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SECTION 321400 - UNIT PAVING

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

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

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

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Revise subparagraphs below to suit Project.

1. Brick pavers set in **[aggregate]** **[bituminous]** **[and]** **[mortar]** setting beds.
2. Concrete pavers set in **[aggregate]** **[bituminous]** **[and]** **[mortar]** setting beds.
3. Asphalt-block pavers set in bituminous setting beds.
4. Stone pavers set in **[aggregate]** **[and]** **[mortar]** setting beds.
5. **[Plastic]** **[Steel]** **[Aluminum]** edge restraints.

1.2 ACTION SUBMITTALS

Retain one of first two paragraphs below. If retaining second paragraph, revise list to coordinate with products retained in Part 2.

- A. Product Data: For materials other than water and aggregates.
- B. LEED Submittals:

Retain subparagraph below if regional materials are required for LEED-NC, LEED-CS, or LEED for Schools Credit MR 5; coordinate with requirements selected in Part 2 for materials.

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.
- C. Samples for **[unit pavers]** **[joint materials]** **[and]** **[edge restraints]**.

1.3 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or build on frozen subgrade or setting beds.

Retain first paragraph below if bituminous setting bed is used.

- B. Weather Limitations for Bituminous Setting Bed: Install bituminous setting bed only when ambient temperature is above 40 deg F (4 deg C) and when base is dry.

Retain paragraph below if mortar or grout is used.

- C. Weather Limitations for Mortar and Grout:
1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

Retain subparagraph below for pavers set in mortar. Hot weather has more effect on paver installations than on masonry because horizontal surfaces absorb more solar energy than vertical surfaces.

2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.

PART 2 - PRODUCTS

2.1 BRICK PAVERS

Retain first paragraph below for LEED-NC, LEED-CS, or LEED for Schools Credit MR 5; before retaining, verify availability of materials that comply.

- A. Regional Materials: Provide brick pavers that have been manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Section 016000 "Product Requirements."

If retaining first paragraph below, retain one weather class, traffic type, and application. Class SX is for exposure to freezing weather, and Class MX is for exterior uses that do not expose brick to freezing. Class NX is excluded because it is for interior locations. Type I is for locations exposed to extensive abrasion, such as sidewalks and driveways in public spaces; Type II is for locations exposed to intermediate abrasion, such as heavily traveled residential walkways and driveways; Type III is for locations exposed to low abrasion, such as floors and patios exposed in single-family homes. Application PS is normal tolerance; Application PX is exceptionally close dimensional tolerance; Application PA is nonuniform sized for characteristic architectural effects. If retaining Application PA, specify tolerances.

- B. Brick Pavers: Light-traffic paving brick; ASTM C 902, [Class SX] [Class MX], [Type I] [Type II] [Type III], [Application PS] [Application PX] [Application PA]. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert, in separate subparagraphs, manufacturer's name>.
 2. Thickness: [1-1/4 inches (32 mm)] [1-1/2 inches (38 mm)] [1-5/8 inches (41 mm)] [2-1/4 inches (57 mm)] [2-5/8 inches (67 mm)] [As indicated] <Insert dimension>.
 3. Face Size: [3-3/4 by 7-1/2 inches (95 by 190 mm)] [3-5/8 by 7-5/8 inches (92 by 194 mm)] [3-5/8 by 11-5/8 inches (92 by 295 mm)] [7-5/8 by 7-5/8 inches (194 by 194 mm)] [4 by 8 inches (102 by 203 mm)] [4 by 12 inches (102 by 305 mm)] [8 by 8 inches (203 by 203 mm)] [As indicated] <Insert dimensions>.

Subparagraph below may be deleted if manufacturer's product designation is used and specifies color.

4. Color: [Dark red] [Medium red] [Full-range red] [Dark brown] [Medium brown] [Full-range brown] [Tan] [Buff] [Cream] [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

Consider retaining paragraph below if latex-modified mortar or grout is used.

- C. Temporary Protective Coating: Precoat exposed surfaces of brick pavers with a continuous film of a temporary protective coating that is compatible with brick, mortar, and grout products.

2.2 CONCRETE PAVERS

Retain first paragraph below for LEED-NC, LEED-CS, or LEED for Schools Credit MR 5; before retaining, verify availability of materials that comply.

- A. Regional Materials: Provide concrete pavers that have been manufactured within 500 miles (800 km) of Project site from aggregates[**and cement**] that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

First paragraph below applies to most standard units.

- B. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936[**and resistant to freezing and thawing when tested according to ASTM C 67**], made from normal-weight aggregates.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Section 016000 "Product Requirements."

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. <Insert, in separate subparagraphs, manufacturer's name>.

Standard-duty interlocking concrete pavers are usually 2-3/8 inches (60 mm) thick; heavy-duty units are usually 3-1/8 inches (80 mm) thick.

2. Thickness: [2-3/8 inches (60 mm)] [3-1/8 inches (80 mm)] <Insert dimension>.

Retain and revise one of first three subparagraphs below to specify face size and shape. Maximum length per ASTM C 936 is 9-1/2 inches (241 mm) for 2-3/8-inch- (60-mm-) thick units, 12-1/2 inches (318 mm) for 3-1/8-inch- (80-mm-) thick units.

3. Face Size and Shape: [3-7/8 inches (98 mm)] [4-7/16 inches (113 mm)] [8-7/8 inches (225 mm)] [9 inches (229 mm)] square.
4. Face Size and Shape: [3-7/8-by-7-7/8-inch (98-by-200-mm)] [4-by-8-inch (102-by-203-mm)] [4-7/16-by-8-7/8-inch (113-by-225-mm)] rectangle.
5. Face Size and Shape: [5-1/2-inch (140-mm) octagon with attached 3-1/2-inch (89-mm) square] [4-1/2-by-9-inch (114-by-229-mm) rectangle with saw-tooth edges] [4-3/4-inch (121-mm) rectangular and trapezoidal units arranged in semicircular courses to produce fan-shaped pattern] [As indicated] <Insert dimensions and shape>.
6. Color: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

Units in paragraph below are primarily suitable for residential walks and patios.

- C. Concrete Pavers: Solid paving units complying with ASTM C 1491, made from lightweight concrete.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Section 016000 "Product Requirements."

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert, in separate subparagraphs, manufacturer's name>.
2. Thickness: [1-5/8 inches (41 mm)] [1-3/4 inches (45 mm)] <Insert dimension>.
3. Face Size and Shape: [9 inches (229 mm) square] [12 inches (305 mm) square] [As indicated] <Insert dimensions and shape>.
4. Color: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

2.3 ASPHALT-BLOCK PAVERS

- A. Asphalt-Block Pavers: Solid units made from asphalt cement complying with ASTM D 312, Type III; inorganic stone dust or cement filler; and coarse aggregate, consisting of clean, hard, unweathered stone crushed into angular particles varying in size up to 3/8 inch (9.5 mm).

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Section 016000 "Product Requirements."

1. \$L~Manufacturers~\$I~5637~L\$: Subject to compliance with requirements, **[provide products by one of the following]** **[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. \$M~Hanover Architectural Products, Inc~\$m~123456797608~M\$.
 - b. **<Insert manufacturer's name>**.
2. Thickness: **[1-1/4 inches (32 mm)] [2 inches (51 mm)] <Insert dimension>**.
3. Face Size: **[4 by 6 inches (102 by 152 mm)] [6 by 6 inches (152 by 152 mm)] [8 by 8 inches (203 by 203 mm)] [8-inch- (203-mm-) wide hexagon] <Insert dimensions>**.
4. Finish: **[Natural, smooth] [Ground] [Ground and sandblasted]**.
5. Color: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>**.

2.4 STONE PAVERS

- A. Granite Pavers: Rectangular paving slabs made from granite complying with ASTM C 615.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Section 016000 "Product Requirements."

1. Products: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **<Insert names of varieties and producers, distributors, or importers>**.

First subparagraph below is an example only. Revise color or grain or specify a retained variety.

2. Color and Grain: **[Light gray] [Dark gray] [Buff] [White] [Black] [Pink] <Insert color>** with **[medium] [fine]** grain.
3. Finish: **[Honed] [Thermal] [As indicated] [Match Architect's sample] <Insert finish>**.

Verify availability of thickness retained in first subparagraph below with stone suppliers.

4. Thickness: Not less than **[3/4 inch (20 mm)] [1-1/4 inches (32 mm)]** unless otherwise indicated.
5. Face Size: **[9 inches (229 mm) square] [12 inches (305 mm) square] [As indicated] <Insert dimensions>**.

- B. Quartz-Based Stone Pavers: **[Rectangular paving slabs]** made from quartz-based stone complying with ASTM C 616, Classification **[I Sandstone] [II Quartzitic Sandstone] [III Quartzite]**.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Section 016000 "Product Requirements."

1. Products: Subject to compliance with requirements, **[provide the following] [provide one of the following] [stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **<Insert names of varieties and producers, distributors, or importers>.**

Consider retaining first subparagraph below. ASTM C 616 requires value of 10 for floors. Before retaining, verify that stone complies.

2. Stone Abrasion Resistance: Minimum value of **[10] <Insert value>**, based on testing according to ASTM C 241 or ASTM C 1353.
3. Finish: **[Sand rubbed] [Natural cleft] [Thermal] [As indicated] [Match Architect's sample] <Insert finish>**.

Verify availability of thickness retained in first subparagraph below with stone suppliers.

4. Thickness: Not less than **[1 inch (25 mm)] [1-1/4 inches (32 mm)] [1-1/2 inches (38 mm)] [1-5/8 inches (40 mm)] [2 inches (50 mm)]** unless otherwise indicated.
5. Face Size: **[9 inches (229 mm) square] [12 inches (305 mm) square] [As indicated] <Insert dimensions>**.

- C. Slate Pavers: **[Rectangular paving slabs]** made from slate complying with ASTM C 629, Classification I Exterior, with a fine, even grain **[and unfading color,]** from clear, sound stock.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Section 016000 "Product Requirements."

1. Products: Subject to compliance with requirements, **[provide the following] [provide one of the following] [stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **<Insert names of varieties and producers, distributors, or importers>**.

First subparagraph below is an example of a generic description that can be retained and revised for a nonproprietary specification. For a more explicit specification, delete subparagraph and list varieties and sources in "Products" Subparagraph above.

2. Color: **[Black] [Blue-black] [Gray] [Blue-gray] [Green] [Purple] [Mottled purple and green] [Red]**.

Consider retaining first subparagraph below. ASTM C 629 requires value of 8 for floors. Before retaining, verify that stone complies.

3. Stone Abrasion Resistance: Minimum value of **[8] <Insert value>**, based on testing according to ASTM C 241 or ASTM C 1353.
4. Finish: **[Honed] [Sand rubbed] [Natural cleft] [As indicated] [Match Architect's sample] <Insert finish>**.

Verify availability of thickness retained in first subparagraph below with stone suppliers.

5. Thickness: Not less than **[1/2 inch (13 mm)] [3/4 inch (20 mm)] [1 inch (25 mm)]** unless otherwise indicated.

6. Face Size: [**9 inches (229 mm) square**] [**12 inches (305 mm) square**] [**As indicated**] **<Insert dimensions>**.

The "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines" limits vertical changes in surfaces of an accessible route to 1/4 inch (6.4 mm) or less. If retaining paragraph below for use on an accessible route, verify that pavers comply with requirements. Some pavers are made by splitting thermal-finished slabs into blocks, which gives them a more even surface than those made with split faces.

- D. Rough-Stone Pavers: Rectangular[**tumbled**] paving stones, with split[**or thermal-finished**] faces and edges, made from granite complying with ASTM C 615.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. If naming varieties or manufacturers, retain one of first two subparagraphs and lists below. See Section 016000 "Product Requirements."

1. Products: Subject to compliance with requirements, [**provide the following**] [**provide one of the following**] [**stone varieties that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. **<Insert names of varieties and producers, distributors, or importers>**.
2. \$L~Manufacturers~\$I~5638~L\$: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. \$M~Buechel Stone Corp~\$m~123456797615~M\$.
 - b. \$M~Cold Spring Granite Inc~\$m~123456797617~M\$.
 - c. \$M~Fletcher Granite Company, Inc~\$m~123456797619~M\$.
 - d. \$M~Granicor, Inc~\$m~123456797620~M\$.
 - e. \$M~Milestone Imports, Inc~\$m~123456797621~M\$.
 - f. \$M~New England Stone, LLC~\$m~123456797622~M\$.
 - g. \$M~North Carolina Granite Corporation~\$m~123456797623~M\$.
 - h. **<Insert manufacturer's name>**.

First subparagraph below is an example only. Revise color or grain or specify a retained variety.

3. Color and Grain: [**Light gray**] [**Dark gray**] [**Buff**] [**White**] [**Black**] [**Pink**] **<Insert color>** with [**medium**] [**fine**] grain.

Retain one of first four options in first subparagraph below for pavers made by splitting thermal-finished slabs into blocks. Usually retain fifth option for pavers with rough-split faces.

4. Thickness: [**1-1/4 inches (32 mm)**] [**2 inches (51 mm)**] [**3 inches (76 mm)**] [**4 inches (102 mm)**] [**4 inches (102 mm), plus or minus 1/2 inch (13 mm)**] **<Insert dimension>**.

Retain one of three options in subparagraph below or revise to suit Project. Sizes listed are offered by North Carolina Granite as Durax #1 and Belgium #1.

5. Face Size: [**4 by 4 inches (100 by 100 mm), plus or minus 1/2 inch (13 mm)**] [**3 to 5 inches (75 to 125 mm) by 8 to 12 inches (200 to 300 mm)**] [**As indicated**] **<Insert dimensions>**.

2.5 EDGE RESTRAINTS

Second option in first paragraph below describes PAVE TECH's "Industrial" edging.

- A. Plastic Edge Restraints: Manufacturer's standard triangular PVC extrusions [**1-3/4 inches (45 mm) high by 3-1/2 inches (89 mm) wide**] [**3-1/8 inches (79 mm) high by 9-1/2 inches (241 mm) wide**] designed to serve as edge restraints for unit pavers; rigid type for straight edges and flexible type for curved edges, with pipe connectors and 3/8-inch (9.5-mm) diameter by 12-inch- (300-mm-) long steel spikes.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Section 016000 "Product Requirements."

1. \$L~Manufacturers~\$I~5639~L\$: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. \$M~Brickstop Corporation~\$m~123456797624~M\$.
 - b. \$M~Dimex Corporation~\$m~123456797625~M\$.
 - c. \$M~Oly-Ola Edgings, Inc~\$m~123456797626~M\$.
 - d. \$M~Pave Tech Inc~\$m~123456797627~M\$.
 - e. <Insert manufacturer's name>.

First option in first paragraph below is designated "Landscape Divider" by J. T. Ryerson & Son; second option is designated "Roadway Curbing."

- B. Steel Edge Restraints: Manufacturer's standard painted steel edging [**3/16 inch (4.8 mm) thick by 4 inches (100 mm) high**] [**1/4 inch (6.4 mm) thick by 5 inches (125 mm) high**] with loops pressed from or welded to face to receive stakes at 36 inches (900 mm) o.c., and steel stakes 15 inches (380 mm) long for each loop.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Section 016000 "Product Requirements."

1. \$L~Manufacturers~\$I~5640~L\$: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. \$M~Border Concepts, Inc~\$m~123456797629~M\$.
 - b. \$M~Collier Metal Specialties, Inc~\$m~123456797630~M\$.
 - c. \$M~J. D. Russell Company (The)~\$m~123456797631~M\$.
 - d. \$M~Sure-loc Edging Corporation~\$m~123456797632~M\$.
 - e. <Insert manufacturer's name>.
 2. Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color>.
- C. Aluminum Edge Restraints: Manufacturer's standard [**straight, 1/8-inch- (3.2-mm-) thick by 4-inch- (100-mm-) high**] [**straight, 3/16-inch- (4.8-mm-) thick by 4-inch- (100-mm-) high**] [**L-shaped, 1/8-inch- (3.2-mm-) thick by 1-3/8-inch- (35-mm-) high**] [**L-shaped, 3/16-inch-**

(4.8-mm-) thick by 2-1/4-inch- (57-mm-) high] extruded-aluminum edging with loops pressed from face to receive stakes at 12 inches (300 mm) o.c., and aluminum stakes 12 inches (300 mm) long for each loop.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Section 016000 "Product Requirements."

1. \$L~Manufacturers~\$l~5641~L\$: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. \$M~Brickstop Corporation~\$m~123456797633~M\$.
 - b. \$M~Curv-Rite, Inc~\$m~123456797634~M\$.
 - c. \$M~Permaloc Corporation~\$m~123456797635~M\$.
 - d. \$M~Sure-loc Edging Corporation~\$m~123456797636~M\$.
 - e. <Insert manufacturer's name>.

2.6 ACCESSORIES

- A. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.

Retain paragraph above or below for expansion joints in pavers with grouted joints and at perimeter when placed against waterproofing. Filler below is used with sealant; filler above may be used where sealant is not required.

- B. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.7 AGGREGATE SETTING-BED MATERIALS

First option in first paragraph below is for light-traffic uses; second is for heavy-duty applications.

- A. Graded Aggregate for Base: Sound, crushed stone or gravel complying with **[ASTM D 448 for Size No. 8] [ASTM D 2940, base material] [requirements in Section 312000 "Earth Moving" for base course]**.

Revise first paragraph below to ASTM C 144 for leveling course less than 1 inch (25 mm) thick.

- B. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.
- C. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

Retain first paragraph below if nonwoven geotextile is used between aggregate base and leveling course. Performance requirements in AASHTO M 288 have been widely adopted by geotextile manufacturers and are repeated below. Project's geotechnical report may include recommendations.

- D. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.
 2. Permittivity: 0.5 per second, minimum; ASTM D 4491.
- E. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.8 BITUMINOUS SETTING-BED MATERIALS

First paragraph below is used to prime bases (concrete slab or binder course) under paving for vehicular traffic. Delete if not required.

- A. Primer for Base: ASTM D 2028, cutback asphalt, grade as recommended by unit paver manufacturer.
- B. Fine Aggregate for Setting Bed: ASTM D 1073, No. 2 or No. 3.
- C. Asphalt Cement: ASTM D 3381, Viscosity Grade AC-10 or Grade AC-20.
- D. Neoprene-Modified Asphalt Adhesive: Paving manufacturer's standard adhesive consisting of oxidized asphalt combined with 2 percent neoprene and 10 percent long-fibered mineral fibers containing no asbestos.
- E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

2.9 MORTAR SETTING-BED MATERIALS

Retain this article if cement-bed or grout applications are required.

Retain first paragraph below for LEED-NC, LEED-CS, or LEED for Schools Credit MR 5; before retaining, verify availability of materials that comply.

- A. Regional Materials: Provide aggregate[, **cement, and lime**] for mortar that has been 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.

Delete first paragraph below if latex-modified portland cement mortar mix is specified for setting bed.

- C. Hydrated Lime: ASTM C 207, Type S.
- D. Sand: ASTM C 144.

Retain first paragraph below for thickset applications if latex additive is required to improve flexibility and other properties of mortar setting bed or if latex additive is used for mortar-bed bond coat.

- E. Latex Additive: [**Manufacturer's standard**] [**acrylic resin**] [**or**] [**styrene-butadiene-rubber**] water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.
- F. Water: Potable.

2.10 GROUT MATERIALS

Retain this article if Project includes grouted joints.

Retain first paragraph below for LEED-NC, LEED-CS, or LEED for Schools Credit MR 5; before retaining, verify availability of materials that comply.

- A. Regional Materials: Provide aggregate [**and cement**] for grout that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Polymer-Modified Tile Grout: ANSI A118.7, sanded.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain one of first two subparagraphs and list of manufacturers below. See Section 016000 "Product Requirements."

- 1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

Retain option in first subparagraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.

- 2. \$L~Basis-of-Design Product~\$l~5642~L\$: Subject to compliance with requirements, provide [**product indicated on Drawings**] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. \$M~Boiardi Products; a QEP company~\$m~123456797640~M\$.
 - b. \$M~Bostik, Inc~\$m~123456797641~M\$.
 - c. \$M~C-Cure~\$m~123456797642~M\$.
 - d. \$M~Custom Building Products~\$m~123456797643~M\$.
 - e. \$M~Jamo Inc~\$m~123456797644~M\$.
 - f. \$M~Laticrete International, Inc~\$m~123456797645~M\$.
 - g. \$M~MAPEI Corporation~\$m~123456797646~M\$.
 - h. \$M~ProSpec~\$m~123456797647~M\$.
 - i. \$M~Southern Grouts & Mortars, Inc~\$m~123456797648~M\$.
 - j. \$M~Summitville Tiles, Inc~\$m~123456797649~M\$.
 - k. \$M~TEC, Specialty Construction Brands, Inc~\$m~123456797650~M\$.
 - l. <Insert manufacturer's name>.

Retain one of two subparagraphs below, or delete both and allow Contractor to select type of grout.

3. Polymer Type: Ethylene-vinyl acetate or acrylic additive in dry, redispersible form; prepackaged with other dry ingredients.
 4. Polymer Type: [**Acrylic resin**] [**or**] [**styrene-butadiene rubber**] in liquid-latex form for addition to prepackaged dry-grout mix.
- C. Grout Colors: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <Insert color>.

Retain paragraph below for job-mixed grout and prepackaged grout formulations that only require adding water.

- D. Water: Potable.

2.11 BITUMINOUS SETTING-BED MIX

- A. Mix bituminous setting-bed materials at an asphalt plant in approximate proportion, by weight, of 7 percent asphalt cement to 93 percent fine aggregate unless otherwise indicated. Heat mixture to 300 deg F (149 deg C).

2.12 MORTAR AND GROUT MIXES

Revise article title if mortar is used but not grout. Coordinate with materials and products retained in articles specifying mortar setting-bed and joint materials and their installation.

- A. General: Comply with referenced standards and with manufacturers' written instructions. Discard mortars and grout if they have reached their initial set before being used.
- B. Mortar-Bed Bond Coat: Mix neat cement and [**latex additive**] [**water**] to a creamy consistency.

Retain one of first two paragraphs below. Use of latex-modified, portland cement mortar can make curing times undesirably long. See Evaluations.

- C. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C 270, Proportion Specification.
- D. Latex-Modified, Portland Cement Setting-Bed Mortar: Comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

Retain one of two paragraphs below with either latex-modified, portland cement setting-bed mortar or portland cement-lime setting-bed mortar.

- E. Latex-Modified, Portland Cement Bond Coat: Proportion and mix portland cement, aggregate, and liquid latex for bond coat to comply with written instructions of liquid-latex manufacturer.

- F. Packaged Grout Mix: Proportion and mix grout ingredients according to grout manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- B. Cut unit pavers with motor-driven masonry saw equipment to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
1. For concrete pavers, a block splitter may be used.

Retain one of six options in first paragraph below or revise to suit Project. Patterns are not applicable to all paver shapes.

- C. Joint Pattern: [**Running bond**] [**Herringbone**] [**Basket weave**] [**Grid**] [**As indicated**] [**Match and continue existing unit paver joint pattern**].

Retain first paragraph below if pavers are used over waterproofing.

- D. Pavers over Waterproofing: Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged.

Joint filler in subparagraph below will protect waterproofing against pavers and will form an expansion joint.

1. Provide joint filler at waterproofing that is turned up on vertical surfaces[**unless otherwise indicated; where unfilled joints are indicated, provide temporary filler or protection until paver installation is complete**].

Retain option in "Tolerances" Paragraph below only for smooth, flat pavers.

- E. Tolerances: Do not exceed[**1/16-inch (1.6-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and**] 1/4 inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface of paving.

Retain one of two "Expansion and Control Joints" paragraphs below if joints are required.

- F. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints[**unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete**]. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 079200 "Joint Sealants."

- G. Expansion and Control Joints: Provide cork joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.
- H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.2 AGGREGATE SETTING-BED APPLICATIONS

Retain first paragraph below if compaction is not covered in Section 312000 "Earth Moving." Coordinate with that Section to ensure that compaction for subgrade under concrete pavers is correctly specified. Compaction below is an example only; revise to suit Project.

- A. Compact soil subgrade uniformly to at least **[95]** <Insert number> percent of **[ASTM D 698]** **[ASTM D 1557]** laboratory density.
- B. Place aggregate base, compact by tamping with plate vibrator, and screed to depth indicated.
- C. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches (300 mm).
- D. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.
- E. Treat leveling course with herbicide to inhibit growth of grass and weeds.
- F. Set pavers with a minimum joint width of 1/16 inch (1.5 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed **[3/8 inch (10 mm)]** <Insert dimension> with pieces cut to fit from full-size unit pavers.

Revise first paragraph below for pavers installed over waterproofing if required.

- G. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz.
- H. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

3.3 BITUMINOUS SETTING-BED APPLICATIONS

First paragraph below may be deleted if paving is not subject to vehicular traffic.

- A. Apply primer to concrete slab or binder course immediately before placing setting bed.
- B. Prepare for setting-bed placement by locating 3/4-inch- (19-mm-) deep control bars approximately 11 feet (3.3 m) apart and parallel to one another, to serve as guides for striking board. Adjust bars to subgrades required for accurate setting of paving units to finished grades indicated.

- C. Place bituminous setting bed between control bars. Spread mix at a minimum temperature of 250 deg F (121 deg C). Strike setting bed smooth, firm, even, and not less than 3/4 inch (19 mm) thick. Add fresh bituminous material to low, porous spots after each pass of striking board. Carefully fill depressions that remain after removing depth-control bars.
1. Roll setting bed with power roller to a nominal depth of 3/4 inch (19 mm). Adjust thickness as necessary to allow accurate setting of unit pavers to finished grades indicated. Complete rolling before mix temperature cools to 185 deg F (85 deg C).

Retain subparagraph above and first paragraph below for asphalt-block paving subject to vehicular traffic and for brick paving regardless of traffic.

- D. Apply neoprene-modified asphalt adhesive to cold setting bed by squeegeeing or troweling to a uniform thickness of 1/16 inch (1.6 mm). Proceed with setting of paving units only after adhesive is tacky and surface is dry to touch.
- E. Place pavers carefully by hand in straight courses, maintaining accurate alignment and uniform top surface. Protect newly laid pavers with plywood panels on which workers can stand. If additional leveling of paving is required, and before treating joints, roll paving with power roller.
- F. Joint Treatment: Place unit pavers with hand-tight joints. Fill joints by sweeping sand over paved surface until joints are filled. Remove excess sand after joints are filled.

3.4 MORTAR SETTING-BED APPLICATIONS

- A. Saturate concrete subbase 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 over surface of concrete subbase about 15 minutes before placing mortar bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch (1.6-mm) thickness for bond coat.
- C. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
- D. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set.

Retain first paragraph below if brick pavers are used.

- E. Wet brick pavers before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- F. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch- (1.5-mm-) thick bond coat to mortar bed or to back of each paver with a flat trowel.

- G. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.

Joint widths in first paragraph below are examples only. Retain tolerance to suit manufacturing tolerances of pavers; rough-stone pavers and Application PA brick pavers require large tolerances.

- H. Spaced Joint Widths: Provide [**3/8-inch (10-mm)**] [**1/2-inch (13-mm)**] [**3/4-inch (19-mm)**] nominal joint width with variations not exceeding plus or minus [**1/16 inch (1.5 mm)**] [**1/8 inch (3 mm)**] [**3/16 inch (4.5 mm)**].

Retain first three paragraphs below for grouted joints.

- I. Grouted Joints: Grout paver joints complying with ANSI A108.10.
- J. Grout joints as soon as possible after initial set of setting bed.
1. Force grout into joints, taking care not to smear grout on adjoining surfaces.
 2. Tool exposed joints slightly concave when thumbprint hard.
- K. Cure grout by maintaining in a damp condition for seven days unless otherwise recommended by grout or liquid-latex manufacturer.
- L. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

Retain subparagraph below if applicable for brick pavers.

1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.

END OF SECTION 321400