: **[Same sealant used for joints in dimension stone] [Single-component, nonsag, urethane sealant; Class 25, Use T (traffic), and Use M (masonry) that**

complies with applicable requirements in Section 079200 "Joint Sealants" and that does not stain stone] [Single-component, nonsag, neutral-curing, medium- to high-modulus silicone sealant; Class 25, Use NT (nontraffic), and Use M (masonry) that complies with applicable requirements in Section 079200 "Joint Sealants" and that does not stain stone].

1. **Products:** Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. BASF Building Systems; MasterSealNP.
 - b. BASF Building Systems; MasterSeal CR195.
 - c. Sika Corporation; Sikaflex - 1a.
 - d. Tremco Incorporated; Vulkem 116.
 - e. BASF Building Systems; Omniseal 50.
 - f. Tremco; Spectrem 2.
 - g. <Insert manufacturer's name; product name or designation>.
2. VOC Content: [250] <Insert value> g/L.
3. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.15 STONE ANCHORS AND ATTACHMENTS

- A. Fabricate anchors from stainless steel, ASTM A 240/A 240M or ASTM A 666, Type 304.
 1. Fasteners for Stainless-Steel Anchors: Annealed stainless-steel bolts, nuts, and washers; **ASTM F 593 (ASTM F 738M)** for bolts and **ASTM F 594 (ASTM F 836M)** for nuts, Alloy Group **1 (A1)**.
- B. Fabricate dowels from stainless steel, ASTM A 276, Type 304.
- C. Fabricate anchors from extruded aluminum, **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T6.
 1. Fasteners for Extruded-Aluminum Anchors: Annealed stainless-steel bolts, nuts, and washers; **ASTM F 593 (ASTM F 738M)** for bolts and **ASTM F 594 (ASTM F 836M)** for nuts, Alloy Group **1 (A1)**.
- D. Anchor Support Grids: Roll-formed steel channels, of size and shape required for application indicated, formed from galvanized-steel sheet not less than **0.108 inch (2.8 mm)** thick and complying with ASTM A 653/A 653M, **G90 (Z275)**.
 1. Fittings and Fasteners: System manufacturer's standard components of design, size, and material required to securely attach grids to building structure and stone anchors to grids. Fabricate components in contact with stone from same material specified for anchors.
- E. Wire Tiebacks: [No. **9 AWG copper or copper-alloy**] [or] [**0.120-inch- (3.0-mm-) diameter, stainless-steel**] wire.

- F. Dovetail Slots: Furnish dovetail slots with filler strips of slot size required to receive anchors provided, fabricated from **0.034-inch- (0.86-mm-)** thick, galvanized-steel sheet complying with ASTM A 653/A 653M, **G90 (Z275)**.
- G. Direct-Mount Anchoring Systems: Stainless-steel[**or aluminum**] stone anchors designed to be applied directly to wall surfaces[**or to metal grids**]. System is secured to wall framing, furring, or sheet-metal reinforcing strips built into wall with[**stainless-steel**] self-drilling screws. Anchors fit into kerfs or holes in edges of stone panels[**and do not need setting spots**].
 - 1. **Products:** Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Halfen Anchoring Systems; Meadow Burke.](#)
 - b. [Heckmann Building Products Inc.](#)
 - c. [Hohmann & Barnard, Inc.](#)
 - d. **<Insert manufacturer's name>**.

2.16 STONE ACCESSORIES

- A. Temporary Setting Shims: Rigid plastic shims, nonstaining to stone, sized to suit joint thickness.
- B. Setting Shims for Direct-Mount Anchoring Systems: Strips of resilient plastic or neoprene, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
- C. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- D. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
 - 1. **Manufacturers:** Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Bostik, Inc.](#)
 - b. [Custom Building Products.](#)
 - c. [Hillyard, Inc.](#)
 - d. [HMK Stone Care; ACI International.](#)
 - e. [Miracle Sealants Company.](#)
 - f. [Stone Care International.](#)
 - g. [Summitville Tiles, Inc.](#)
 - h. **<Insert manufacturer's name>**.

2.17 STONE FABRICATION, GENERAL

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
 - 1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.
- B. Fabricate stone paneling in sizes and shapes required to comply with requirements indicated.
 - 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
 - 2. For marble, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."
 - 3. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
- C. Cut stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association.
 - 1. Where items are installed with adhesive or where stone edges are visible in the finished work, make items uniform in thickness and of identical thickness for each type of item; gage back of stone if necessary.
 - 2. Clean sawed backs of stones to remove rust stains and iron particles.
 - 3. Dress joints straight and at right angle to face unless otherwise indicated.
 - 4. Cut and drill sinkages and holes in stone for anchors, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.
 - 5. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
- D. Finish exposed faces and edges of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups.
- E. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
 - 1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples[**and mockups**].

2.18 STONE WALL PANELING

- A. Arrange panels in shop or other suitable space in proposed orientation and sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
 - 1. Lay out one elevation at a time if approved by Architect.
 - 2. Notify Architect seven days in advance of date and time when layout will be available for viewing.
 - 3. Provide lighting of similar type and level as that of final installation for viewing layout unless otherwise approved by Architect.

4. Rearrange panels as directed by Architect until layout is approved.
 5. Do not trim nonmodular-size units to less than modular size until after Architect's approval of layout, unless otherwise approved by Architect.
 6. Mark backs of units and Shop Drawings with sequence numbers based on approved layout. Mark backs of units to indicate orientation of units in completed Work.
- B. Nominal Thickness: [**3/4 inch (20 mm)**] [**7/8 inch (22 mm)**] [**1 inch (25 mm)**] [**1-1/4 inches (32 mm)**] [**2 inches (50 mm)**] unless otherwise indicated.
- C. Control depth of stone to maintain minimum clearances of [**3/4 inch (20 mm)**] [**1 inch (25 mm)**] between backs of panels and structural members, fireproofing if any, backup walls, and other work behind stone. Do not back check stone less than **1 inch (25 mm)** thick.
- D. Cut stone to produce uniform joints [**1/16 inch (1.5 mm)**] [**1/8 inch (3 mm)**] [**1/4 inch (6 mm)**] [**3/8 inch (10 mm)**] <Insert dimension> wide and in locations indicated.
- E. Quirk-miter corners unless otherwise indicated. Fabricate for anchorage in top and bottom bed joints of corner units.
- F. Carve and cut [**inscriptions**] [**and**] [**decorative surfaces**]. Use skilled stone carvers experienced in the successful performance of work similar to that indicated.
- G. Abrasively etch [**inscriptions**] [**and**] [**decorative surfaces**].
- H. Laser etch [**inscriptions**] [**and**] [**decorative surfaces**].
- I. Pattern Arrangement: Fabricate and arrange panels with veining and other natural markings to comply with the following requirements:
1. Arrange panels with veining horizontal.
 2. Arrange panels with veining vertical.
 3. Arrange panels with veining as indicated on Drawings.
 4. Arrange panels in blend pattern.
 5. Book match units, single-course height.
 6. Book match units, both vertically and horizontally.
 7. Book match units in each course. No matching is required between successive courses.
 8. Slip match units, single-course height.
 9. Slip match units, both vertically and horizontally.
 10. Slip match units in each course. No matching is required between successive courses.

2.19 STONE COLUMN FACING

- A. Nominal Thickness: [**3/4 inch (20 mm)**] [**7/8 inch (22 mm)**] [**1 inch (25 mm)**] [**1-1/4 inches (32 mm)**] [**2 inches (50 mm)**] unless otherwise indicated.
- B. Joints: [**1/16-inch- (1.5-mm-) wide grouted**] [**1/8-inch- (3-mm-) wide grouted**] [**1/8-inch- (3-mm-) wide, sealant-filled**] [**1/4-inch- (6-mm-) wide, mortar-pointed**] [**1/4-inch- (6-mm-) wide, sealant-filled**] [**3/8-inch- (10-mm-) wide, mortar-pointed**] [**3/8-inch- (10-mm-) wide, sealant-filled**] <Insert dimension and description> joints.

- C. Quirk-miter corners unless otherwise indicated. Install anchorage in top and bottom bed joints of corner units.
- D. Pattern Arrangement: Fabricate and arrange panels with veining and other natural markings to comply with the following requirements:
 - 1. Arrange panels with veining horizontal.
 - 2. Arrange panels with veining vertical.
 - 3. Arrange panels with veining as indicated on Drawings.

2.20 MIXES

- A. Spotting Plaster: Stiff mix of molding plaster and water.
- B. Mortar, General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
 - 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
 - 2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.
- C. Setting Mortar: Comply with ASTM C 270, Proportion Specification.
 - 1. Type: [N] [O].
 - 2. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times the volume of cement and lime.
- D. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, for mortar types indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:
 - 1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
 - 2. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
 - 3. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.
 - 4. Type: [N] [O].
 - 5. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times the volume of cement and lime.
- E. Grout: Comply with mixing requirements of referenced ANSI standards and with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive stone paneling and conditions under which stone paneling will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone paneling.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone paneling.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING STONE, GENERAL

- A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.
- C. Contiguous Work: Provide reveals and openings as required to accommodate contiguous work.
- D. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
- E. Erect stone units level, plumb, and true with uniform joint widths. Use temporary shims to maintain joint width.
- F. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Sealing of expansion and other joints is specified in Section 079200 "Joint Sealants."
 - 2. Keep expansion joints free of plaster, mortar, grout, and other rigid materials.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed **1/8 inch in 96 inches (3 mm in 2400 mm)**, **1/4 inch (6 mm)** maximum.
- B. Variation from Level: For lintels, sills, chair rails, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, **3/8 inch (10 mm)** maximum.

- C. Variation of Linear Building Line: For position shown in plan and related portion of walls and partitions, do not exceed **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, **3/8 inch (10 mm)** maximum.
- D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus **1/8 inch (3 mm)**.
- E. Variation in Joint Width: Do not vary from average joint width more than plus or minus **1/16 inch (1.5 mm)** or one-fourth of nominal joint width, whichever is less.
- F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed **1/32-inch (0.8-mm)** difference between planes of adjacent units.

3.4 INSTALLATION OF STONE PANELING

- A. Set units firmly against setting spots. Locate setting spots at anchors and spaced not more than **18 inches (450 mm)** apart across back of unit, but provide no fewer than one setting spot per **2 sq. ft. (0.18 sq. m)** unless otherwise indicated.
 - 1. Moisture Exposure: Use portland cement mortar for setting spots where stone is applied to inside face of exterior walls and [**where indicated**] **<Insert wet locations>**.
- B. Set units on direct-mount anchoring system with anchors securely attached to stone and to backup surfaces. Comply with anchoring recommendations in ASTM C 1242.
 - 1. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant for filling kerfs.
 - 2. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.
- C. Minimum Anchors: Provide anchors at a maximum of **24 inches (600 mm)** o.c. around perimeter of stone panels with a minimum of four anchors per panel.
- D. Minimum Anchors: Provide a minimum of four anchors per panel up to **12 sq. ft. (1.1 sq. m)** in face area, plus a minimum of two additional anchors for each additional **8 sq. ft. (0.7 sq. m)**.
- E. [**Grout**] [**Point**] joints after setting stone.
- F. Fill[**indicated**] joints with sealant after setting [**and grouting**] [**and pointing**] stone.

3.5 GROUTING JOINTS

- A. Grout stone to comply with ANSI A108.10.
 - 1. Use sanded grout mixture for joints wider than **1/8 inch (3 mm)**.
 - 2. Use unsanded grout mixture for joints **1/8 inch (3 mm)** and narrower.

- B. Remove temporary shims before grouting.
- C. Tool joints uniformly and smoothly with plastic tool.

3.6 POINTING JOINTS WITH MORTAR

- A. Prepare stone-joint surfaces for pointing with mortar by removing temporary shims, dust, and mortar particles. Where setting spots occur at joints, rake out excess setting mortar or plaster to a depth of not less than **1/2 inch (13 mm)**.
- B. Point stone joints by placing pointing mortar in layers of not more than **3/8 inch (10 mm)**. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer. Apply mortar first to areas where depths are greater than surrounding areas until a uniform depth is formed.
- C. Tool joints when pointing mortar is thumbprint hard. Use a round jointer having a diameter **1/8 inch (3 mm)** larger than width of joint.

3.7 JOINT-SEALANT INSTALLATION

- A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants." Remove temporary shims before applying sealants.

3.8 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone paneling as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace stone paneling of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective stone paneling.
 - 3. Defective joints, including misaligned joints.
 - 4. Stone paneling and joints not matching approved Samples and mockups.
 - 5. Stone paneling not complying with other requirements indicated.
- C. Replace in a manner that results in stone paneling that matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.
- D. Clean stone paneling no fewer than six days after completion of grouting and pointing, using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.
- E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions and recommendations.

3.9 PROTECTION

- A. Protect stone surfaces, edges, and corners from construction damage. Use securely fastened untreated wood, plywood, or heavy cardboard to prevent damage.
- B. Before inspection for Substantial Completion, remove protective coverings and clean surfaces.

SECTION 097516 - STONE BASE

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 stone base.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for sealing expansion joints in stone base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each [**variety of stone,**] stone accessory, and manufactured product.
- B. LEED Submittals (Projects authorized for LEED certification only):
 - 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured[**and regionally extracted and manufactured**] materials. Include statement indicating cost for each regionally manufactured material.
 - a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
 - b. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.
 - 3. Product Data for Credit IEQ 4.1: For [**adhesives**] [**and**] [**sealants**], documentation including printed statement of VOC content.
 - 4. Laboratory Test Reports for Credit IEQ 4.1: For [**adhesives**] [**and**] [**sealants**], documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Shop Drawings: Show fabrication and installation details for stone base, including dimensions and profiles of stone units.
 - 1. Show locations and details of joints.
 - 2. Show locations and details of anchors, including locations of supporting construction.
- D. Samples for Initial Selection: For joint materials involving color selection.
- E. Samples for Verification:
 - 1. For each stone type indicated, in sets of Samples not less than **12 inches (300 mm)** square. Include **[two] [three] [four] [five]** <Insert number> or more Samples in each set and show the full range of variations in appearance characteristics in completed Work.
 - 2. For each color of **[grout] [pointing mortar] [and] [sealant]** required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **[Installer] [fabricator]**.
- B. Material Test Reports:
 - 1. Stone Test Reports: For **[each]** stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous **[three] [five]** <Insert number> years.
 - 2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of stone base.
- C. Installer Qualifications: A firm or individual experienced in installing stone base similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockup for stone base, not less than **72 inches (1800 mm)** long.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Sealant Adhesion and Compatibility Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units.
- C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.
- D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.8 FIELD CONDITIONS

- A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F (10 deg C) during installation and for seven days after completion.
- B. Field Measurements: Verify dimensions of construction to receive stone base by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. Time delivery and installation of stone base to avoid extended on-site storage and to coordinate with work adjacent to stone base.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain[**each variety of**] stone, [**regardless of finish,**] from a single quarry[, **whether specified in this Section or in another Section of the Specifications,**] with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.

- B. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Section 044200 "Exterior Stone Cladding."

2.2 GRANITE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 615.
- B. Regional Materials: Granite shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Granite shall be fabricated within 500 miles (800 km) of Project site.
- D. Description: Uniform, [fine] [medium]-grained, [white] [pink] [gray] [black] <Insert color> stone[without veining].
- E. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- F. Cut: [Vein] [Fleuri].
 - 1. Orientation of Veining: [Horizontal] [Vertical] [As indicated].
- G. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- H. Finish: [Polished] [Honed] [Thermal] [As indicated] [Match Architect's sample] <Insert finish>.
- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.3 LIMESTONE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 568.
 - 1. Classification: [I Low] [II Medium] [III High] Density.
- B. Regional Materials: Limestone shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Limestone shall be fabricated within 500 miles (800 km) of Project site.
- D. Description: [Dolomitic] [Oolitic] [Shell] limestone.
- E. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:

1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**
- F. Varieties and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
1. Indiana Oolitic Limestone Grade and Color: **[Select, buff] [Select, gray] [Standard, buff] [Standard, gray] [Rustic, buff] [Rustic, gray] [Variegated]**, according to grade and color classification established by ILI.
- G. Cut: **[Vein] [Fleuri]**.
1. Orientation of Veining: **[Horizontal] [Vertical] [As indicated]**.
- H. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- I. Finish: **[Smooth] [Sand rubbed] [Machine tooled, four bats per 1 inch (25 mm)] [Machine tooled, six bats per 1 inch (25 mm)] [Machine tooled, eight bats per 1 inch (25 mm)] [As indicated] [Match Architect's sample] <Insert finish> [, matching standard ILI finish]**.
- J. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.4 MARBLE **<Insert drawing designation>**

- A. Material Standard: Comply with ASTM C 503, **[Classification I Calcite] [, Classification II Dolomite] [, Group A] [, Group B] [, Group C] [, Group D]**.
- B. Regional Materials: Marble shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.
- C. Regional Materials: Marble shall be fabricated within **500 miles (800 km)** of Project site.
- D. Description: Uniform, fine- to medium-grained, **[white] <Insert color>** stone with only slight veining.
- E. Varieties and Sources: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]**:
1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**
- F. Cut: **[Vein] [Fleuri]**.
1. Orientation of Veining: **[Horizontal] [Vertical] [As indicated]**.
- G. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- H. Finish: **[Polished] [Honed] [As indicated] [Match Architect's sample] <Insert finish>**.

- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.5 QUARTZ-BASED STONE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 616, [Classification I Sandstone] [Classification II Quartzitic Sandstone] [Classification III Quartzite] [, except for minimum free silica content].
- B. Regional Materials: Quartz-based stone shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Quartz-based stone shall be fabricated within 500 miles (800 km) of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- E. Finish: [Sand rubbed] [Natural cleft] [Thermal] [As indicated] [Match Architect's sample] <Insert finish>.
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.6 SERPENTINE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 1526, [Classification I Exterior] [Classification II Interior].
- B. Regional Materials: Serpentine shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Serpentine shall be fabricated within 500 miles (800 km) of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- F. Finish: [Polished] [Honed] [As indicated] [Match Architect's sample] <Insert finish>.

- G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.7 SLATE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 629, [Classification I Exterior] [Classification II Interior].
- B. Regional Materials: Slate shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Slate shall be fabricated within 500 miles (800 km) of Project site.
- D. Description: [Black] [Blue-black] [Gray] [Blue-gray] [Green] [Purple] [Mottled purple and green] [Red] slate with a fine, even grain[and unfading color,] from clear, sound stock.
- E. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- F. Finish: [Honed] [Sand rubbed] [Natural cleft] [As indicated] [Match Architect's sample] <Insert finish>.
- G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.8 TRAVERTINE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 1527, [Classification I Exterior] [Classification II Interior].
- B. Regional Materials: Travertine shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Travertine shall be fabricated within 500 miles (800 km) of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- E. Cut: [Vein] [Fleuri].
 - 1. Orientation of Veining: [Horizontal] [Vertical] [As indicated].

- F. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- G. Filling: Fill pores on faces of stone with cementitious filler of color [selected by Architect] [matching Architect's sample].
- H. Finish: [Polished] [Honed] [As indicated] [Match Architect's sample] <Insert finish>.
- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.9 OTHER STONE <Insert drawing designation>

- A. Material Standards:
 - 1. Maximum Absorption per ASTM C 97/C 97M: <Insert required value>.
 - 2. Minimum Compressive Strength per ASTM C 170/C 170M: <Insert required value>.
 - 3. Minimum Flexural Strength per ASTM C 880/C 880M: <Insert required value>.
- B. Regional Materials: Stone shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Regional Materials: Stone shall be fabricated within 500 miles (800 km) of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- E. Finish: [Polished] [Honed] [Sand rubbed] [Natural cleft] [As indicated] [Match Architect's sample] <Insert finish>.
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.10 SETTING MATERIALS

- A. Molding Plaster: ASTM C 59/C 59M.
- B. Portland Cement: ASTM C 150, Type I or Type II.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Aggregate: ASTM C 144.
- E. Water: Potable.

- F. Adhesives, General: Use only adhesives formulated for stone and ceramic tile and recommended by their manufacturer for the application indicated.
- G. Organic Adhesive: ANSI A136.1, Type I[.][, with a VOC content of 65 g/L or less.][, that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."]
1. **Manufacturers:** Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Boiardi Products; a QEP company.
 - b. Bostik, Inc.
 - c. C-Cure.
 - d. Custom Building Products.
 - e. DAP Inc.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Mer-Krete Systems; ParexLahabra, Inc.
 - j. Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.
 - k. Southern Grouts & Mortars, Inc.
 - l. TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.
 - m. **<Insert manufacturer's name>.**
- H. Water-Cleanable Epoxy Adhesive: ANSI A118.3[.][, with a VOC content of 65 g/L or less.][, that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."]
1. **Manufacturers:** Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Boiardi Products; a QEP company.
 - b. Bonstone Materials Corporation.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Mer-Krete Systems; ParexLahabra, Inc.
 - j. Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.
 - k. Summitville Tiles, Inc.
 - l. TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.
 - m. **<Insert manufacturer's name>.**

- I. Stone Adhesive: Two-part, **[epoxy-resin] [or] [polyester-resin]** stone adhesive with an initial set time of not more than two hours at **70 deg F (21 deg C)**., and with a VOC content of **65 g/L or less.**, that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 1. Color: **[Clear] [Match stone]**.
 2. **Products:** Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. Epoxy Adhesive: [Akemi North America](#); Akepox.
 - b. Epoxy Adhesive: [SikeAxson](#), Wood & Stone Company; **Adekit 130.**
 - c. Epoxy Adhesive: [Bonstone Materials Corporation](#); Touchstone Last Patch.
 - d. Epoxy Adhesive: [Bonstone Materials Corporation](#); Touchstone Ratio Pac Clear Gel Epoxy.
 - e. Epoxy Adhesive: **<Insert manufacturer's name; product name or designation>**.
 - f. Polyester Adhesive: [Akemi North America](#); Platinum Clear Polyester Adhesive.
 - g. Polyester Adhesive: [SikeAxson](#), Wood & Stone Company; Wood & Stone Polyester.
 - h. Polyester Adhesive: [Bonstone Materials Corporation](#); Gripstone L-200KG.
 - i. Polyester Adhesive: **<Insert manufacturer's name; product name or designation>**.

2.11 GROUT

- A. Grout Colors: **[Match stone] [As indicated by manufacturer's designations] [Match Architect's samples] [As selected by Architect from manufacturer's full range]**.
- B. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate to produce required color.
- C. Standard Cement Grout: ANSI A118.6, packaged.
 1. Grout Type: **[Sanded] [Unsanded]**.
- D. Polymer-Modified Tile Grout: ANSI A118.7, packaged.
 1. **Manufacturers:** Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Bostik, Inc.](#)
 - b. [C-Cure.](#)
 - c. [Custom Building Products.](#)
 - d. [DAP Inc.](#)
 - e. [Jamo Inc.](#)
 - f. [Laticrete International, Inc.](#)

- g. [MAPEI Corporation.](#)
 - h. [Mer-Krete Systems; ParexLahabra, Inc.](#)
 - i. [Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.](#)
 - j. [Southern Grouts & Mortars, Inc.](#)
 - k. [Summitville Tiles, Inc.](#)
 - l. [TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.](#)
 - m. **<Insert manufacturer's name>.**
- 2. Polymer Type: [**Acrylic resin**] [**or**] [**ethylene vinyl acetate**], in dry, redispersible form, packaged with other dry ingredients.
 - 3. Polymer Type: [**Acrylic resin**] [**or**] [**styrene-butadiene rubber**] in liquid-latex form for addition to packaged dry-grout mix.
 - 4. Grout Type: [**Sanded**] [**Unsanded**].
- E. Water-Cleanable Epoxy Grout: ANSI A118.3, packaged, chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.
- 1. **Manufacturers:** Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [Boiardi Products; a QEP company.](#)
 - b. [Bostik, Inc.](#)
 - c. [C-Cure.](#)
 - d. [Custom Building Products.](#)
 - e. [Jamo Inc.](#)
 - f. [Laticrete International, Inc.](#)
 - g. [MAPEI Corporation.](#)
 - h. [Mer-Krete Systems; ParexLahabra, Inc.](#)
 - i. [Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.](#)
 - j. [Summitville Tiles, Inc.](#)
 - k. [TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.](#)
 - l. **<Insert manufacturer's name>.**

2.12 POINTING MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Pigments shall have a record of satisfactory performance in mortar.

1. **Products:** Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **Davis Colors**; True Tone Mortar Colors.
 - b. **Lanxess Corporation**; Bayferrox Iron Oxide Pigments.
 - c. **Solomon Colors**; SGS Mortar Colors.
 - d. **<Insert manufacturer's name; product name or designation>**.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime.

E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Use a mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight.

1. **Products:** Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **Holcim (US) Inc.**; Rainbow Mortamix Custom Color Cement/Lime.
 - b. **Lafarge North America Inc.**; Eaglebond.
 - c. **Lehigh Cement Company**; Lehigh Custom Color Portland/Lime Cement.
 - d. **<Insert manufacturer's name; product name or designation>**.

F. Aggregate: ASTM C 144, except with 100 percent passing **No. 16 (1.18-mm)** sieve.

1. White Aggregates: Natural white sand or ground white stone.
2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.

G. Water: Potable.

2.13 SEALANTS

A. Joint Sealants: Manufacturer's standard sealants of characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and will not stain the stone they are applied to.

1. Mildew-Resistant Joint Sealant: **[Mildew resistant, single component, nonsag, neutral curing, silicone] [Single component, nonsag, mildew resistant, acid curing, silicone] <Insert joint sealant>**.
2. Joint Sealant: **[Latex] [Acrylic based] [Butyl rubber based] [Single component, nonsag, neutral curing, silicone; Class 25] <Insert joint sealant>**.
3. VOC Content: **[250] <Insert value>** g/L or less.
4. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
5. Colors: Provide colors of exposed sealants to match other joints in stone adjoining sealed joints unless otherwise indicated.

2.14 STONE ANCHORS AND ATTACHMENTS

- A. Wire Tiebacks: [**No. 9 AWG copper or copper-alloy**] [or] [**0.120-inch- (3.0-mm-) diameter, stainless-steel**] wire.

2.15 STONE ACCESSORIES

- A. Temporary Setting Shims: Rigid plastic shims, nonstaining to stone, sized to suit joint thickness.
- B. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- C. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
1. **Manufacturers:** Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
- a. Bostik, Inc.
 - b. Custom Building Products.
 - c. Hillyard, Inc.
 - d. HMK Stone Care; ACI International.
 - e. Miracle Sealants Company.
 - f. Stone Care International.
 - g. Summitville Tiles, Inc.
 - h. **<Insert manufacturer's name>.**

2.16 STONE FABRICATION, GENERAL

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically displeasing, as judged by Architect.
- B. Fabricate stone base in sizes and shapes required to comply with requirements indicated.
1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
2. For marble, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."
3. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

- C. Cut stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association.
 - 1. Where items are installed with adhesive or where stone edges are visible in the finished work, make items uniform in thickness and of identical thickness for each type of item; gage back of stone if necessary.
 - 2. Clean sawed backs of stones to remove rust stains and iron particles.
 - 3. Dress joints straight and at right angle to face unless otherwise indicated.
- D. Fabricate molded work to produce stone shapes with a uniform profile throughout entire unit length and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units.
 - 1. Produce moldings with machines having abrasive shaping wheels made to reverse contour of molding shape; do not sculpt moldings.
- E. Finish exposed faces and edges of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups.
- F. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
 - 1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples[**and mockups**].

2.17 STONE BASE

- A. Nominal Thickness: [**3/4 inch (20 mm)**] [**7/8 inch (22 mm)**] [**1-1/4 inches (32 mm)**] unless otherwise indicated.
- B. Top-Edge Detail: [**Straight, slightly eased at corner**] [**3/8-inch (10-mm) bevel**] [**3/4-inch (20-mm) radius**] [**3/8-inch (10-mm) radius**] [**As indicated**].
- C. Ends: [**Butt ends into casings**] [**Butt ends into opening frames**] [**Return ends to depth of adjacent finish with edge detail same as top edge**] unless otherwise indicated.
- D. Joints: [**1/16-inch- (1.5-mm-) wide grouted joints**] [**1/8-inch- (3-mm-) wide grouted joints**] [**1/8-inch- (3-mm-) wide, sealant-filled joints**] [**Bonded joints, 1/32 inch (0.8 mm) or less in width**].
 - 1. Locate joints at midpoints between adjacent paneling joints unless otherwise indicated.

2.18 MIXES

- A. Spotting Plaster: Stiff mix of molding plaster and water.
- B. Mortar, General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing

time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.

1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.

C. Setting Mortar: Comply with ASTM C 270, Proportion Specification.

1. Type: [N] [O].
2. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times the volume of cement and lime.

D. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, for mortar types indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:

1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
2. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
3. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.
4. Type: [N] [O].
5. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times the volume of cement and lime.

E. Grout: Comply with mixing requirements of referenced ANSI standards and with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive stone base and conditions under which stone base will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone base.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone base.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING STONE, GENERAL

- A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.
- C. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
- D. Erect stone units level, plumb, and true with uniform joint widths. Use temporary shims to maintain joint width.
- E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Sealing of expansion and other joints is specified in Section 079200 "Joint Sealants."
 - 2. Keep expansion joints free of plaster, mortar, grout, and other rigid materials.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Level: For lintels, sills, chair rails, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, **3/8 inch (10 mm)** maximum.
- B. Variation in Joint Width: Do not vary from average joint width more than plus or minus **1/16 inch (1.5 mm)** or one-fourth of nominal joint width, whichever is less.
- C. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed **1/32-inch (0.8-mm)** difference between planes of adjacent units.

3.4 INSTALLATION OF STONE BASE

- A. Stone Base: At locations with stone paneling, set units by adhering to stone paneling with water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- B. Stone Base: At locations with stone paneling, set units firmly against setting spots. Locate setting spots at anchors and spaced not more than **18 inches (450 mm)** apart unless otherwise indicated. Provide no fewer than two anchors per piece for stone base up to **48 inches (1200 mm)** in length, plus one additional anchor for each additional **24 inches (600 mm)** of length.
- C. Stone Base: At locations without stone paneling, adhere units to plywood backing with full spread of water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.

- D. Stone Base: At locations without stone paneling, adhere units to gypsum board with full spread of **[organic] [water-cleanable epoxy]** adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- E. Assemble indicated multiple-piece stone base by bonding joints with stone adhesive as units are set. Mask areas adjacent to joints to prevent adhesive smears. Clamp units in place to ensure that surfaces are properly aligned and joints are minimum width.
- F. **[Grout] [Point]** joints after setting stone.
- G. Fill **[indicated]** joints with sealant after setting **[and grouting] [and pointing]** stone.

3.5 GROUTING JOINTS

- A. Grout stone to comply with ANSI A108.10.
 - 1. Use sanded grout mixture for joints wider than **1/8 inch (3 mm)**.
 - 2. Use unsanded grout mixture for joints **1/8 inch (3 mm)** and narrower.
- B. Remove temporary shims before grouting.
- C. Tool joints uniformly and smoothly with plastic tool.

3.6 POINTING JOINTS WITH MORTAR

- A. Prepare stone-joint surfaces for pointing with mortar by removing temporary shims, dust, and mortar particles. Where setting spots occur at joints, rake out excess setting mortar or plaster to a depth of not less than **1/2 inch (13 mm)**.
- B. Point stone joints by placing pointing mortar in layers of not more than **3/8 inch (10 mm)**. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer. Apply mortar first to areas where depths are greater than surrounding areas until a uniform depth is formed.
- C. Tool joints when pointing mortar is thumbprint hard. Use a round jointer having a diameter **1/8 inch (3 mm)** larger than width of joint.

3.7 JOINT-SEALANT INSTALLATION

- A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants." Remove temporary shims before applying sealants.

3.8 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone base as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.

- B. Remove and replace stone base of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective stone base.
 - 3. Defective joints, including misaligned joints.
 - 4. Stone base and joints not matching approved Samples and mockups.
 - 5. Stone base not complying with other requirements indicated.
- C. Replace in a manner that results in stone base that matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.
- D. Clean stone base no fewer than six days after completion of grouting and pointing, using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.
- E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions and recommendations.

3.9 PROTECTION

- A. Protect stone surfaces, edges, and corners from construction damage. Use securely fastened untreated wood, plywood, or heavy cardboard to prevent damage.
- B. Before inspection for Substantial Completion, remove protective coverings and clean surfaces.

END OF SECTION 097516

SECTION 097519 - STONE TRIM

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 interior stone trim.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for sealing expansion joints in interior stone trim.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [**Project site**] <Insert location>.

1.4 ACTION SUBMITTALS

- A. Product Data: For each[**variety of stone,**] stone accessory, and manufactured product.
- B. LEED Submittals (Projects authorized for LEED authorization only):
 - 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured[**and regionally extracted and manufactured**] materials. Include statement indicating cost for each regionally manufactured material.
 - a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
 - b. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.
 - 3. Product Data for Credit IEQ 4.1: For [**adhesives**] [**and**] [**sealants**], documentation including printed statement of VOC content.

4. Laboratory Test Reports for Credit IEQ 4.1: For **[adhesives]** **[and]** **[sealants]**, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Show fabrication and installation details for stone trim, including dimensions and profiles of stone units.
 1. Show locations and details of joints.
 2. Show locations and details of anchors, including locations of supporting construction.
- D. Samples for Initial Selection: For joint materials involving color selection.
- E. Samples for Verification:
 1. For each stone type indicated, in sets of Samples not less than **12 inches (300 mm)** square. Include **[two]** **[three]** **[four]** **[five]** **<Insert number>** or more Samples in each set and show the full range of variations in appearance characteristics in completed Work.
 2. For each color of **[grout]** **[pointing mortar]** **[and]** **[sealant]** required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **[Installer]** **[fabricator]**.
- B. Material Test Reports:
 1. Stone Test Reports: For **[each]** stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous **[three]** **[five]** **<Insert number>** years.
 2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of interior stone trim.
- C. Installer Qualifications: A firm or individual experienced in installing interior stone trim similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical interior stone trim as shown on Drawings.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Sealant Adhesion and Compatibility Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical units so that they are right side up when units are installed.
- C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.
- D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.9 FIELD CONDITIONS

- A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F (10 deg C) during installation and for seven days after completion.
- B. Field Measurements: Verify dimensions of construction to receive interior stone trim by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 COORDINATION

- A. Time delivery and installation of interior stone trim to avoid extended on-site storage and to coordinate with work adjacent to interior stone trim.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain **[each variety of]** stone, **[regardless of finish,]** from a single quarry **[, whether specified in this Section or in another Section of the Specifications,]** with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
- B. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Section 044200 "Exterior Stone Cladding."

2.2 GRANITE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 615.
- B. Regional Materials: Granite shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.
- C. Regional Materials: Granite shall be fabricated within **500 miles (800 km)** of Project site.
- D. Description: Uniform, **[fine]** **[medium]**-grained, **[white]** **[pink]** **[gray]** **[black]** <Insert color> stone **[without veining]**.
- E. Varieties and Sources: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**
- F. Cut: **[Vein]** **[Fleuri]**.
 - 1. Orientation of Veining: **[Horizontal]** **[Vertical]** **[As indicated]**.
- G. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- H. Finish: **[Polished]** **[Honed]** **[Thermal]** **[As indicated]** **[Match Architect's sample]** <Insert finish>.
- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.3 LIMESTONE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 568.

1. Classification: [**I Low**] [**II Medium**] [**III High**] Density.
- B. Regional Materials: Limestone shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.
- C. Regional Materials: Limestone shall be fabricated within **500 miles (800 km)** of Project site.
- D. Description: [**Dolomitic**] [**Oolitic**] [**Shell**] limestone.
- E. Varieties and Sources: Subject to compliance with requirements, [**provide the following**] [**provide one of the following**] [**available stone varieties that may be incorporated into the Work include, but are not limited to, the following**]:
 1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>**.
- F. Varieties and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
 1. Indiana Oolitic Limestone Grade and Color: [**Select, buff**] [**Select, gray**] [**Standard, buff**] [**Standard, gray**] [**Rustic, buff**] [**Rustic, gray**] [**Variegated**], according to grade and color classification established by ILI.
- G. Cut: [**Vein**] [**Fleuri**].
 1. Orientation of Veining: [**Horizontal**] [**Vertical**] [**As indicated**].
- H. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- I. Finish: [**Smooth**] [**Sand rubbed**] [**Machine tooled, four bats per 1 inch (25 mm)**] [**Machine tooled, six bats per 1 inch (25 mm)**] [**Machine tooled, eight bats per 1 inch (25 mm)**] [**As indicated**] [**Match Architect's sample**] **<Insert finish>** [, matching standard ILI finish].
- J. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.4 MARBLE **<Insert drawing designation>**

- A. Material Standard: Comply with ASTM C 503[, **Classification I Calcite**] [, **Classification II Dolomite**] [, **Group A**] [, **Group B**] [, **Group C**] [, **Group D**].
- B. Regional Materials: Marble shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.
- C. Regional Materials: Marble shall be fabricated within **500 miles (800 km)** of Project site.
- D. Description: Uniform, fine- to medium-grained, [**white**] **<Insert color>** stone with only slight veining.

- E. Varieties and Sources: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**
- F. Cut: **[Vein]** **[Fleuri]**.
 - 1. Orientation of Veining: **[Horizontal]** **[Vertical]** **[As indicated]**.
- G. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- H. Finish: **[Polished]** **[Honed]** **[As indicated]** **[Match Architect's sample]** **<Insert finish>**.
- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.5 SERPENTINE **<Insert drawing designation>**

- A. Material Standard: Comply with ASTM C 1526, **[Classification I Exterior]** **[Classification II Interior]**.
- B. Regional Materials: Serpentine shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.
- C. Regional Materials: Serpentine shall be fabricated within **500 miles (800 km)** of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>**.
- E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- F. Finish: **[Polished]** **[Honed]** **[As indicated]** **[Match Architect's sample]** **<Insert finish>**.
- G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.6 TRAVERTINE **<Insert drawing designation>**

- A. Material Standard: Comply with ASTM C 1527, **[Classification I Exterior]** **[Classification II Interior]**.
- B. Regional Materials: Travertine shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.

- C. Regional Materials: Travertine shall be fabricated within **500 miles (800 km)** of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**
- E. Cut: **[Vein] [Fleuri]**.
 - 1. Orientation of Veining: **[Horizontal] [Vertical] [As indicated]**.
- F. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- G. Filling: Fill pores on faces of stone with cementitious filler of color **[selected by Architect] [matching Architect's sample]**.
- H. Finish: **[Polished] [Honed] [As indicated] [Match Architect's sample] <Insert finish>**.
- I. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.7 OTHER STONE **<Insert drawing designation>**

- A. Material Standards:
 - 1. Maximum Absorption per ASTM C 97/C 97M: **<Insert required value>**.
 - 2. Minimum Compressive Strength per ASTM C 170/C 170M: **<Insert required value>**.
 - 3. Minimum Flexural Strength per ASTM C 880/C 880M: **<Insert required value>**.
- B. Regional Materials: Stone shall be fabricated within **500 miles (800 km)** of Project site from stone that has been extracted within **500 miles (800 km)** of Project site.
- C. Regional Materials: Stone shall be fabricated within **500 miles (800 km)** of Project site.
- D. Varieties and Sources: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>**.
- E. Finish: **[Polished] [Honed] [Sand rubbed] [Natural cleft] [As indicated] [Match Architect's sample] <Insert finish>**.
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.8 SETTING MATERIALS

- A. Molding Plaster: ASTM C 59/C 59M.
- B. Portland Cement: ASTM C 150, Type I or Type II.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Aggregate: ASTM C 144.
- E. Water: Potable.
- F. Adhesives, General: Use only adhesives formulated for stone and ceramic tile and recommended by their manufacturer for the application indicated.
- G. Organic Adhesive: ANSI A136.1, Type I[.][, with a VOC content of 65 g/L.][, that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."]
 - 1. **Manufacturers:** Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Boiardi Products; a QEP company.](#)
 - b. [Bostik, Inc.](#)
 - c. [C-Cure.](#)
 - d. [Custom Building Products.](#)
 - e. [DAP Inc.](#)
 - f. [Jamo Inc.](#)
 - g. [Laticrete International, Inc.](#)
 - h. [MAPEI Corporation.](#)
 - i. [Mer-Krete Systems; ParexLahabra, Inc.](#)
 - j. [Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.](#)
 - k. [Southern Grouts & Mortars, Inc.](#)
 - l. [TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.](#)
 - m. <Insert manufacturer's name>.
- H. Water-Cleanable Epoxy Adhesive: ANSI A118.3[.][, with a VOC content of 65 g/L or less.][, that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."]
 - 1. **Manufacturers:** Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Boiardi Products; a QEP company.](#)
 - b. [Bonstone Materials Corporation.](#)
 - c. [Bostik, Inc.](#)
 - d. [C-Cure.](#)
 - e. [Custom Building Products.](#)
 - f. [Jamo Inc.](#)
 - g. [Laticrete International, Inc.](#)
 - h. [MAPEI Corporation.](#)
 - i. [Mer-Krete Systems; ParexLahabra, Inc.](#)
 - j. [Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.](#)
 - k. [Summitville Tiles, Inc.](#)
 - l. [TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.](#)
 - m. **<Insert manufacturer's name>.**
- I. Stone Adhesive: Two-part, [epoxy-resin] [or] [polyester-resin] stone adhesive with an initial set time of not more than two hours at **70 deg F (21 deg C)**[[, and with a VOC content of **65 g/L or less.**][, that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."]
1. Color: [Clear] [Match stone].
 2. **Products:** Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Epoxy Adhesive: [Akemi North America](#); Akepox.
 - b. Epoxy Adhesive: [Axson North America, Inc.](#), Wood & Stone Company; Akabond Epoxy.
 - c. Epoxy Adhesive: [Bonstone Materials Corporation](#); Touchstone Last Patch.
 - d. Epoxy Adhesive: [Bonstone Materials Corporation](#); Touchstone Ratio Pac Clear Gel Epoxy.
 - e. Epoxy Adhesive: **<Insert manufacturer's name; product name or designation>.**
 - f. Polyester Adhesive: [Akemi North America](#); Platinum Clear Polyester Adhesive.
 - g. Polyester Adhesive: [Axson North America, Inc.](#), Wood & Stone Company; Wood & Stone Polyester.
 - h. Polyester Adhesive: [Bonstone Materials Corporation](#); Gripstone L-200KG.
 - i. Polyester Adhesive: **<Insert manufacturer's name; product name or designation>.**

2.9 GROUT

- A. Grout Colors: [Match stone] [As indicated by manufacturer's designations] [Match Architect's samples] [As selected by Architect from manufacturer's full range].
- B. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate to produce required color.
- C. Standard Cement Grout: ANSI A118.6, packaged.

1. Grout Type: [**Sanded**] [**Unsanded**].
- D. Polymer-Modified Tile Grout: ANSI A118.7, packaged.
1. **Manufacturers:** Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [Bostik, Inc.](#)
 - b. [C-Cure.](#)
 - c. [Custom Building Products.](#)
 - d. [DAP Inc.](#)
 - e. [Jamo Inc.](#)
 - f. [Laticrete International, Inc.](#)
 - g. [MAPEI Corporation.](#)
 - h. Mer-Krete Systems; ParexLahabra, Inc.
 - i. [Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.](#)
 - j. [Southern Grouts & Mortars, Inc.](#)
 - k. [Summitville Tiles, Inc.](#)
 - l. [TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.](#)
 - m. <**Insert manufacturer's name**>.
 2. Polymer Type: [**Acrylic resin**] [**or**] [**ethylene vinyl acetate**], in dry, redispersible form, packaged with other dry ingredients.
 3. Polymer Type: [**Acrylic resin**] [**or**] [**styrene-butadiene rubber**] in liquid-latex form for addition to packaged dry-grout mix.
 4. Grout Type: [**Sanded**] [**Unsanded**].
- E. Water-Cleanable Epoxy Grout: ANSI A118.3, packaged, chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.
1. **Manufacturers:** Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [Boiardi Products; a QEP company.](#)
 - b. [Bostik, Inc.](#)
 - c. [C-Cure.](#)
 - d. [Custom Building Products.](#)
 - e. [Jamo Inc.](#)
 - f. [Laticrete International, Inc.](#)
 - g. [MAPEI Corporation.](#)
 - h. [Mer-Krete Systems; ParexLahabra, Inc.](#)
 - i. [Prospec; Bonsal American; a division of Oldcastle Architectural Products Group.](#)
 - j. [Summitville Tiles, Inc.](#)
 - k. [TEC, Specialty Construction Brands, Inc.; an H. B. Fuller company.](#)
 - l. <**Insert manufacturer's name**>.

2.10 POINTING MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.
1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Pigments shall have a record of satisfactory performance in mortar.
1. **Products:** Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Davis Colors](#); True Tone Mortar Colors.
 - b. [Lanxess Corporation](#); Bayferrox Iron Oxide Pigments.
 - c. [Solomon Colors](#); SGS Mortar Colors.
 - d. **<Insert manufacturer's name; product name or designation>**.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime.
- E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Use a mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight.
1. **Products:** Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Holcim \(US\) Inc.](#); Rainbow Mortamix Custom Color Cement/Lime.
 - b. [Lafarge North America Inc.](#); Eaglebond.
 - c. [Lehigh Cement Company](#); Lehigh Custom Color Portland/Lime Cement.
 - d. **<Insert manufacturer's name; product name or designation>**.
- F. Aggregate: ASTM C 144, except with 100 percent passing **No. 16 (1.18-mm)** sieve.
1. White Aggregates: Natural white sand or ground white stone.
 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.
- G. Water: Potable.

2.11 SEALANTS

- A. Joint Sealants: Manufacturer's standard sealants of characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and will not stain the stone they are applied to.
1. Mildew-Resistant Joint Sealant: [**Mildew resistant, single component, nonsag, neutral curing, silicone**] [**Single component, nonsag, mildew resistant, acid curing, silicone**] <Insert joint sealant>.
 2. Joint Sealant: [**Latex**] [**Acrylic based**] [**Butyl rubber based**] [**Single component, nonsag, neutral curing, silicone; Class 25**] <Insert joint sealant>.
 3. VOC Content: [**250**] <Insert value> g/L or less.
 4. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 5. Colors: Provide colors of exposed sealants to match other joints in stone adjoining sealed joints unless otherwise indicated.
- B. Sealant for Filling Kerfs: [**Same sealant used for joints in dimension stone**] [**Single-component, nonsag, urethane sealant; Class 25, Use T (traffic), and Use M (masonry) that complies with applicable requirements in Section 079200 "Joint Sealants" and that does not stain stone**] [**Single-component, nonsag, neutral-curing, medium- to high-modulus silicone sealant; Class 25, Use NT (nontraffic), and Use M (masonry) that complies with applicable requirements in Section 079200 "Joint Sealants" and that does not stain stone**].
1. **Products:** Subject to compliance with requirements, [**provide the following**] [**provide one of the following**] [**available products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [BASF Building Systems](#); Sonolastic NP 1.
 - b. [BASF Building Systems](#); Sonolastic Ultra.
 - c. [Sika Corporation](#); Sikaflex - 1a.
 - d. [Tremco Incorporated](#); Vulkem 116.
 - e. [BASF Building Systems](#); Omniseal 50.
 - f. Dow Corning Corporation; 756 SMS.
 - g. [General Electric Company](#); GE Advanced Materials - Silicones; SilPruf NB SCS9000.
 - h. [Tremco Incorporated](#); Spectrem 2.
 - i. <Insert manufacturer's name; product name or designation>.
 2. VOC Content: [**250**] <Insert value> g/L or less.
 3. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.12 STONE ANCHORS AND ATTACHMENTS

- A. Fabricate anchors from stainless steel, ASTM A 240/A 240M or ASTM A 666, Type 304.

1. Fasteners for Stainless-Steel Anchors: Annealed stainless-steel bolts, nuts, and washers; **ASTM F 593 (ASTM F 738M)** for bolts and **ASTM F 594 (ASTM F 836M)** for nuts, Alloy Group **1 (A1)**.
- B. Fabricate dowels from stainless steel, ASTM A 276, Type 304.
- C. Fabricate anchors from extruded aluminum, **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T6.
 1. Fasteners for Extruded-Aluminum Anchors: Annealed stainless-steel bolts, nuts, and washers; **ASTM F 593 (ASTM F 738M)** for bolts and **ASTM F 594 (ASTM F 836M)** for nuts, Alloy Group **1 (A1)**.
- D. Wire Tiebacks: [**No. 9 AWG copper or copper-alloy**] [or] [**0.120-inch- (3.0-mm-) diameter, stainless-steel**] wire.

2.13 STONE ACCESSORIES

- A. Temporary Setting Shims: Rigid plastic shims, nonstaining to stone, sized to suit joint thickness.
- B. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- C. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
 1. **Manufacturers:** Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [Bostik, Inc.](#)
 - b. [Custom Building Products.](#)
 - c. [Hillyard, Inc.](#)
 - d. [HMK Stone Care; ACI International.](#)
 - e. [Miracle Sealants Company.](#)
 - f. [Stone Care International.](#)
 - g. [Summitville Tiles, Inc.](#)
 - h. **<Insert manufacturer's name>**.

2.14 STONE FABRICATION, GENERAL

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
 1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.

- B. Fabricate stone trim in sizes and shapes required to comply with requirements indicated.
 - 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
 - 2. For marble, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."
 - 3. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
- C. Cut stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association.
 - 1. Where items are installed with adhesive or where stone edges are visible in the finished work, make items uniform in thickness and of identical thickness for each type of item; gage back of stone if necessary.
 - 2. Clean sawed backs of stones to remove rust stains and iron particles.
 - 3. Dress joints straight and at right angle to face unless otherwise indicated.
 - 4. Cut and drill sinkages and holes in stone for anchors, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.
- D. Fabricate molded work to produce stone shapes with a uniform profile throughout entire unit length and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units.
 - 1. Produce moldings with machines having abrasive shaping wheels made to reverse contour of molding shape; do not sculpt moldings.
 - 2. Miter moldings at corners, unless otherwise indicated, with edges of miters slightly eased at outside corners.
- E. Finish exposed faces and edges of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups.
- F. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
 - 1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples[**and mockups**].

2.15 STONE TRIM

- A. Flat Trim:
 - 1. Nominal Thickness: [**3/4 inch (20 mm)**] [**7/8 inch (22 mm)**] [**1-1/4 inches (32 mm)**] [**1-1/2 inches (40 mm)**] unless otherwise indicated.
 - 2. Edge Detail: [**Straight, slightly eased at corners**] [**3/8-inch (10-mm) bevels**] [**3/4-inch (20-mm) radii**] [**3/8-inch (10-mm) radii**] [**As indicated**].
 - 3. Joints: [**1/16-inch- (1.5-mm-) wide grouted joints**] [**1/8-inch- (3-mm-) wide grouted joints**] [**1/8-inch- (3-mm-) wide, sealant-filled joints**] [**Bonded joints, 1/32 inch (0.8 mm) or less in width**].

B. Molded Trim:

1. Profile: Match [**profiles indicated on Drawings**] [**existing**].
2. Joints: [**1/16-inch- (1.5-mm-) wide grouted joints**] [**1/8-inch- (3-mm-) wide grouted joints**] [**1/8-inch- (3-mm-) wide, sealant-filled joints**] [**Bonded joints, 1/32 inch (0.8 mm) or less in width**].

2.16 MIXES

A. Spotting Plaster: Stiff mix of molding plaster and water.

B. Mortar, General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.

1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.

C. Setting Mortar: Comply with ASTM C 270, Proportion Specification.

1. Type: [**N**] [**O**].
2. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times the volume of cement and lime.

D. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, for mortar types indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:

1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
2. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
3. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.
4. Type: [**N**] [**O**].
5. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times the volume of cement and lime.

E. Grout: Comply with mixing requirements of referenced ANSI standards and with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive stone trim and conditions under which stone trim will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone trim.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone trim.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING STONE, GENERAL

- A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.
- C. Contiguous Work: Provide reveals and openings as required to accommodate contiguous work.
- D. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
- E. Erect stone units level, plumb, and true with uniform joint widths. Use temporary shims to maintain joint width.
- F. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Sealing of expansion and other joints is specified in Section 079200 "Joint Sealants."
 - 2. Keep expansion joints free of plaster, mortar, grout, and other rigid materials.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed **1/8 inch in 96 inches (3 mm in 2400 mm)**, **1/4 inch (6 mm)** maximum.
- B. Variation from Level: For lintels, sills, chair rails, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, **3/8 inch (10 mm)** maximum.

- C. Variation of Linear Building Line: For position shown in plan and related portion of walls and partitions, do not exceed **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, **3/8 inch (10 mm)** maximum.
- D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus **1/8 inch (3 mm)**.
- E. Variation in Joint Width: Do not vary from average joint width more than plus or minus **1/16 inch (1.5 mm)** or one-fourth of nominal joint width, whichever is less.
- F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed **1/32-inch (0.8-mm)** difference between planes of adjacent units.

3.4 INSTALLATION

- A. Stone Trim: At locations with stone paneling, set units by adhering to stone paneling with water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- B. Stone Trim: At locations with stone paneling, set units firmly against setting spots. Locate setting spots at anchors and spaced not more than **18 inches (450 mm)** apart unless otherwise indicated. Provide no fewer than two anchors per piece for stone trim up to **48 inches (1200 mm)** in length, plus one additional anchor for each additional **24 inches (600 mm)** of length.
- C. Stone Trim: At locations without stone paneling, adhere units to plywood backing with full spread of water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- D. Stone Trim: At locations without stone paneling, adhere units to gypsum board with full spread of **[organic] [water-cleanable epoxy]** adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- E. Assemble indicated multiple-piece stone trim by bonding joints with stone adhesive as units are set. Mask areas adjacent to joints to prevent adhesive smears. Clamp units in place to ensure that surfaces are properly aligned and joints are minimum width.
- F. **[Grout] [Point]** joints after setting stone.
- G. Fill **[indicated]** joints with sealant after setting **[and grouting] [and pointing]** stone.

3.5 GROUTING JOINTS

- A. Grout stone to comply with ANSI A108.10.
 - 1. Use sanded grout mixture for joints wider than **1/8 inch (3 mm)**.
 - 2. Use unsanded grout mixture for joints **1/8 inch (3 mm)** and narrower.
- B. Remove temporary shims before grouting.
- C. Tool joints uniformly and smoothly with plastic tool.

3.6 POINTING JOINTS WITH MORTAR

- A. Prepare stone-joint surfaces for pointing with mortar by removing temporary shims, dust, and mortar particles. Where setting spots occur at joints, rake out excess setting mortar or plaster to a depth of not less than **1/2 inch (13 mm)**.
- B. Point stone joints by placing pointing mortar in layers of not more than **3/8 inch (10 mm)**. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer. Apply mortar first to areas where depths are greater than surrounding areas until a uniform depth is formed.
- C. Tool joints when pointing mortar is thumbprint hard. Use a round jointer having a diameter **1/8 inch (3 mm)** larger than width of joint.

3.7 JOINT-SEALANT INSTALLATION

- A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants." Remove temporary shims before applying sealants.

3.8 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean interior stone trim as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace interior stone trim of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective stone trim.
 - 3. Defective joints, including misaligned joints.
 - 4. Interior stone trim and joints not matching approved Samples and mockups.
 - 5. Interior stone trim not complying with other requirements indicated.
- C. Replace in a manner that results in interior stone trim that matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.
- D. Clean interior stone trim no fewer than six days after completion of grouting and pointing, using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.
- E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions and recommendations.

3.9 PROTECTION

- A. Protect stone surfaces, edges, and corners from construction damage. Use securely fastened untreated wood, plywood, or heavy cardboard to prevent damage.

- B. Before inspection for Substantial Completion, remove protective coverings and clean surfaces.

END OF SECTION 097519

SECTION 09 91 13 - EXTERIOR PAINTING

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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 09 96 00 "High-Performance Coatings" for special-use coatings.
 - 3. Section 09 91 23 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
 - 4. Section 09 93 00 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.

1.3 DEFINITIONS

- A. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523 (semigloss).
- B. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523 (gloss).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.

2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
3. VOC content.
4. Include all of the above information in the project closeout Operations and Maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
1. **ICI Paints.**

2. [Sherwin-Williams Company \(The\)](#).
3. Substitutions: see section 01 25 00 – Substitution Procedures.

B. Products: Subject to compliance with requirements, listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Ready mixed, unless intended to be a field-catalyzed coating.

C. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. Provide paints and coatings 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.
3. Supply each coating material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
5. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

D. VOC Content: Provide materials that comply with the most stringent VOC limits specified in the following:

1. 40 CFR 50, Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

E. Colors: As selected by Architect from manufacturer's full range .

2.3 PRIMERS/SEALERS

A. General: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.4 WATER-BASED PAINTS

A. Latex, Exterior Semi-Gloss (Gloss Level 5): MPI #11.

- B. Latex, Exterior, Gloss (Gloss Level 6): MPI #119.
- C. Light Industrial Coating, Exterior, Water Based, Semi-Gloss (Gloss Level 5): MPI #163.
- D. Light Industrial Coating, Exterior, Water Based, Gloss (Gloss Level 6): MPI #164.

2.5 FLOOR COATINGS

- A. Sealer, Water Based, for Concrete Floors: MPI #99.

2.6 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer[.] but not less than the following:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 - 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Latex System:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
- B. CMU Substrates:
 - 1. Latex System:
 - a. Prime Coat: Block filler, latex, interior/exterior, MPI #4.
 - b. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
 - 2. Latex over Alkali-Resistant Primer System:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
- C. Steel Substrates:

1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Shop primer specified in Section 05 12 00 "Structural Steel Framing" where substrate is specified.
 - b. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #163.

- D. Galvanized-Metal Substrates:
 1. Latex System:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.

 2. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #163.

- E. Wood Substrates: Including wood trim doors .
 1. Latex System:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.

- F. Exterior Gypsum Board Substrates:
 1. Latex System:
 - a. Prime Coat: Latex, exterior, matching topcoat.
 - b. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 09 96 00 "High-Performance Coatings" for high-performance and special-use coatings.
 - 3. Section 09 91 13 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
 - 4. Section 09 93 00 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 DEFINITIONS

- A. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523 (semigloss).
- B. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523 (gloss).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. LEED Submittals:

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1. Product Data for Credit EQ 4.2: For paints and coatings, including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For paints and coatings, documentation indicating that they meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.
4. Include above information in project closeout Operations and Maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

Comment [11]: Conflicts with no paint attic stock requirement

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
 - 1. [Sherwin-Williams Company \(The\)](#).
 - 2. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- B. **Products:** Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

- A. **MPI Standards:** Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Ready mixed, unless intended to be a field-catalyzed coating.
- C. **Material Compatibility:**
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. Provide paints and coatings 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.
 - 3. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
 - 5. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- D. **VOC Content:** Products shall comply with the most stringent VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Dry-Fog Coatings: 400 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
 - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

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6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

E. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Colors: As selected by Architect from manufacturer's full range .

2.3 PRIMERS/SEALERS

A. General:Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.4 WATER-BASED PAINTS

A. As designated on Drawings.Latex, Interior, Flat, (Gloss Level 1):[MPI #53.]

B. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5):[MPI #147.]

2.5 FLOOR COATINGS

A. Stain, Interior, for Concrete Floors: MPI #58.

B. Sealer, Water Based, for Concrete Floors: MPI #99.

2.6 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

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- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer[,] but not less than the following:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- J. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Non-traffic Surfaces:

1. Latex System:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
2. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
3. High-Performance Architectural Latex System:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.

B. Concrete Substrates, Traffic Surfaces:

1. Concrete Stain System:

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- a. First Coat: Stain, interior, for concrete floors, MPI #58.
 - b. Topcoat: Stain, interior, for concrete floors, MPI #58.
2. Water-Based Clear Sealer System:
 - a. First Coat: Sealer, water based, for concrete floors, MPI #99.
 - b. Topcoat: Sealer, water based, for concrete floors, MPI #99.
- C. CMU Substrates:
1. Institutional Low-Odor/VOC Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
- D. Steel Substrates:
1. Latex over Alkyd Primer System:
 - a. Prime Coat: Shop primer specified in Section 05 12 00 "Structural Steel Framing" where substrate is specified.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
 2. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
 3. High-Performance Architectural Latex System:
 - a. Prime Coat: Shop primer specified in Section 05 12 00 "Structural Steel Framing" where substrate is specified.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.
- E. Galvanized-Metal Substrates:
1. Latex over Waterborne Primer System:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
 2. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
3. High-Performance Architectural Latex System:
- a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.
- F. Wood Substrates: Including wood trim doors wood-based panel products .
1. Latex System:
- a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
2. Institutional Low-Odor/VOC Latex System:
- a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
3. High-Performance Architectural Latex System:
- a. Prime Coat: Primer, latex, for interior wood[, **MPI #39**].
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.
- G. Gypsum Board or Plaster Substrates:
1. Latex System:
- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
2. Institutional Low-Odor/VOC Latex System:
- a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

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c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

3. High-Performance Architectural Latex System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
- c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.

H. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings .

1. Latex System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.

2. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

END OF SECTION 09 91 23

SECTION 09 93 00 - STAINING AND TRANSPARENT FINISHING

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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section includes surface preparation and application of wood finishes[.]
 - 1. Exterior Substrates:
 - a. Exposed wood panel products.
 - 2. Interior Substrates:
 - a. Dressed lumber (finish carpentry).
 - b. Exposed wood panel products.
- B. Related Requirements:
 - 1. Section 09 91 13 "Exterior Painting" for standard paint systems on exterior substrates.
 - 2. Section 09 91 23 "Interior Painting" for stains and transparent finishes on concrete floors.
 - 3. Section 09 96 00 "High-Performance Coatings" for transparent high-performance coatings on concrete floors and clay masonry.

1.3 DEFINITIONS

- A. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- C. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. LEED Submittals (Projects authorized for LEED certification only):
 - 1. Product Data for Credit EQ 4.2: For interior stains and coatings, documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit EQ 4: For interior stains and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches square .
 - 2. Label each Sample for location and application area.
- E. Product List: For each product indicated, include the following:
 - 1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.
 - 3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by the following :
 - 1. **Pratt & Lambert.**
 - 2. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- B. **Products:** Subject to compliance with requirements, provide product listed in other Part 2 articles for the category indicated.

2.2 MATERIALS, GENERAL

- A. **MPI Standards:** Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. **Material Compatibility:**
 - 1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
- C. **VOC Content:** Products shall comply with VOC limits of authorities having jurisdiction and, for interior stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
 - 2. Shellacs, Clear: VOC not more than 730 g/L.
 - 3. Stains: VOC not more than 250 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
- D. **Low-Emitting Materials:** Interior stains and finishes shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the

Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- E. Stain Colors: As selected by Architect from manufacturer's full range .

2.3 WOOD FILLERS

- A. Wood Filler Paste: MPI #91.

2.4 PRIMERS AND SEALERS

- A. Provide all primer, sealants, and coating products used in any individual system from the same manufacturer, no exceptions.
- B. Primer, Latex for Exterior Wood: MPI #6.

2.5 STAINS

- A. Provide all stain and varnish products used in any individual system from the same manufacturer, no exceptions.
- B. Stain, Exterior, Water Based, Solid Hide: MPI #16.
- C. Stain, for Exterior Wood Decks: MPI #33.
- D. Stain, Semi-Transparent, for Interior Wood: MPI #90.

2.6 WATER-BASED VARNISHES

- A. Varnish, Water Based, Clear, Satin (Gloss Level 4): MPI #128.
- B. Varnish, Water Based, Clear, Semi-Gloss (Gloss Level 5): MPI #129.
- C. Varnish, Water Based, Clear, Gloss (Gloss Level 6): MPI #130.

2.7 POLYURETHANE VARNISHES

- A. Varnish, Polyurethane, Moisture-Cured, Gloss (Gloss Level 6): MPI #31.
- B. Varnish, Aliphatic Polyurethane, Two-Component (Gloss Level 6 or 7): MPI #78.

2.8 OIL FINISH

- A. Danish Oil: MPI #92.

2.9 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Maximum Moisture Content of Interior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with finish application only after unsatisfactory conditions have been corrected.
1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Exterior Wood Substrates:
1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 2. Prime edges, ends, faces, undersides, and backsides of wood.
 - a. For solid hide stained wood, stain edges and ends after priming.
 - b. For varnish coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
 3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.
- E. Interior Wood Substrates:
1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
 3. Sand surfaces that will be exposed to view and dust off.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for finish and substrate indicated.
 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood substrates, nontraffic surfaces, including wood trim architectural woodwork doors wood-based panel products glued-laminated construction exposed joists exposed beams .
 - 1. Solid Hide, Water-Based Stain System:
 - a. Prime Coat: Primer, oil for exterior wood, MPI #7.
 - b. Topcoat: Stain, exterior, water based, solid hide, MPI #16.
 - 2. Solid Hide, Water-Based Stain System:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Prime Coat: Primer, alkyd for exterior wood[, MPI #5].
 - c. Prime Coat: Primer, oil for exterior wood[, MPI #7].
 - d. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
 - e. Topcoat: Stain, exterior, water based, solid hide, MPI #16.
 - 3. Semitransparent Stain System:
 - a. Prime Coat: Stain, exterior, solvent based, semi-transparent, matching topcoat.
 - b. Topcoat: Stain, exterior, solvent based, semi-transparent, MPI #13.
 - 4. Varnish over Semitransparent Stain System:
 - a. Stain Coat: Stain, exterior, solvent based, semi-transparent, MPI #13.
 - b. First Intermediate Coat: Varnish matching topcoat.
 - c. Second Intermediate Coat: Varnish matching topcoat.
 - d. Topcoat: Varnish, with UV Inhibitor, Exterior, Semi-Gloss (Gloss Level 5), MPI #30.
 - 5. Varnish System:
 - a. Prime Coat: Varnish matching topcoat.
 - b. First Intermediate Coat: Varnish matching topcoat.

- c. Second Intermediate Coat: Varnish matching topcoat.
 - d. Topcoat: Varnish, with UV Inhibitor, Exterior, Semi-Gloss (Gloss Level 5), MPI #30.
 - 6. Clear, Two-Component Polyurethane Varnish over Stain System:
 - a. Stain Coat: Stain, exterior, solvent based, semi-transparent, MPI #13.
 - b. First Intermediate Coat: Varnish, aliphatic polyurethane, two-component, matching topcoat.
 - c. Second Intermediate Coat: Varnish, aliphatic polyurethane, two-component, matching topcoat.
 - d. Topcoat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.
 - 7. Clear, Two-Component Polyurethane Varnish System:
 - a. Prime Coat: Varnish, aliphatic polyurethane, two-component, matching topcoat.
 - b. Intermediate Coat: Varnish, aliphatic polyurethane, two-component, matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.
- B. Wood substrates, traffic surfaces, including wood decks and stairs.
 - 1. Deck Stain over Wood Preservative System:
 - a. Preservative Coat: Preservative, for exterior wood, MPI #37.
 - b. Intermediate Coat: Stain, for exterior wood decks, matching topcoat.
 - c. Top coat: Stain, for exterior wood decks, MPI #33.
 - 2. Deck Stain System:
 - a. Prime Coat: Stain, for exterior wood decks, matching topcoat.
 - b. Top coat: Stain, for exterior wood decks, MPI #33.

3.6 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood substrates, nontraffic surfaces, including wood trim architectural woodwork doors windows wood-based panel products glued-laminated construction exposed joists exposed beams .
 - 1. Solid-Color Latex Stain System:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
 - c. Topcoat: Stain, exterior, water based, solid hide, MPI #16.

2. Solid-Color Latex Stain System:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Prime Coat: Primer, oil for exterior wood, MPI #7.
 - c. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
 - d. Topcoat: Stain, exterior, water based, solid hide, MPI #16.
3. Semitransparent Stain System:
 - a. Prime Coat: Stain, semi-transparent, matching topcoat.
 - b. Topcoat: Stain, semi-transparent, for interior wood, MPI #90.
4. Semitransparent Stain System:
 - a. Prime Coat: Stain, exterior, solvent based, semi-transparent, matching topcoat.
 - b. Topcoat: Stain, exterior, solvent based, semi-transparent, MPI #13.
5. Water-Based Varnish over Stain System:
 - a. Stain Coat: Stain, semi-transparent, for interior wood, MPI #90.
 - b. First Intermediate Coat: Water-based varnish matching topcoat.
 - c. Second Intermediate Coat: Water-based varnish matching topcoat.
 - d. Topcoat: Varnish, water based, clear, satin (Gloss Level 4), MPI #128.
6. Water-Based Varnish System:
 - a. Prime Coat: Water-based varnish matching topcoat.
 - b. Intermediate Coat: Water-based varnish matching topcoat.
 - c. Topcoat: Varnish, water based, clear, satin (Gloss Level 4), MPI #128.
7. Polyurethane Varnish over Stain System:
 - a. Stain Coat: Stain, semi-transparent, for interior wood, MPI #90.
 - b. First Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
 - d. Topcoat: Varnish, interior, polyurethane, oil-modified, satin (Gloss Level 4), MPI #57.
8. Polyurethane Varnish System:
 - a. Prime Coat: Polyurethane varnish matching topcoat.
 - b. Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Topcoat: Varnish, interior, polyurethane, oil-modified, satin (Gloss Level 4), MPI #57.
9. Moisture-Cured Clear Polyurethane over Stain System:
 - a. Stain Coat: Stain, semi-transparent, for interior wood, MPI #90.
 - b. First Intermediate Coat: Moisture-cured polyurethane matching topcoat.

- c. Second Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - d. Topcoat: Varnish, polyurethane, moisture-cured, gloss (Gloss Level 6), MPI #31.
- 10. Moisture-Cured Clear Polyurethane System:
 - a. Prime Coat: Moisture-cured polyurethane matching topcoat.
 - b. Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - c. Topcoat: Varnish, polyurethane, moisture-cured, gloss (Gloss Level 6), MPI #31.
- 11. Clear, Two-Component Polyurethane System:
 - a. Prime Coat: Two-component polyurethane matching topcoat.
 - b. Intermediate Coat: Two-component polyurethane matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or Gloss Level 7), MPI #78.
- 12. Danish Oil System:
 - a. Prime Coat: Danish oil, MPI #92.
 - b. Topcoat: Danish oil, MPI #92.

END OF SECTION 09 93 00

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
 - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

- A. Section includes surface preparation and application of high-performance coating systems.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 09 91 13 "Exterior Painting" for special-use coatings and general field painting.
 - 3. Section 09 91 23 "Interior Painting" for special-use coatings and general field painting.

1.3 DEFINITIONS

- A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- B. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. LEED Submittals (Projects authorized for LEED certification):
 - 1. Product Data for Credit EQ 4.2: For interior coatings, documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit EQ 4: For interior coatings, documentation indicating that products comply with the testing and product requirements of the California

Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
 - 3. VOC content.
 - 4. Include the above information in the project closeout Operation and Maintenance Manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
1. **PPG Architectural Finishes, Inc.**
 2. **Tnemec Company, Inc..**
 3. **Substitutions:** see section 01 25 00 – Substitution Procedures.
- B. **Products:** Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. **MPI Standards:** Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."
- B. **Material Compatibility:**
1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
 3. Provide products of same manufacturer for each coat in a coating system.
- C. **VOC Content:** Products shall comply with VOC limits of authorities having jurisdiction and, for interior coatings applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Primers, Sealers, and Undercoaters: 200 g/L.
 4. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
 5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 6. Pre-Treatment Wash Primers: 420 g/L.
 7. Floor Coatings: 100 g/L.
 8. Shellacs, Clear: 730 g/L.
 9. Shellacs, Pigmented: 550 g/L.
- D. **Low-Emitting Materials:** Interior coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. **Colors:** As selected by Architect from manufacturer's full range .

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.

2.4 INTERIOR PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior: MPI #50.
- B. Wood-Knot Sealer: White shellac or other sealer recommended in writing by manufacturer for this purpose.

2.5 METAL PRIMERS

- A. Primer, Zinc-Rich, Inorganic: MPI #19.
- B. Primer, Zinc-Rich, Epoxy: MPI #20.
- C. Primer, Rust-Inhibitive, Water Based: MPI #107.
- D. Primer, Epoxy, Anti-Corrosive, for Metal: MPI #101.

2.6 EPOXY COATINGS

- A. Epoxy, Gloss: MPI #77.
- B. Epoxy-Modified Latex, Interior, Gloss (Gloss Level 6): MPI #115.
- C. Epoxy, High-Build, Low Gloss: MPI #108.
- D. Epoxy Deck Coating (Slip-Resistant): MPI #82.

2.7 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
 1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Masonry (Clay and CMU): 12 percent.
 - c. Wood: 15 percent.
 - d. Gypsum Board: 12 percent.
- B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- C. Plaster Substrates: Verify that plaster is fully cured.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches.
 2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
- E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.
1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi at 6 to 12 inches.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer[.] but not less than the following:
1. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
 2. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
1. Scrape and clean knots. Before applying primer apply coat of knot sealer recommended in writing by topcoat manufacturer for coating system indicated.
 2. Sand surfaces that will be exposed to view and dust off.
 3. Prime edges, ends, faces, undersides, and back sides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for coating and substrate indicated.
 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Concrete Substrates, Vertical Surfaces:
 1. Epoxy System:
 - a. Prime Coat: Epoxy, gloss[, **MPI #77**].
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
- B. Concrete Substrates, Horizontal Surfaces:

1. Epoxy Slip-Resistant Deck Coating System:
 - a. Topcoat: Epoxy deck coating (slip-resistant), MPI #82.
- C. Clay-Masonry Substrates:
 1. Epoxy System:
 - a. Prime Coat: Epoxy, gloss, MPI #77.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 2. Pigmented Polyurethane over Epoxy System:
 - a. Prime Coat: Epoxy, gloss, MPI #77.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 3. Pigmented Polyurethane System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- D. CMU Substrates:
 1. Epoxy System:
 - a. Block Filler: Block filler, epoxy, MPI #116.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 2. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Block Filler: Block filler, epoxy, MPI #116.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- E. Steel Substrates:
 1. High-Build Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 2. Pigmented Polyurethane over Epoxy System:

- a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. First Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - d. Second Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
3. Pigmented Polyurethane over Epoxy Zinc-Rich Primer System:
- a. Prime Coat: Primer, zinc-rich, epoxy, MPI #20.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. First Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
4. Pigmented Polyurethane over High-Build Epoxy System:
- a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
5. Pigmented Polyurethane over Epoxy Zinc-Rich Primer and High-Build Epoxy System:
- a. Prime Coat: Primer, zinc-rich, epoxy, MPI #20.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108.
 - c. First Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - d. Second Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
6. Pigmented Polyurethane over Inorganic Zinc-Rich Primer and High-Build Epoxy System:
- a. Prime Coat: Primer, zinc-rich, inorganic, MPI #19.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- F. Galvanized-Metal Substrates:
1. Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 2. Pigmented Polyurethane System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.

- b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 3. Pigmented Polyurethane over Vinyl Wash and Epoxy Primer System:
 - a. Prime Coat: Primer, vinyl wash, MPI #80.
 - b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - c. First Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - d. Second Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- G. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 1. Epoxy System:
 - a. Prime Coat: Primer, vinyl wash, MPI #80.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 2. Pigmented Polyurethane System:
 - a. Prime Coat: Primer, vinyl wash, MPI #80.
 - b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - c. First Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - d. Second Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 3. Pigmented Polyurethane System:
 - a. Prime Coat: Primer, vinyl wash, MPI #80.
 - b. Intermediate Coat: Primer, epoxy, as recommended in writing by topcoat manufacturer.
 - c. First Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - d. Second Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- H. Wood Substrates:
 1. Pigmented Polyurethane System:
 - a. Prime Coat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.

- c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. Epoxy System:

- a. Prime Coat: Epoxy, gloss, MPI #77.
- b. Intermediate Coat: Epoxy, gloss, MPI #77.
- c. Topcoat: Epoxy, gloss, MPI #77.

2. Epoxy-Modified Latex System:

- a. Prime Coat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
- b. Intermediate Coat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
- c. Topcoat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.

B. Concrete Substrates, Horizontal Surfaces.

1. Epoxy System:

- a. Prime Coat: Epoxy, gloss, MPI #77.
- b. Intermediate Coat: Epoxy, gloss, MPI #77.
- c. Topcoat: Epoxy, gloss, MPI #77.

2. Pigmented Polyurethane System:

- a. Prime Coat: Epoxy, gloss, MPI #77.
- b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.

3. Clear Two-Component Polyurethane System:

- a. Prime Coat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.
- b. Intermediate Coat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.
- c. Topcoat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.

C. Clay-Masonry Substrates:

1. Epoxy System:

- a. Prime Coat: Epoxy, gloss, MPI #77.

- b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 - 2. Epoxy-Modified Latex System:
 - a. Prime Coat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
 - b. Intermediate Coat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
 - c. Topcoat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
 - 3. Clear Two-Component Polyurethane System:
 - a. Prime Coat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.
 - b. Intermediate Coat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.
 - c. Topcoat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.
- D. CMU Substrates:
 - 1. Epoxy System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 - 2. Epoxy-Modified Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
 - c. Topcoat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
- E. Steel Substrates:
 - 1. High-Build Epoxy System:
 - a. Prime Coat: Primer, zinc-rich, epoxy, MPI #20.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 - d. Topcoat: Epoxy, high-build, low gloss, MPI #108.
 - 2. Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 - 3. Epoxy-Modified Latex System:

- a. Prime Coat: Primer, rust-inhibitive, water based, MPI #107.
 - b. Intermediate Coat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
 - c. Topcoat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
4. Pigmented Polyurethane System:
- a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
5. Pigmented Polyurethane over Inorganic Zinc-Rich Primer System:
- a. Prime Coat: Primer, zinc-rich, inorganic, MPI #19.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
6. Pigmented Polyurethane over Epoxy Zinc-Rich Primer System:
- a. Prime Coat: Primer, zinc-rich, epoxy, MPI #20.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
7. Pigmented Polyurethane over High-Build Epoxy System:
- a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- F. Galvanized-Metal Substrates:
1. Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, gloss, MPI #77.
 - c. Topcoat: Epoxy, gloss, MPI #77.
 2. Pigmented Polyurethane System:
 - a. Prime Coat: Primer, epoxy, as recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.

G. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Epoxy System:

- a. Prime Coat: Primer, vinyl wash, MPI #80.
- b. Intermediate Coat: Epoxy, gloss, MPI #77.
- c. Topcoat: Epoxy, gloss, MPI #77.

2. Pigmented Polyurethane System:

- a. Prime Coat: Primer, vinyl wash, MPI #80.
- b. Intermediate Coat: Epoxy, gloss, MPI #77.
- c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.

H. Wood Substrates:

1. Epoxy System:

- a. Prime Coat: Epoxy, gloss, MPI #77.
- b. Intermediate Coat: Epoxy, gloss, MPI #77.
- c. Topcoat: Epoxy, gloss, MPI #77.

2. Pigmented Polyurethane System:

- a. Prime Coat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.
- c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 6), MPI #72.

I. Gypsum Board Substrates:

1. Epoxy System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Epoxy, gloss, MPI #77.
- c. Topcoat: Epoxy, gloss, MPI #77.

2. Epoxy-Modified Latex System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
- c. Topcoat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.

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