SECTION 096340 - STONE FLOORING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
       2. SUMMARY
          1. Section Includes:

Dimension stone exterior flooring.

Dimension stone interior flooring.

Dimension stone stair treads[**and risers**].

Dimension stone thresholds.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Retain first subparagraph below if applicable.

[**Section 071326 "Self-Adhering Sheet Waterproofing"**] [**Section 071353 "Elastomeric Sheet Waterproofing"**] [**Section 071354 "Thermoplastic Sheet Waterproofing"**] [**Section 071416 "Cold Fluid-Applied Waterproofing"**] for waterproofing[**, protection board**] [**and**] [**pedestals**] under stone flooring.

Section 093033 "Stone Tiling."

Delete first subparagraph below if joint sealants are not used or if sealing joints with sealants is included in this Section.

Section 079200 "Joint Sealants" for sealing joints in stone flooring system with elastomeric sealants.

Section 321400 "Unit Paving" for stone pavers.

* + - 1. DEFINITIONS
         1. ILI – Indiana Limestone Institute.
         2. MIA – Marble Institute of America.
         3. NBGQA – North American Building Granite Quarriers Association.
      2. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at Project site.

If needed, insert list of conference participants.

* + - 1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each variety of stone, stone accessory, and manufactured product.
         5. Sustainable Design Submittals:

Usually, retain "Shop Drawings" paragraph below for most projects.

* + - * 1. Shop Drawings: Include plans, sections, details, and attachments to other work.

Show locations and details of joints both within stone flooring and between stone flooring and other finish materials.

Show direction of veining, grain, or other directional patterns.

* + - * 1. Samples for Initial Selection: For joint materials involving color selection.

Generally, retain "Samples for Verification" paragraph below, especially for more variable varieties where Samples may serve to define acceptable range of colors, patterns, etc.

* + - * 1. Samples for Verification:

For each stone type indicated, in sets of Samples not less than 12 inches 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.

For each color of [**grout**] [**pointing mortar**] required.

Coordinate "Qualification Data" paragraph below with qualification requirements in "Quality Assurance" Article.

* + - * 1. Qualification Data: For fabricator.

Retain "Material Test Reports" paragraph below for material test reports that are Contractor's responsibility.

* + - * 1. Material Test Reports:

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 five years.

* + - 1. CLOSEOUT SUBMITTALS
         1. 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.
      2. QUALITY ASSURANCE

Retain "Fabricator Qualifications" paragraph below if required.

* + - * 1. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone flooring.

Usually retain one of two "Installer Qualifications" paragraphs below. Delete both if not required by Project size, fabrication, or installation details.

* + - * 1. Installer Qualifications: Fabricator of stone flooring.
        2. 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.
        3. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

Build mockup of typical interior floor area [**as shown on Drawings**] [**about 96 inches square**].

Build mockup of typical exterior pavement area [**as shown on Drawings**] [**about 96 inches square**].

Retain first subparagraph below if using mockups not only for establishing appearance factors.

Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Director’s Representative specifically approves such deviations in writing.

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

* + - 1. DELIVERY, STORAGE, AND HANDLING
         1. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.

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.

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.

* + - * 1. 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.
        2. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
      1. FIELD CONDITIONS
         1. 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.
         2. 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.
         3. 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:

Usually retain subparagraphs below. Hot weather affects stone flooring more than masonry, because a horizontal surface absorbs more solar energy than a vertical surface. Adjust requirements to suit local conditions.

Maintain temperature of materials below 100 deg F.

Do not apply mortar to substrates with temperatures of 100 deg F and above.

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.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. MANUFACTURERS

Delete third option in "Source Limitations for Stone" paragraph below if not using other stone Sections or if other Sections do not require same stone varieties.

* + - * 1. 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.

For stone types that include same list of varieties and sources, provide same variety from same source for each.

Examination of blocks is usually only done for large installations and involves traveling to quarry or to shop where blocks are sawed into slabs, which is frequently not the fabrication shop.

Make quarried blocks available for examination by Director’s Representative.

When blocks are not selected at the quarry, first subparagraph below may allow some control over range of color and other visual characteristics. Supplier must have adequate stock of slabs to allow selection, or procedure below is not beneficial. Retaining below may add cost, because supplier may increase prices to account for rejected slabs.

Make stone slabs available for examination by Director’s Representative.

Director’s Representative will select aesthetically acceptable slabs[**and will indicate aesthetically unacceptable portions of slabs**].

Segregate slabs selected for use on Project and mark backs indicating approval.

Subparagraph below may be advantageous for stone that is highly variable; otherwise, delete below.

Mark and photograph aesthetically unacceptable portions of slabs as directed by Director’s Representative.

Retain "Varieties and Sources" paragraph below and delete stone-type articles below if stone varieties and sources are specified in Section 044200 "Exterior Stone Cladding." Specifying all stone types in one Section helps ensure uniformity of stone supplied under different Sections.

* + - * 1. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Section 044200 "Exterior Stone Cladding."
      1. GRANITE <**Insert drawing designation**>

Some granite varieties that are suitable for interior floors do not comply with ASTM C615; verify that granite selected complies before retaining "Material Standard" paragraph below.

* + - * 1. Material Standard: Comply with ASTM C615.

"Description" paragraph below is an example of a generic description that can be retained and revised for a nonproprietary specification.

* + - * 1. Description: Uniform, [**fine**] [**medium**]-grained, [**white**] [**pink**] [**gray**] [**black**] <**Insert color**> stone[**without veining**].

For a more explicit specification, retain "Varieties and Sources" paragraph below and name specific products.

* + - * 1. 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]:

<**Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers**>.

Retain "Cut" paragraph below if variety has veining and is cut parallel (fleuri cut) as well as perpendicular (vein cut) to the plane of the veining.

* + - * 1. Cut: [**Vein**] [**Fleuri**].
        2. Finish: [**Polishe**d] [**Honed**] [**Thermal**] [**As indicated**] [**Match Director’s Representative's sample**] <**Insert finish**>.

Retain paragraph below for added quality control if required.

* + - * 1. Match Director’s Representative's samples for color, finish, and other stone characteristics relating to aesthetic effects.
      1. LIMESTONE <**Insert drawing designation**>
         1. Material Standard: Comply with ASTM C568.

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.

Classification: [**I Low**] [**II Medium**] [**III High**] Density.

Consider retaining "Stone Abrasion Resistance" subparagraph below. ASTM C568 requires a value of 10 for floors; a value of 12 is recommended for stairs. Verify that limestone selected complies before retaining.

Stone Abrasion Resistance: Minimum value of [**10**][**12**], based on testing according to ASTM C241 or ASTM C1353.

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.

* + - * 1. Description: [**Dolomitic**] [**Oolitic**] [**Shell**] limestone.
        2. 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]:

<**Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers**>.

Retain "Varieties and Sources" paragraph below if Indiana limestone is required. If retaining below, retain "II Medium Density" and "Oolitic" options in "Classification" subparagraph and "Description" paragraph, respectively, above. Revise below if stone from a particular quarry is required.

* + - * 1. 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.

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.

Retain "Cut" paragraph below if variety has veining and is cut parallel (fleuri cut) as well as perpendicular (vein cut) to the plane of the veining. Delete if variety retained, such as Indiana limestone, has no veining.

* + - * 1. Cut: [**Vein**] [**Fleuri**].

Retain last option in "Finish" paragraph below for Indiana limestone.

* + - * 1. Finish: [Smooth finish] [Sand rubbed] [As indicated] [Match Director’s Representative's sample] [, matching standard ILI finish].

Retain paragraph below for added quality control if required.

* + - * 1. Match Director’s Representative's samples for color, finish, and other stone characteristics relating to aesthetic effects.
      1. MARBLE <**Insert drawing designation**>

Many marble varieties that are suitable for interior floors do not comply with ASTM C503; verify that marble selected complies before retaining option in "Material Standard" paragraph below.

* + - * 1. Material Standard: Comply with ASTM C503[, Classification I Calcite] [, Classification II Dolomite] [, Group A] [, Group B] [, Group C] [, Group D].

Consider retaining "Stone Abrasion Resistance" subparagraph below. ASTM C503 requires a value of 10 for floors; a value of 12 is recommended for stairs. Verify that marble selected complies before retaining.

Stone Abrasion Resistance: Minimum value of [**10**][**12**], based on testing according to ASTM C241 or ASTM C1353.

"Description" paragraph below is an example of a generic description that can be retained and revised for a nonproprietary specification. Description is for a crystalline calcite marble; revise to describe other marble varieties if required.

* + - * 1. Description: Uniform, fine- to medium-grained, [**white**] <**Insert color**> stone with only slight veining.

For a more explicit specification, retain "Varieties and Sources" paragraph below and name specific products.

* + - * 1. 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]:

<**Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers**>.

Retain "Cut" paragraph below if variety has veining and is available either cut parallel (fleuri cut) or perpendicular (vein cut) to the plane of the veining.

* + - * 1. Cut: [**Vein**] [**Fleuri**].
        2. Finish: [Polished] [Honed] [As indicated] [Match Director’s Representative's sample].

Retain paragraph below for added quality control if required.

* + - * 1. Match Director’s Representative's samples for color, finish, and other stone characteristics relating to aesthetic effects.
      1. QUARTZ-BASED STONE <**Insert drawing designation**>
         1. Material Standard: Comply with ASTM C616, [Classification I Sandstone] [Classification II Quartzitic Sandstone] [Classification III Quartzite].

Consider retaining "Stone Abrasion Resistance" subparagraph below. ASTM C616 requires a value of 10 for floors; a value of 12 is recommended for stairs. Verify that quartz-based stone selected complies before retaining.

Stone Abrasion Resistance: Minimum value of [**10**][**12**], based on testing according to ASTM C241 or ASTM C1353.

For a more explicit specification, retain "Varieties and Sources" paragraph below and name specific products.

* + - * 1. 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]:

<**Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers**>.

* + - * 1. Finish: [Sand rubbed] [Natural cleft] [Thermal] [As indicated] [Match Director’s Representative's sample].

Retain paragraph below for added quality control if required.

* + - * 1. Match Director’s Representative's samples for color, finish, and other stone characteristics relating to aesthetic effects.
      1. SERPENTINE <**Insert drawing designation**>

If retaining this article, retain one of two options in "Material Standard" paragraph below. Classification I Exterior requires lower absorption and higher strength. Verify that serpentine selected complies with Classification I Exterior before retaining.

* + - * 1. Material Standard: Comply with ASTM C1526, [Classification I Exterior] [Classification II Interior].

Consider retaining "Stone Abrasion Resistance" subparagraph below. ASTM C1526 requires a value of 10 for floors; a value of 12 is recommended for stairs. Verify that serpentine selected complies before retaining.

Stone Abrasion Resistance: Minimum value of [**10**][**12**], based on testing according to ASTM C241 or ASTM C1353.

For a more explicit specification, retain "Varieties and Sources" paragraph below and name specific products.

* + - * 1. 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]:

<**Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers**>.

* + - * 1. Finish: [Polished] [Honed] [As indicated] [Match Director’s Representative's sample].

Retain paragraph below for added quality control if required.

* + - * 1. Match Director’s Representative's samples for color, finish, and other stone characteristics relating to aesthetic effects.
      1. SLATE <**Insert drawing designation**>

If retaining this article, retain one of two options in "Material Standard" paragraph below. Classification I Exterior requires lower absorption and better acid resistance in addition to higher strength. Verify that slate selected complies with Classification I Exterior before retaining.

* + - * 1. Material Standard: Comply with ASTM C629, [**Classification I Exterior**] [**Classification II Interior**].

Consider retaining "Stone Abrasion Resistance" subparagraph below. ASTM C629 requires a value of 8 for floors; a value of 12 is recommended for stairs. Verify that slate selected complies before retaining.

Stone Abrasion Resistance: Minimum value of [**8**][**12**], based on testing according to ASTM C241 or ASTM C1353.

"Description" paragraph below is an example of a generic description that can be retained and revised for a nonproprietary specification.

* + - * 1. 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.

For a more explicit specification, retain "Varieties and Sources" paragraph below and name specific products.

* + - * 1. 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]:

<**Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers**>.

* + - * 1. Finish: [Honed] [Sand rubbed] [Natural cleft] [As indicated] [Match Director’s Representative's sample].

Retain paragraph below for added quality control if required.

* + - * 1. Match Director’s Representative's samples for color, finish, and other stone characteristics relating to aesthetic effects.
      1. TRAVERTINE <**Insert drawing designation**>

If retaining this article, retain one of two options in "Material Standard" paragraph below. Classification I Exterior requires higher strength; verify that travertine selected complies with this classification before retaining.

* + - * 1. Material Standard: Comply with ASTM C1527, [**Classification I Exterior**] [**Classification II Interior**].

Consider retaining "Stone Abrasion Resistance" subparagraph below. ASTM C1527 requires a value of 10 for floors; a value of 12 is recommended for stairs. Verify that travertine selected complies before retaining.

Stone Abrasion Resistance: Minimum value of [**10**][**12**], based on testing according to ASTM C241 or ASTM C1353.

For a more explicit specification, retain "Varieties and Sources" paragraph below and name specific products.

* + - * 1. 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]:

<**Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers**>.

Do not use fleuri-cut, also called "cross-cut," travertine on floors, because it contains voids just beneath the surface, which will eventually fracture.

* + - * 1. Cut: Vein.

When travertine is used on floors, fill pores to prevent them from accumulating dirt.

* + - * 1. Filling: Fill pores on faces of stone with cementitious filler of color [selected by Director’s Representative] [matching Director’s Representative's sample].
        2. Finish: [Polished] [Honed] [As indicated] [Match Director’s Representative's sample].

Retain paragraph below for added quality control if required.

* + - * 1. Match Director’s Representative's samples for color, finish, and other stone characteristics relating to aesthetic effects.
      1. OTHER STONE <**Insert drawing designation**>

Usually replace "Other Stone" in title of this article with common name or varietal name of stone, as used on Drawings.

* + - * 1. Material Standards:

Retain appropriate subparagraphs below and insert values based on test data for acceptable stone varieties, or delete all for proprietary specification. Absorption and compressive strength are often indicative of ability to resist freezing and thawing. Absorption is also indicative of a stone's ability to resist soiling and staining. Flexural strength and modulus of rupture are unimportant if a stone is fully supported on a continuous setting bed.

Maximum Absorption according to ASTM C97: <**Insert required value**>.

Minimum Compressive Strength according to ASTM C170: <**Insert required value**>.

Minimum Flexural Strength according to ASTM C880: <**Insert required value**>.

Minimum Modulus of Rupture according to ASTM C99: <**Insert required value**>.

Abrasion resistance is indicative of ability to resist wear. A value of 10 is recommended for most floors, with 12 recommended for stairs and floors with heavy foot traffic. Verify that selected stone complies with specified value.

Stone Abrasion Resistance: Minimum value of [**10**] [**12**], based on testing according to ASTM C241 or ASTM C1353.

For a more explicit specification, retain "Varieties and Sources" paragraph below and name specific products.

* + - * 1. 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]:

<**Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers**>.

* + - * 1. Finish: [Polished] [Honed] [Sand rubbed] [Natural cleft] [As indicated] [Match Director’s Representative's sample].

Retain paragraph below for added quality control if required.

* + - * 1. Match Director’s Representative's samples for color, finish, and other stone characteristics relating to aesthetic effects.
      1. MORTAR MATERIALS

Retain listed products in this article for mortar types used: setting or pointing mortar, or both. Use pointing mortar rather than grout for joints 3/16 inch or wider. Use unsanded grout with polished stone, especially softer stones such as marble; sand can scratch the stone when grout is spread and wiped.

Delete option in "Portland Cement" paragraph below if using grout rather than pointing mortar.

* + - * 1. Portland Cement: ASTM C150, Type I or Type II.[ Provide natural color or white cement as required to produce mortar color indicated.]

Retain "Low-Alkali Cement" subparagraph below to limit staining if recommended by stone source.

Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C114.

* + - * 1. Hydrated Lime: ASTM C207, Type S.
        2. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C150, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=379) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Lafarge North America Inc](http://www.specagent.com/Lookup?uid=123457139139).

[Lehigh Hanson; Heidelberg Cement Group](http://www.specagent.com/Lookup?uid=123457139141).

Quickrete.

SPEC MIX.

Approved equivalent.

Retain "Mortar Pigments" paragraph below for colored cement or for pigments added at Project site.

* + - * 1. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979. Use only pigments with a record of satisfactory performance in stone masonry mortar.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=380) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Davis Colors](http://www.specagent.com/Lookup?uid=123457139144).

[Euclid Chemical Company (The); an RPM company](http://www.specagent.com/Lookup?uid=123457139147).

[Solomon Colors, Inc](http://www.specagent.com/Lookup?uid=123457139145).

Approved equivalent.

Mix in "Colored Portland Cement-Lime Mix" paragraph below allows better control of color than does job-mixed, portland cement-lime mortar with pigment added. Delete if using grout rather than pointing mortar.

* + - * 1. 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.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=6724) Subject to compliance with requirements, provide products by one of the following:

[Lafarge North America Inc](http://www.specagent.com/Lookup?uid=123457139149).

[Lehigh Hanson; Heidelberg Cement Group](http://www.specagent.com/Lookup?uid=123457139150).

SPEC MIX.

Approved equivalent.

* + - * 1. Aggregate: ASTM C144; except for joints narrower than 1/4 inch and pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.

Retain "White Aggregates" subparagraph below for white mortar. Delete if using grout rather than pointing mortar.

White Aggregates: Natural white sand or ground white stone.

Retain "Colored Aggregates" subparagraph below for colored-aggregate mortar. Delete if using grout rather than pointing mortar.

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

Retain "Latex Additive" paragraph below if required for mortar-bed bond coat, slurry bond coat, or latex-modified portland cement mortar bed. Additive is available in either concentrated or prediluted form.

* + - * 1. 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.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=382) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Boiardi Products Corporation; a QEP company](http://www.specagent.com/Lookup?uid=123457139165).

[Custom Building Products](http://www.specagent.com/Lookup?uid=123457139169).

[Laticrete International, Inc](http://www.specagent.com/Lookup?uid=123457139171).

[MAPEI Corporation](http://www.specagent.com/Lookup?uid=123457139172).

Approved equivalent.

Retain "Thinset Mortar" paragraph below if required for setting thresholds or stair treads.

* + - * 1. Thinset Mortar:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=382) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Boiardi Products Corporation; a QEP company](http://www.specagent.com/Lookup?uid=123457139165).

[Custom Building Products](http://www.specagent.com/Lookup?uid=123457139169).

[Laticrete International, Inc](http://www.specagent.com/Lookup?uid=123457139171).

[MAPEI Corporation](http://www.specagent.com/Lookup?uid=123457139172).

Approved equivalent.

Retain "Standard Dry-Set Mortar," "Modified Dry-Set Mortar," "Medium-Bed Modified Dry-Set Mortar," or "Improved Modified Dry-Set Mortar" subparagraph below.

Standard Dry-Set Mortar: ANSI A118.1.

Modified Dry-Set Mortar: ANSI A118.4.

Prepackaged Dry-Mortar Mix: Factory-prepared, packaged mixture of portland cement; dry, redispersible, ethylene vinyl acetate or acrylic additive; and other ingredients to which only water needs to be added at Project site.

Medium-Bed Modified Dry-Set Mortar: ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 5/8 inch.

Prepackaged Dry-Mortar Mix: Factory-prepared, packaged mixture of portland cement; dry, redispersible, ethylene vinyl acetate or acrylic additive; and other ingredients to which only water needs to be added at Project site.

Improved Modified Dry-Set Mortar: ANSI A118.15.

Prepackaged Dry-Mortar Mix: Factory-prepared, packaged mixture of portland cement; dry, redispersible, ethylene vinyl acetate or acrylic additive; and other ingredients to which only water needs to be added at Project site.

* + - * 1. Water: Potable.
      1. GROUT

For joints wider than 3/16 inch, grout should be recommended by manufacturer for joint width used, or joints should be pointed with mortar instead.

* + - * 1. Grout Colors: [Match stone] [As indicated by manufacturer's designations] [Match Director’s Representative's samples] [As selected by Director’s Representative from manufacturer's full range].

Retain grout types required from "Sand-Portland Cement Grout," "Standard Cement Grout," "High-Performance Cement Grout," and "Water-Cleanable Epoxy Grout" paragraphs below. Coordinate with installation requirements. Insert colors required for each grout type or indicate in a schedule.

Grout in "Sand-Portland Cement Grout" paragraph below is field-mixed portland cement and fine-graded sand. Delete if only prepackaged products are acceptable or if sanded grout is not required. Sanded grout is generally used for joint widths 1/8 inch or wider. Avoid sand-portland cement grout for stone with honed or polished finish; sand can scratch the stone when grout is spread and wiped.

* + - * 1. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate to produce required color.

Standard cement grouts and polymer-modified tile grouts are packaged products and are available either sanded or unsanded. Sanded grout is generally used for joint widths 1/8 inch or wider; unsanded grout is generally used for joint widths 1/8 inch or narrower. Avoid sanded grouts for stone with honed or polished finish; sand can scratch the stone when grout is spread and wiped.

* + - * 1. Standard Cement Grout: ANSI A118.6, packaged.

Retain one or both subparagraphs below to suit joint widths specified. Do not use sanded grout for joints with polished stone, especially softer stones such as marble; sand can scratch the stone when grout is spread and wiped.

Unsanded grout mixture for joints 1/8 inch and narrower.

Sanded grout mixture for joints wider than 1/8 inch.

* + - * 1. High-Performance Cement Grout: ANSI A118.7, packaged.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=383) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Boiardi Products Corporation; a QEP company](http://www.specagent.com/Lookup?uid=123457139177).

[Custom Building Products](http://www.specagent.com/Lookup?uid=123457139182).

[Laticrete International, Inc](http://www.specagent.com/Lookup?uid=123457139183).

[MAPEI Corporation](http://www.specagent.com/Lookup?uid=123457139184).

Approved equivalent.

Unsanded grout mix for joints 1/8 inch and narrower.

Sanded grout mix for joints wider than 1/8 inch.

Water-cleanable epoxy grout is more resistant to staining than portland cement-based grouts. Water-cleanable epoxy grout is also the preferred grout for certain stone types that are prone to warping due to water absorption from setting materials and grouts (water-cleanable epoxy grout contains very little water). See the Evaluations.

* + - * 1. Water-Cleanable Epoxy Grout: ANSI A118.3 packaged, chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=384) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Boiardi Products Corporation; a QEP company](http://www.specagent.com/Lookup?uid=123457139196).

[Custom Building Products](http://www.specagent.com/Lookup?uid=123457139192).

[Laticrete International, Inc](http://www.specagent.com/Lookup?uid=123457139193).

[MAPEI Corporation](http://www.specagent.com/Lookup?uid=123457139194).

Approved equivalent.

* + - 1. WATERPROOF MEMBRANES

ANSI A118.10 specifies waterproof membranes for use under thinset tile installations. These products can also be used under thickset stone installations.

* + - * 1. 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.
        2. Chlorinated Polyethylene Sheet: ASTM D4068; Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.

[Products:](http://www.specagent.com/Lookup?ulid=6725) Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

[Noble Company (The)](http://www.specagent.com/Lookup?uid=123457139201); Chloraloy®.

Approved equivalent.

* + - * 1. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.

[Products:](http://www.specagent.com/Lookup?ulid=6727) Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

Mapaei Corpoaration; Mapeguard® WP 200.

[Schluter Systems L.P](http://www.specagent.com/Lookup?uid=123457139203); KERDI.

[Schönox; HPS North America, Inc](http://www.specagent.com/Lookup?uid=123457138532).; Schonox AB.

Approved equivalent.

* + - * 1. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

[Products:](http://www.specagent.com/Lookup?ulid=6729) Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

[Boiardi Products Corporation; a QEP company](http://www.specagent.com/Lookup?uid=123457139204); Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.

[Custom Building Products](http://www.specagent.com/Lookup?uid=123457139206); Custom® 9240 Waterproofing and Anti­Fracture Membrane.

[Laticrete International, Inc](http://www.specagent.com/Lookup?uid=123457139207).; Laticrete 9235 Waterproofing Membrane.

[MAPEI Corporation](http://www.specagent.com/Lookup?uid=123457139208); Mapelastic 315.

Approved equivalent.

* + - * 1. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

[Products:](http://www.specagent.com/Lookup?ulid=6730) Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

[Boiardi Products Corporation; a QEP company](http://www.specagent.com/Lookup?uid=123457139212); Elastiment 644 Membrane Waterproofing System.

[Custom Building Products](http://www.specagent.com/Lookup?uid=123457139215); RedGard® Waterproofing and Crack Prevention Membrane.

[Laticrete International, Inc](http://www.specagent.com/Lookup?uid=123457139217).; laticrete Hydro Ban.

[MAPEI Corporation](http://www.specagent.com/Lookup?uid=123457139218); [**Mapelastic HPG**][**Mapelastic™ AquaDefense**].

Approved equivalent.

* + - * 1. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.

[Products:](http://www.specagent.com/Lookup?ulid=6731) Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

[Boiardi Products Corporation; a QEP company](http://www.specagent.com/Lookup?uid=123457139222); Elastiment 323 Cement Based Waterproofing, Anti-Fracture/Crack Suppression Membrane.

[Laticrete International, Inc](http://www.specagent.com/Lookup?uid=123457139217).; Laticrete Hydro Ban® Cementitious Waterproofing Membrane.

[MAPEI Corporation](http://www.specagent.com/Lookup?uid=123457139224); Mapelastic Turbo.

Approved equivalent.

Adhesive in "Water-Cleanable Epoxy Adhesive" paragraph below is preferred setting material for certain stone types that are prone to warping due to water absorption from various mortar types and from water-emulsion organic adhesives. (Although below is water cleanable, it contains little water.)

* + - * 1. Water-Cleanable Epoxy Adhesive: ANSI A118.3.

[Products:](http://www.specagent.com/Lookup?ulid=385) Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

[Custom Building Products](http://www.specagent.com/Lookup?uid=123457139228); EBM­Lite™ Premium Epoxy Bonding Mortar - 100% Solids.

[Laticrete International, Inc](http://www.specagent.com/Lookup?uid=123457139233).; Laticrete Latapoxy® 300 Adhesive.

[MAPEI Corporation](http://www.specagent.com/Lookup?uid=123457139234); Kerapoxy® 410.

Approved equivalent.

* + - 1. ACCESSORIES

Retain "Paver Pedestals" paragraph below for stone set on pedestals over waterproofing. Pedestals elevate, level, space, and stabilize pavers, and they facilitate drainage. Supports may be of fixed height for stone flooring following slope of deck or adjustable for leveling stone flooring over a sloped deck.

* + - * 1. Paver Pedestals: Manufacturer's standard paver support assembly, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of [**1/8 inch**] [**or**] [**3/16 inch**].

[Manufacturers:](http://www.specagent.com/Lookup?ulid=386) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Bison ScrewJack Company](http://www.specagent.com/Lookup?uid=123457139239).

[Hanover Architectural Products](http://www.specagent.com/Lookup?uid=123457139244).

Tile Tech Pavers, Inc.

Westile; An Oldcastle Company.

Approved equivalent.

* + - * 1. Temporary Spacers: Resilient plastic, nonstaining to stone, sized to suit joint thickness.

Retain "Cleavage Membrane" paragraph below for large stone units or if concrete substrate is subject to movement and deflection.

* + - * 1. Cleavage Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils thick.

Retain "Reinforcing Wire" paragraph below if reinforced mortar bed is required. Always reinforce mortar bed if using a cleavage membrane.

* + - * 1. Reinforcing Wire: Galvanized, welded, 0.062-inch- diameter wire; 2-by-2-inch mesh; comply with ASTM A1064, except for minimum wire size.

Retain "Divider Strips and Edging" paragraph below if required by Project.

* + - * 1. 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:

Exposed-Edge Material: [**Half-hard brass**] [**White zinc alloy**] [**Nickel silver**] [**Stainless steel; ASTM A666 or ASTM A276, Type 302**].

Cross-Section Profile: [**Angle or L-shape**] [**T-shape, single or two part**] [**Straight shape**].

Height: [**Match stone thickness**] [**Equal to stone thickness plus depth of setting bed**].

Exposed-Edge Width: [**0.063 inch**] [**1/8 inch**] [**1/4 inch**] [**3/8 inch**].

Control-Joint Filler: Neoprene.

* + - * 1. 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.

Width: 1/4 inch.

Depth: 1/2 inch.

Length: 4 inches less than stair width.

Retain "Cork Joint Filler" paragraph below if required for joints in exterior flooring or for locations where exterior stone flooring abuts curbs, vertical surfaces, or other paving types.

* + - * 1. Cork Joint Filler: Preformed strips complying with ASTM D1752, Type II.
        2. Joint Sealants: Manufacturer's standard sealants that comply with applicable requirements in Section 079200 "Joint Sealants" and will not stain the stone they are applied to.

Use mildew-resistant joint sealant at plumbing fixtures and for control and expansion joints in toilet rooms[**and other wet locations**].

Revise subparagraph below if color matching is not possible with sealant products selected, which may be the case with mildew-resistant sealants from some manufacturers.

Colors: Provide colors of exposed sealants to match other joints in stone adjoining sealed joints unless otherwise indicated.

* + - * 1. 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.

See the Evaluations for information on use of floor sealers.

Floor Sealer: Colorless stain-resistant, and oleo phobic, impregnating sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

[Products:](http://www.specagent.com/Lookup?ulid=385) Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

Miracle Sealants; 511 Impregnator Sealer.

MORE Surface Care, LLC; MORE Stone Sealer.

Stone Technologies Corp.; Stone Sealer #6 – Eco Enhancing Sealer.

Surface Solutions LLC.; InvisaGuard IVG Impregnating.

Approved equivalent.

* + - 1. MORTAR AND GROUT MIXES
         1. 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.

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.

Combine mortar materials and thoroughly mix in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.

Retain "Mixing Pointing Mortar" subparagraph below for prehydrating pointing mortar if required. Prehydrating mortar allows most of initial shrinkage to occur before mortar is placed in joint. Delete if using grout rather than pointing mortar.

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.

Retain "Portland Cement-Lime Setting Mortar" or "Latex-Modified Portland Cement Setting Mortar" paragraph below. Using latex-modified portland cement mortar can make curing times undesirably long. See the Evaluations.

* + - * 1. Portland Cement-Lime Setting Mortar: ASTM C270, 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.
        2. 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.

Retain "Mortar-Bed Bond Coat" paragraph below if mortar bed is installed directly over concrete. Use first option only with unmodified portland cement mortar; second option may be used with either latex-modified mortar or unmodified portland cement mortar.

* + - * 1. Mortar-Bed Bond Coat: Mix neat cement and [**water**] [**latex additive**] to a creamy consistency.

Retain "Cement-Paste Bond Coat" or "Latex-Modified Portland Cement Bond Coat" paragraph below. Retain second paragraph with either latex-modified mortar or unmodified portland cement mortar; retain first paragraph only with unmodified portland cement mortar.

* + - * 1. Cement-Paste Bond Coat: Mix either neat cement or cement and sand with water to a consistency similar to that of thick cream.
        2. Latex-Modified Portland Cement Bond Coat: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
        3. Pointing Mortar: Comply with requirements indicated above for setting mortar, including type and the following:

Retain "Pigmented Pointing Mortar," "Packaged Portland Cement-Lime Mix Mortar," or "Colored-Aggregate Pointing Mortar" subparagraph below. Ratio in first subparagraph applies only to pigment types listed in "Mortar Materials" Article. Other pigments, if inserted, may require different limitations.

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.

Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.

Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.

* + - * 1. Joint Grout: Comply with mixing requirements in referenced ANSI standards and with manufacturer's written instructions.
      1. FABRICATION OF STONE

Delete this article if all stone used is natural-cleft, random-sized, untrimmed material.

* + - * 1. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.

Retain subparagraph below if stone varieties used may require repairs.

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 Director’s Representative.

* + - * 1. Fabricate stone to comply with requirements indicated and with the following references:

Retain applicable references in first three subparagraphs below. No specific reference for slate or quartz-based stone currently exists, but related information is included in MIA's "Dimension Stone - Design Manual VII." Data are also available from product sources and fabricators.

For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."

For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

For marble, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."

For stone not otherwise indicated, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."

* + - * 1. Cut stone to produce pieces of thickness, size, and shape indicated.

If different stone types require different patterns, stone edges, and joint widths, consider copying appropriate subparagraphs from first seven subparagraphs below to articles specifying stone types; if copying subparagraphs, delete them here.

Retain option from "Stone Thickness" subparagraph below or revise to suit Project. 3/4 inch is minimum thickness for granite, marble, and serpentine, and is typical for most flooring. Minimum thickness of limestone depends on the variety used; typically 1-1/4 inches for dolomitic limestone and 2 inches for oolitic limestone. Large units require thicker stone.

Stone Thickness: [**1/2 inch**] [**3/4 inch**] [**7/8 inch**] [**1 inch**] [**1-1/4 inches**] [**2 inches**] unless otherwise indicated.

Retain one of first four "Pattern" subparagraphs below for modular and random arrangements; revise to suit Project.

Pattern: [**Rectangular**] [**Diamond**]-grid pattern of [**12 by 12 inches**] [**18 by 18 inches**] [**24 by 24 inches**].

Pattern: Rectilinear [**brickwork**] [**herringbone**] pattern of 12-by-24-inch units.

Pattern: Random, rectangular pattern composed of units of not less than [**6 inches**] [**8 inches**] or more than [**24 inches**] [**32 inches**] in nominal dimension.

Pattern: Random, polygonal pattern composed of units of not less than 1 sq. ft. or more than 5 sq. ft. in area.

For modular patterns that are too complex to be clearly described and for large panel arrangements custom cut to fit installation space, retain "Pattern" subparagraph below and indicate pattern on Drawings.

Pattern: As indicated.

Stone Edges: [**Square cut with top corner slightly eased to prevent snipping**] [**Square cut with 1/16-inch- wide bevel at top corner**] [**Rough split**] [**As indicated**].

Joint Width: [**1/16 inch**] [**1/8 inch**] [**1/4 inch**] [**3/8 inch**].

Delete "Pattern Arrangement" paragraph below if not using marble or other stone with natural markings that allow pattern arrangement.

* + - * 1. Pattern Arrangement: Fabricate and arrange stone units with veining and other natural markings to comply with the following requirements:

Cut stone from one block or contiguous, matched blocks in which natural markings occur.

First option in first subparagraph below applies to vein-cut stone (cut perpendicular to bedding plane); second applies to fleuri-cut stone (cut parallel to bedding plane) but may also be used with vein-cut stone.

Arrange units [**with veining as indicated on Drawings**] [**in blend pattern**].

Retain applicable requirement(s) in subparagraphs below for vein-cut stone (cut perpendicular to bedding plane). Complement pattern description with drawing indications as required.

Book match adjacent units[**in each row and between adjacent rows**].

Book match adjacent units in each row, and arrange units in end-slip pattern between adjacent rows.

Arrange units in side-slip[**and end-slip**] pattern.

Arrange four units adjoining center point of room in two-way book match, and arrange surrounding units in side-slip and end-slip pattern.

Number stone units and note numbers on Shop Drawings to designate installation location of each unit.

Retain first paragraph below if thresholds are required. Show threshold profiles on Drawings. Ensure that thresholds are accessible to people with disabilities.

* + - * 1. Fabricate stone thresholds in sizes and profiles as indicated or required to provide transition between adjacent floor finishes.

Revise first subparagraph below as necessary or delete if accessibility for people with disabilities is not required.

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 or less, and finish bevel to match adjacent surfaces of threshold.

Where difference in floor levels exceeds 1/2 inch, 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.

Retain first paragraph below if stair treads are required. Show tread profiles and details of abrasive inserts or grooves on Drawings.

* + - * 1. 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.][ Cut grooves about **1/8 inch** wide by **1/16 inch** deep in stair treads as indicated.]
        2. 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.

Grade and select 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**].

1. EXECUTION
   * + 1. EXAMINATION
          1. 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.
          2. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone flooring.
          3. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. PREPARATION

Coordinate first paragraph below with requirements in other Sections in which substrates are specified. For concrete substrates, retain requirement in Section 033000 "Cast-in-Place Concrete" that forbids use of curing and sealing compounds on surfaces covered by ceramic tile, but revise to include stone flooring.

* + - * 1. Vacuum concrete substrates to remove dirt, dust, debris, and loose particles.
        2. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
        3. 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.
        4. 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.
      1. INSTALLATION, GENERAL

Retain or revise requirements in this article to suit Project; delete others.

* + - * 1. Do necessary field cutting as stone is set. Cut lines straight and true, and finish field-cut edges to match shop-cut edges.

Use power saws with diamond blades to cut stone[**, except for stone that is specified to have rough-split edges**].

* + - * 1. Set stone to comply with requirements indicated.[ Match stone for color and pattern by using units numbered in sequence as indicated on Shop Drawings.]
        2. Scribe and field cut stone as necessary to fit at obstructions. Produce neat joints of size specified or indicated.
        3. Provide control and expansion joints of widths and at locations indicated. Keep control and expansion joints free of mortar, grout, and other rigid materials.
      1. INSTALLATION TOLERANCES
         1. 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.
         2. 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.

Tolerances in "Variation in Surface Plane" and "Variation in Plane between Adjacent Units (Lipping)" paragraphs below are generally appropriate for smooth-finished stone flooring. Revise for natural-cleft, thermal, and similar finishes. Revise to suit Project.

* + - * 1. 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.
        2. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch difference between planes of adjacent units.
      1. INSTALLATION OF STONE BONDED TO CONCRETE

Delete this article if all stone is installed over a cleavage membrane or over waterproofing. Thinset methods are not included here, because they are generally not recommended unless stone units are small. If thinset methods are required, copy appropriate requirements from Section 093033 "Stone Tiling."

* + - * 1. Saturate concrete with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
        2. 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.

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.

* + - * 1. 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.
        2. 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.
        3. 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.
        4. 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.
        5. Rake out joints to depth required to receive [**grout**] [**pointing mortar**] as units are set.

Delete paragraph below if joints are grouted rather than pointed.

* + - * 1. Point joints after setting. Fill full with mortar type and color indicated. Tool joints flat, uniform, and smooth, without visible voids.
      1. INSTALLATION OF STONE OVER [**CLEAVAGE MEMBRANE**] [**WATERPROOFING**]

Retain one of first three paragraphs below.

* + - * 1. Place cleavage membrane over substrates indicated to receive stone, lapped at least 4 inches at joints.

Retain first paragraph below for waterproofing specified in a waterproofing Section.

* + - * 1. See waterproofing Section for installation of waterproofing[**and protection board**].

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.

Cork filler in subparagraph below will protect waterproofing against stone and will form an expansion joint.

Provide cork joint filler, where indicated, at waterproofing that is turned up on vertical surfaces or, if not indicated, provide temporary filler or protection until stone flooring installation is complete.

Retain first paragraph below for waterproof membrane specified in this Section.

* + - * 1. 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.

Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

* + - * 1. Place reinforcing wire fabric over [**cleavage membrane**] [**waterproofing**] [**protection board**], 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.
        2. Place mortar bed over [**cleavage membrane**] [**waterproofing**] [**protection board**] 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.
        3. 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.
        4. 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.
        5. 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.
        6. Rake out joints to depth required to receive [**grout**] [**pointing mortar**] as units are set.

Delete paragraph below if joints are grouted rather than pointed.

* + - * 1. Point joints after setting. Fill full with mortar type and color indicated. Tool joints flat, uniform, and smooth, without visible voids.
      1. INSTALLATION OF STONE FLOORING ON PEDESTALS OVER WATERPROOFING
         1. See waterproofing Section for installation of waterproofing[**and protection board**].
         2. Accurately install pedestals and other accessories to elevations required. Adjust for final level and slope with shims.

Delete concrete fill in subparagraph below unless using Wausau Tile's tilting and telescoping pedestals.

Fill pedestal with concrete mix, strike smooth with top of pedestal, and cure according to ACI 301.

* + - * 1. 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.

Revise subparagraph below to suit Project. Consider paved area layout, stone module, and construction tolerances when imposing limits. Verify minimum dimensions with stone supplier. Minimum pedestal dimensions may also govern.

Lay out stone units to avoid less than half-width units at perimeter or other terminations.

* + - * 1. Install stone flooring units to not vary more than 1/16 inch in elevation between adjacent units.
      1. INSTALLATION OF STONE THRESHOLDS
         1. At locations adjacent to stone flooring, install stone thresholds in same type of setting bed as abutting stone flooring unless otherwise indicated.

Retain subparagraph below if required.

Set thresholds in thinset mortar to comply with ANSI A108.5 at locations where mortar bed would otherwise be exposed above other adjacent flooring.

* + - * 1. At locations not adjacent to stone flooring, install stone thresholds in [thinset mortar to comply with ANSI A108.5] [water-cleanable epoxy adhesive to comply with ANSI A108.4].
      1. INSTALLATION OF STONE STAIR TREADS[**AND RISERS**]

Retain one of two paragraphs below.

* + - * 1. Install stone stair treads [**and risers**]to comply with "Installation of Stone Bonded to Concrete" Article.
        2. Install stone stair treads [and risers ]in [thinset mortar to comply with ANSI A108.5] [water-cleanable epoxy adhesive to comply with ANSI A108.4].
      1. GROUTING

Delete this article if joints are pointed with mortar rather than grouted. Grouts may be used for stone joints less than 3/16 inch wide; point wider joints with mortar unless grout manufacturer recommends product for joints wider than 3/16 inch. Retain first paragraph below if using sand-portland, standard, or polymer-modified cement grout.

* + - * 1. Grout stone joints to comply with ANSI A108.10 and with manufacturer's written instructions.

Usually retain first subparagraph below. See the Evaluations.

Do not use sanded grout for polished stone.

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.

Retain paragraph below if using epoxy grout.

* + - * 1. Grout stone joints with water-cleanable epoxy grout to comply with ANSI A108.6 and with manufacturer's written instructions.
      1. INSTALLATION OF JOINT-SEALANT
         1. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."
      2. ADJUSTING AND CLEANING
         1. Remove and replace stonework of the following description:

Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Director’s Representative.

Defective joints.

Stone flooring and joints not matching approved Samples and mockups.

Stonework not complying with other requirements indicated.

* + - * 1. Replace in a manner that results in stonework matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
        2. In-Progress Cleaning: Clean stonework as work progresses. Remove [**mortar fins and smears**] [**grout smears**] before tooling joints.

Revise first paragraph below to suit Project.

* + - * 1. Clean stonework after setting and [**pointing**] [**grouting**] are complete. Use procedures recommended by stone fabricator for application types.

Retain paragraph below if sealer is required.

* + - * 1. Apply sealer to cleaned stonework according to sealer manufacturer's written instructions.
      1. PROTECTION
         1. Prohibit traffic from installed stone for a minimum of 72 hours.
         2. 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 096340