

SECTION 09 6340 - 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.

1.2 SUMMARY

A. Section Includes:

1. Dimension stone interior flooring.
2. Dimension stone stair treads and risers.
3. Dimension stone thresholds.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing control and expansion joints in stonework with elastomeric sealants.

1.3 PREINSTALLATION MEETINGS

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

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 materials. Include statement indicating cost for each regionally manufactured material.
3. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
4. Product Data for Credit IEQ 4.3: For interior stone flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.
5. Product Data for Credit IEQ 4.3: For adhesives and grout, documentation including printed statement of VOC content.

- C. 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.
- 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 at least three 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]** **[pointing mortar]** required.

1.5 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.

1.6 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.

1.7 QUALITY ASSURANCE

- A. Comply with the most current edition of the Northwestern University Design Standards.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone flooring.
- C. Installer Qualifications: Fabricator of stone flooring.
- D. 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.
- E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical interior floor area **[as shown on Drawings]**.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 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.
 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.

1.9 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. 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 (38 deg C).
 2. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.
 3. When the ambient temperature exceeds 90 deg F (32 deg C), 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 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.

2.2 PERFORMANCE REQUIREMENTS

- A. FloorScore Compliance: Stone for floors shall comply with requirements of FloorScore Standard.

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].
- G. Finish: [Polished] [Honed] [Thermal] [As indicated] [Match Architect's sample] <Insert finish>.
- H. 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.
 2. Stone Abrasion Resistance: Minimum value of 10, based on testing according to ASTM C 241/C 241M or ASTM C 1353.
- 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]**.
- H. Finish: **[Smooth finish] [Sand rubbed] [As indicated] [Match Architect's sample] <Insert finish>[, matching standard ILI finish]**.
- I. 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]**.
1. Stone Abrasion Resistance: Minimum value of 10, based on testing according to ASTM C 241/C 241M or ASTM C 1353.
- 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, **<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]**.
- G. Finish: **[Polished] [Honed] [As indicated] [Match Architect's sample] <Insert finish>**.
- H. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.6 SLATE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 629, [**Classification I Exterior**] [**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. 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.

2.7 MORTAR MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. 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.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Essroc.
 - b. Holcim (US) Inc.
 - c. Lafarge North America Inc.
 - d. Lehigh Hanson; HeidelbergCement Group.

- E. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bayer, Industrial Chemicals Division.
 - b. Davis Colors.
 - c. Lanxess Corporation.
- F. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Holcim (US) Inc.
 - b. Lafarge North America Inc.
 - c. Lehigh Hanson; HeidelbergCement Group.
- G. Aggregate: ASTM C 144; except for joints narrower than 1/4 inch (6 mm) and pointing mortar, use aggregate graded 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.
- H. 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. Boiardi Products Corporation; a QEP company.
 - b. Bonsal American, an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. DAP Products Inc.
 - f. Laticrete International, Inc.
 - g. MAPEI Corporation.
- I. Thin-Set Mortar:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products Corporation; a QEP company.
 - b. Bonsal American, an Oldcastle company.
 - c. Bostik, Inc.
 - d. DAP Products Inc.

- e. Laticrete International, Inc.
 - f. MAPEI Corporation.
- 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 liquid-latex additive.
- J. 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 (3 mm) and narrower.
 - 2. Sanded grout mixture for joints wider than 1/8 inch (3 mm).
 - D. Polymer-Modified Cement Grout: ANSI A118.7, packaged.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products Corporation; a QEP company.
 - b. Bonsal American, an Oldcastle company.
 - c. Bostik, Inc.
 - d. DAP Products Inc.
 - e. Laticrete International, Inc.
 - f. MAPEI Corporation.
 - 2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to packaged dry-grout mix.
 - 3. Unsanded grout mix for joints 1/8 inch (3 mm) and narrower.
 - 4. Sanded grout mix for joints wider than 1/8 inch (3 mm).
 - 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. Boiardi Products Corporation; a QEP company.
 - b. Bonsal American, an Oldcastle company.
 - c. Bostik, Inc.
 - d. Laticrete International, Inc.

- e. MAPEI Corporation.

2.9 WATERPROOF MEMBRANES

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, SBS-modified-bituminous sheet with woven reinforcement facing; 0.040-inch (1.01-mm) nominal thickness.

2.10 ACCESSORIES

- A. Water-Cleanable Epoxy Adhesive: ANSI A118.3, 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 one of the following:
- a. Bonsal American, an Oldcastle company.
 - b. Bostik, Inc.
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.
- B. Temporary Spacers: Resilient plastic, nonstaining to stone, sized to suit joint thickness.
- C. Cleavage Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils (0.1 mm) thick.
- D. Reinforcing Wire: Galvanized, welded, 0.062-inch- (1.57-mm-) diameter wire; 2-by-2-inch (50-by-50-mm) 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: [**Half-hard brass**] [**White zinc alloy**] [**Nickel silver**] [**Stainless steel; ASTM A 666, Type 302**].
 - 2. Cross-Section Profile: [**Angle or L-shape**] [**T-shape, single or two part**] [**Straight shape**].
 - 3. Height: [**Match stone thickness**] [**Equal to stone thickness plus depth of setting bed**].
 - 4. Exposed-Edge Width: [**0.063 inch (1.6 mm)**] [**1/8 inch (3.2 mm)**] [**1/4 inch (6.4 mm)**] [**3/8 inch (10 mm)**].
 - 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 (6.4 mm).

2. Depth: 1/2 inch (12.7 mm).
3. Length: 4 inches (100 mm) 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.

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.
 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Add only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Portland Cement-Lime Setting Mortar: ASTM C 270, Proportion Specification, [**Type N**] [**Type S**] [**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. Mortar-Bed Bond Coat: Mix neat cement and latex additive to a creamy consistency.
- D. Cement-Paste Bond Coat: Mix either neat cement or cement and sand with water to a consistency similar to that of thick cream.
- E. Latex-Modified Portland Cement Bond Coat: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- F. Pointing Mortar: Comply with requirements indicated above for setting mortar, including type and 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.

- G. Joint Grout: Comply with mixing requirements in referenced ANSI standards and with manufacturer's written instructions.

2.12 STONE FABRICATION

- 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 to comply with requirements indicated and with the following references:

1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
2. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
3. For marble, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."
4. For stone not otherwise indicated, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."

- C. Cut stone to produce pieces of thickness, size, and shape indicated.

1. Stone Thickness: [**1/2 inch (13 mm)**] [**3/4 inch (20 mm)**] [**7/8 inch (21 mm)**] [**1 inch (25 mm)**] [**1-1/4 inches (32 mm)**] [**2 inches (50 mm)**] unless otherwise indicated.
2. Pattern: [**Rectangular**] [**Diamond**]-grid pattern of [**12 by 12 inches (305 by 305 mm)**] [**18 by 18 inches (457 by 457 mm)**] [**24 by 24 inches (610 by 610 mm)**].
3. Pattern: Rectilinear [**brickwork**] [**herringbone**] pattern of 12-by-24-inch (305-by-610-mm) units.
4. Pattern: Random, rectangular pattern composed of units not less than [**6 inches (152 mm)**] [**8 inches (203 mm)**] or more than [**24 inches (610 mm)**] [**32 inches (813 mm)**] in nominal dimension.
5. Pattern: Random, polygonal pattern composed of units not less than 1 sq. ft. (0.09 sq. m) or more than 5 sq. ft. (0.46 sq. m) in area.
6. Pattern: As indicated.
7. Stone Edges: [**Square cut with top corner slightly eased to prevent snipping**] [**Square cut with 1/16-inch- (1.5-mm-) wide bevel at top corner**] [**Rough split**] [**As indicated**].
8. Joint Width: [**1/16 inch (1.5 mm)**] [**1/8 inch (3 mm)**] [**1/4 inch (6 mm)**] [**3/8 inch (10 mm)**] <Insert dimension>.

- D. Pattern Arrangement: Fabricate and arrange stone units with veining and other natural markings to comply with the following requirements:

1. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
2. Arrange units [**with veining as indicated on Drawings**] [**in blend pattern**].
3. Book match adjacent units [**in each row and between adjacent rows**].
4. Book match adjacent units in each row, and arrange units in end-slip pattern between adjacent rows.
5. Arrange units in side-slip [**and end-slip**] pattern.
6. Arrange four units adjoining center point of room in two-way book match, and arrange surrounding units in side-slip and end-slip pattern.

7. Number stone units and note numbers on Shop Drawings to designate installation location of each unit.
- E. Fabricate stone thresholds in sizes and profiles as indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges of thresholds at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch (13 mm) or less, and finish bevel to match adjacent surfaces of threshold.
 2. Where difference in floor levels exceeds 1/2 inch (13 mm), bevel edge of threshold at 1:12 slope, aligning lower edge of bevel with adjacent floor finish. Finish bevel to match adjacent surfaces of threshold.
- F. Fabricate stone stair treads in sizes and profiles indicated. Rout grooves into treads to receive abrasive strips and install strips to comply with manufacturer's written instructions.
- G. Carefully inspect finished stone units at fabrication plant for compliance with appearance, material, and fabrication requirements. Replace defective units. Clean sawed backs of stones to remove rust stains and iron particles.
1. Grade and select stone for overall uniform appearance when assembled in place.
 2. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples and mockups.

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 (1:50) 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.
- B. Set stone to comply with requirements indicated. Match stone for color and pattern by using units numbered in sequence as indicated on Shop Drawings.
- 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 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 Surface Plane: 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), or 3/8 inch (10 mm) maximum from level or slope indicated.
- D. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch (0.8-mm) 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 (1.5-mm) 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 (13 mm).
- 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- (1.5-mm-) 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**] [**pointing mortar**] as units are set.
- H. Point joints after setting. Fill full with mortar type and color indicated. Tool joints flat, uniform, and smooth, without visible voids.

3.6 INSTALLATION OF STONE OVER [**CLEAVAGE MEMBRANE**] [**WATERPROOFING**]

- A. Place cleavage membrane over substrates indicated to receive stone, lapped at least 4 inches (100 mm) at joints.
- B. See waterproofing Section for installation of waterproofing.
 - 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.
- C. 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.
- D. Place reinforcing wire fabric over [**cleavage membrane**] [**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 (13 mm).
- E. Place mortar bed over [**cleavage membrane**] [**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.
- F. 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.
- G. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform 1/16-inch- (1.5-mm-) thick bond coat to mortar bed or to back of each stone unit.
- H. 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.

- I. Rake out joints to depth required to receive [**grout**] [**pointing mortar**] as units are set.
- J. Point joints after setting. Fill full with mortar type and color indicated. Tool joints flat, uniform, and smooth, without visible voids.

3.7 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.

3.8 STONE STAIR TREAD AND RISER INSTALLATION

- A. Install stone stair treads and risers to comply with "Installation of Stone Bonded to Concrete" Article.
- B. Install stone stair treads and risers in thin-set, latex-portland cement mortar to comply with ANSI A108.5.

3.9 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.

3.10 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.

NORTHWESTERN UNIVERSITY

PROJECT NAME _____

JOB # _____

FOR: _____

ISSUED: 03/29/2017

- C. In-Progress Cleaning: Clean stonework as work progresses. Remove mortar fins and smears grout smears before tooling joints.
- D. Clean stonework after setting and **[pointing]** **[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.

3.11 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 (20-mm) untreated plywood over nonstaining kraft paper.

END OF SECTION 09 6340