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SECTION 02780 - UNIT PAVERS

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 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

Adjust list 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. Rough-stone pavers set in **[aggregate] [and] [mortar]** setting beds.
5. **[Plastic] [Steel] [Aluminum]** edge restraints.
6. Cast-in-place concrete edge restraints.
7. Precast concrete curbs.
8. Stone curbs.

- B. Related Sections include the following:

List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.

1. Division 2 Section "Earthwork" for excavation and compacted subgrade.
2. Division 2 Section "Hot-Mix Asphalt Paving" for asphalt base under unit pavers.
3. Division 2 Section "Cement Concrete Pavement" **[for concrete base under unit pavers] [and] [for cast-in-place concrete curbs and gutters serving as edge restraint for unit pavers]**.

4. Division 7 Section "[**Self-Adhering Sheet Waterproofing**] [**Elastomeric Sheet Waterproofing**] [**Thermoplastic Sheet Waterproofing**]" for waterproofing and protection board under plaza deck pavers.

Select from options in subparagraph above or first subparagraph below. Insert other materials included in the waterproofing Section that the reader might expect to find in this Section.

5. Division 7 Section "[**Cold Fluid-Applied Waterproofing**] [**Hot Fluid-Applied Waterproofing**]" for waterproofing and protection board under plaza deck pavers.
6. Division 7 Section "[**Built-up Asphalt Roofing**] [**Built-up Coal-Tar Roofing**] [**EPDM Membrane Roofing**] [**Thermoplastic Membrane Roofing**] [**APP-Modified Bituminous Membrane Roofing**] [**SBS-Modified Bituminous Membrane Roofing**] [**Self-Adhering Modified Bituminous Membrane Roofing**]" for roof pavers.
7. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit pavers with elastomeric sealants.
8. Division 9 Section "Brick Flooring" for brick flooring for interior applications.
9. Division 9 Section "Stone Paving and Flooring" for dimension stone paving.

1.3 SUBMITTALS

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

Select paragraph above or first paragraph and list below. If retaining below, edit list to coordinate with products retained in Part 2.

- B. Product Data: For the following:
 1. Pavers.
 2. Bituminous setting materials.
 3. Mortar and grout materials.
 4. Edge restraints.
 5. Precast concrete curbs.
 6. Stone curbs.
- C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
- D. Samples for Initial Selection: For the following:
 1. Each type of unit paver indicated.
 2. Joint materials involving color selection.
 3. Exposed edge restraints involving color selection.
 4. Precast concrete curbs.
 5. Granite for stone curbs.

Delete paragraph and subparagraphs above if colors and other characteristics are preselected and specified or scheduled. Retain paragraph and subparagraphs below with or without above.

E. Samples for Verification:

1. Full-size units of each type of unit paver indicated.[**Assemble not less than five Samples of each type of unit on suitable backing and grout joints.**]
2. Joint materials.
3. Exposed edge restraints.
4. Precast concrete curbs.
5. Stone curbs.

Delete paragraph below if deleting requirement for preconstruction compatibility and adhesion testing.

- F. Compatibility and Adhesion Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

Delete paragraph and subparagraph below if latex additives are not specified or if testing is considered unnecessary.

- B. Preconstruction Compatibility and Adhesion Testing: Submit to latex-additive manufacturer, for testing indicated below, samples of paving materials that will contact or affect mortar and grout that contain latex additives.
1. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be nonstaining to, installed pavers and other materials constituting paver installation.

Delete paragraph and subparagraph below if not required. If retained, indicate location, size, and other details of mockups on Drawings or by inserts. Revise wording if only one mockup is required.

- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

Retain subparagraph below if mockups are erected as part of building rather than separately and the intention is to make an exception to the default requirement in Division 1 Section "Quality Requirements" for demolishing and removing mockups when directed, unless otherwise indicated.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

Delete paragraph below if Work of this Section is not extensive or complex enough to justify a preinstallation conference. If retaining, coordinate with Division 1.

- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

Delete paragraph below if no liquid-latex compounds are used.

- D. Store liquids in tightly closed containers protected from freezing.

Delete paragraph below if bituminous setting bed is not used.

- E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

Delete paragraph and subparagraphs below if bituminous setting bed is not used.

- B. Weather Limitations for Bituminous Setting Bed:

1. Install bituminous setting bed only when ambient temperature is above 40 deg F (4 deg C) and when base is dry.
2. Apply asphalt adhesive only when ambient temperature is above 50 deg F (10 deg C) and when temperature has not been below 35 deg F (2 deg C) for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.

Delete paragraph and subparagraphs below if no mortar or grout.

- C. Weather Limitations for Mortar and Grout:

1. Cold-Weather Requirements: Protect unit paver work against freezing when ambient temperature is 40 deg F (4 deg C) and falling. Heat materials to provide mortar and grout temperatures between 40 and 120 deg F (4 and 49 deg C). Provide the following protection for completed portions of work for 24 hours after installation when the mean daily air temperature is as indicated: below 40 deg F (4 deg C), cover with weather-

resistant membrane; below 25 deg F (minus 4 deg C), cover with insulating blankets; below 20 deg F (minus 7 deg C), provide enclosure and temporary heat to maintain temperature above 32 deg F (0 deg C).

Retain subparagraph and associated 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. Insert specific limits to suit local conditions.

2. Hot-Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.
 - a. When ambient temperature exceeds 100 deg F (38 deg C), or when wind velocity exceeds 8 mph (13 km/h) and ambient temperature exceeds 90 deg F (32 deg C), set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 BRICK PAVERS

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products.

If brick pavers are used, select one of first two paragraphs and associated subparagraphs below. Standards cover a range of brick used as paving material for pedestrian and vehicular traffic. See Evaluations.

If retaining paragraph below, select 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 for installation with grouted joints; Application PX is close tolerance for ungrouted joints; Application PA is non-uniform sized for decorative effect. If Application PA is retained, specify tolerances.

- A. Brick Pavers: Light-traffic paving brick; ASTM C 902, Class [SX] [MX], Type [I] [II] [III], Application [PS] [PX] [PA]. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.

If naming manufacturers, retain one of three subparagraphs and lists below. Refer to Division 1 Section "Product Requirements." Refer to BIA's Web site for names of brick paver manufacturers.

1. Basis-of-Design Product: The design for brick pavers is based on <Insert manufacturer's name and product>. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - a. <Insert, in separate subparagraphs, manufacturer's name.>

2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
3. Products: Subject to compliance with requirements, provide one of the following:

Retain list below with either of last two subparagraphs above.

- a. **<Insert, in separate subparagraphs, manufacturer's name; product name or designation.>**

Select size requirements from options in two subparagraphs below.

4. 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>.
5. 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.

6. 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>.

If retaining first paragraph below, select one type and application. Type R is for units set in a mortar setting bed or a bituminous setting bed supported by an adequate base. Type F is for units set in a sand setting bed with sand between the pavers. Application PS is for general use; Application PX is for pavers with close dimensional tolerances. Application PX must be selected if specifying Type F.

- B. Brick Pavers: Heavy vehicular paving brick; ASTM C 1272, [Type F, Application PX] [Type R, Application PS] [Type R, Application PX] [Type R, Application PA]. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.

If naming manufacturers, retain one of three subparagraphs and lists below. Refer to Division 1 Section "Product Requirements." Refer to BIA's Web site for names of brick paver manufacturers.

1. Basis-of-Design Product: The design for brick pavers is based on <Insert manufacturer's name and product>. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - a. **<Insert, in separate subparagraphs, manufacturer's name.>**

2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
3. Products: Subject to compliance with requirements, provide one of the following:

Retain list below with either of last two subparagraphs above.

- a. **<Insert, in separate subparagraphs, manufacturer's name; product name or designation.>**

Select size requirements from options in two subparagraphs below. 2-1/4 inches (57 mm) is minimum thickness for Type R; 2-5/8 inches (67 mm) is minimum for Type F.

4. Thickness: [2-1/4 inches (57 mm)] [2-5/8 inches (67 mm)] [As indicated] **<Insert dimension>**.
5. 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.

6. 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>**.

- C. Efflorescence: Brick shall be rated "not effloresced" when tested according to ASTM C 67.

Consider retaining paragraph below with either paragraph above if latex-modified mortar or grout is used. Temporary protective coating prevents staining.

- D. 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 and can be removed without damaging grout or brick. Do not coat unexposed brick surfaces.

2.2 CONCRETE PAVERS

Paragraph below applies to most standard units. ASTM reference limits length-to-thickness ratio to no more than 4 (to provide interlocking effect) and face area to no more than 101 sq. in. (0.065 sq. m) and requires compressive strength of 8000 psi (55 MPa). Revise if units made from lightweight aggregate are required.

- A. 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.

If naming manufacturers, retain one of three subparagraphs and lists below. Refer to Division 1 Section "Product Requirements." Refer to ICPI's and NCMA's Web sites for names of concrete paver manufacturers.

1. Basis-of-Design Product: The design for concrete pavers is based on **<Insert manufacturer's name and product>**. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - a. **<Insert, in separate subparagraphs, manufacturer's name.>**
2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
3. Products: Subject to compliance with requirements, provide one of the following:

Retain list below with either of last two subparagraphs above.

- a. **<Insert, in separate subparagraphs, manufacturer's name; product name or designation.>**

Select one thickness from options in subparagraph below. 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.

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

Retain and edit 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.

5. Face Size and Shape: [**3-7/8 inches (98 mm) square**] [**4-7/16 inches (113 mm) square**] [**8-7/8 inches (225 mm) square**] [**9 inches (229 mm) square**].
6. 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.
7. 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>**.
8. Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] **<Insert color>**.

Paragraph below applies primarily to custom and large-size units. Revise if units made from lightweight aggregate are required.

- B. Concrete Pavers: Solid paving units, made from normal-weight concrete with a compressive strength not less than [**5000 psi (34 MPa)**] [**6000 psi (41 MPa)**] **<Insert value>**, water absorption not more than 5 percent according to ASTM C 140, and no breakage and not more than 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.

If naming manufacturers, retain one of three subparagraphs and lists below with either paragraph above. Refer to Division 1 Section "Product Requirements." Refer to ICPI's and NCMA's Web sites for names of concrete paver manufacturers.

1. Basis-of-Design Product: The design for concrete pavers is based on **<Insert manufacturer's name and product>**. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - a. **<Insert, in separate subparagraphs, manufacturer's name.>**
2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
3. Products: Subject to compliance with requirements, provide one of the following:

Retain list below with either of last two subparagraphs above.

- a. **<Insert, in separate subparagraphs, manufacturer's name; product name or designation.>**

Select one thickness from options in subparagraph below.

4. Thickness: **[1-5/8 inches (41 mm)] [1-3/4 inches (45 mm)] [2 inches (51 mm)] [2-3/8 inches (60 mm)] <Insert dimension>**.

Retain and edit one of first three subparagraphs below to specify face size and shape.

5. Face Size and Shape: **[8-7/8 inches (225 mm) square] [9 inches (229 mm) square] [12 inches (305 mm) square] [18 inches (457 mm) square] [24 inches (610 mm) square]**.
6. Face Size and Shape: **[9-by-18 inch (229-by-457 mm)] [12-by-24 inch (305-by-610 mm)] rectangle**.
7. Face Size and Shape: **[As indicated] <Insert dimensions and shape>**.
8. 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).
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or first subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

2. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Hanover Architectural Products, Inc.
 - b. <Insert manufacturer's name.>
3. Thickness: [1-1/4 inches (32 mm)] [2 inches (51 mm)] [3 inches (76 mm)] <Insert dimension>.
4. 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)] [5 by 12 inches (127 by 305 mm)] [6 by 12 inches (152 by 305 mm)] [8-inch- (203-mm-) wide hexagon] <Insert dimensions>.
5. Dimensional Tolerances: Plus or minus 1/16 inch (1.6 mm).
6. Finish: [Natural, smooth] [Ground] [Ground and sandblasted].
7. Color: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

2.4 ROUGH-STONE PAVERS

The Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)" limits abrupt 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 selected can 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.

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

If naming varieties or manufacturers, retain one of three subparagraphs and lists below. Refer to Division 1 Section "Product Requirements."

1. Varieties and Sources: Subject to compliance with requirements, provide[**one of**] the following:
 - a. <Insert name of variety and producer, distributor, or importer.>
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

3. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Buechel Stone Corp.
 - b. Cold Spring Granite Inc.
 - c. Fletcher Granite Company, Inc.
 - d. Granicor, Inc.
 - e. Milestone Imports, Inc.

- f. New England Stone, LLC.
- g. North Carolina Granite Corporation.
- h. <Insert manufacturer's name.>

Subparagraph below is an example only. Revise color or grain or specify a selected variety.

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

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

- 5. 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>.

Select 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.

- 6. 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 ACCESSORIES

Delete this Article if no edge restraints or joint filler or if specified in other Sections. Other sizes and configurations are available besides those indicated below. See manufacturers' catalogs.

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

- A. Plastic Edge Restraints: 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.

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

- 2. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. BRICKSTOP Corporation.
 - b. Dimex Corporation.
 - c. PAVE TECH Inc.
 - d. Ryerson, J. T. & Son, Inc.
 - 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: 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.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or first subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

2. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Border Concepts, Inc.
 - b. Collier Metal Specialties, Inc.
 - c. J. D. Russell Company (The).
 - d. Ryerson, J. T. & Son, Inc.
 - e. Sure-Loc Edging Corporation.
 - f. <Insert manufacturer's name.>
 3. 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: [**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.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

2. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. BRICKSTOP Corporation.
 - b. Curv-Rite, Inc.
 - c. Permaloc Corporation.
 - d. Sure-Loc Edging Corporation.
 - e. <Insert manufacturer's name.>

Retain first paragraph below for troweled-concrete edge restraints and for edges made of pavers embedded in concrete.

- D. Job-Built Concrete Edge Restraints: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 3000 psi (20 MPa).
- E. Precast Concrete Curbs: Made from normal-weight concrete with a compressive strength not less than **[5000 psi (34 MPa)] [6000 psi (41 MPa)] <Insert value>** and water absorption not more than 5 percent, in shapes and sizes indicated.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or first subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

- 2. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Hanover Architectural Products, Inc.
 - b. **<Insert manufacturer's name.>**
- 3. Color and Texture: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color and texture>**.
- F. Stone Curbs: Granite curbing, with face battered 1 inch per foot (1:12), produced in random lengths not less than 36 inches (900 mm) from granite complying with ASTM C 615.

If naming varieties or manufacturers, retain one of three subparagraphs and lists below. Refer to Division 1 Section "Product Requirements."

- 1. Varieties and Sources: Subject to compliance with requirements, provide **[one of]** the following:
 - a. **<Insert name of variety and producer, distributor, or importer.>**
- 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

- 3. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Cold Spring Granite Inc.
 - b. Fletcher Granite Company, Inc.

- c. Granicor, Inc.
- d. New England Stone, LLC.
- e. North Carolina Granite Corporation.
- f. Polycor Inc.
- g. Swenson Granite Co.
- h. <Insert manufacturer's name.>

Subparagraph below is an example only. Revise color or grain or specify selected variety.

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

Select dimensions from options in three subparagraphs below, insert others, or delete subparagraphs and show dimensions on Drawings.

- 5. Top Width: [**4 inches (102 mm)**] [**5 inches (127 mm)**] [**6 inches (152 mm)**] <Insert dimension>.
- 6. Face Height: [**4 inches (102 mm)**] [**6 inches (152 mm)**] [**8 inches (203 mm)**] <Insert dimension>.
- 7. Total Height: [**12 inches (305 mm)**] [**16 inches (406 mm)**] [**18 inches (457 mm)**] <Insert dimension>.

Select finishes from options in two subparagraphs below; usually sawed tops and either split or sawed faces.

- 8. Top Finish: [**Sawed**] [**Thermal**] [**Bush hammered**].
- 9. Face Finish: [**Split**] [**Sawed**] [**Thermal**] [**Bush hammered**].

Insert other materials (pressure-treated wood, stone, etc.) used for edge restraints if not included in other Sections.

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

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

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

2.6 AGGREGATE SETTING-BED MATERIALS

Delete this Article if no aggregate setting-bed applications.

First two paragraphs below are examples of aggregate types and gradations that could be used where two layers are placed beneath leveling course. For heavy-duty applications, consult highway department requirements and revise to suit Project. See Evaluations.

First option in paragraph below is for light-traffic uses; second is for heavy-duty applications. Delete paragraph if subbase is not required.

- A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with [ASTM D 448 for Size No. 57] [ASTM D 2940, subbase material] [requirements in Division 2 Section "Earthwork" for subbase material].

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

- B. 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 Division 2 Section "Earthwork" for base course].

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

- C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.

Usually retain paragraph above and delete first paragraph below. See Evaluations.

- D. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D 448 for Size No. 10.

- 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.

Retain subparagraph below if a particular color is required.

1. Provide sand of color needed to produce required joint color.

Retain paragraph and subparagraphs below if separation geotextile is used between subgrade and aggregate setting bed. Revise to suit Project. Project's geotechnical report may include recommendations. See the Evaluations in Division 2 Section "Earthwork."

- F. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

Survivability is the rating of a geotextile's ability to withstand installation stresses and is divided into three classes by AASHTO M 288. Class 2 is the default class recommended by AASHTO M 288 for separation geotextile applications.

1. Survivability: Class 2; AASHTO M 288.

Requirements in three subparagraphs below correspond to default values in AASHTO M 288 for Class 2 separation geotextiles.

2. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

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.

- G. Drainage Geotextile: Nonwoven needle-punched geotextile, 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:

Retain first subparagraph below if AASHTO M 288 survivability classification is required. Survivability is the rating of a geotextile's ability to withstand installation stresses and is divided into three classes by AASHTO M 288. Class 2 is the default class recommended by AASHTO M 288 for subsurface drainage applications. Revise to Class 1 if higher strength is required or Class 3 if lower strength is permitted.

1. Survivability: Class 2; AASHTO M 288.
2. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.
3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

- H. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.7 BITUMINOUS SETTING-BED MATERIALS

Delete this Article if no bituminous setting-bed applications.

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.

Retain subparagraph below if a particular color is required.

1. Provide sand of color needed to produce required joint color.

2.8 MORTAR SETTING-BED MATERIALS

Retain this Article if cement bed or grout applications are required.

- A. Portland Cement: ASTM C 150, Type I or II.

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

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

Retain first paragraph below for slurry bond coat and latex-modified portland cement mortar bed. Additive is available in either concentrated or prediluted form. Concentrated form is used with water; prediluted is added without water. Select one or more options below.

- D. 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 mortar bed, and not containing a retarder.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering latex additives that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

2. Manufacturer: Subject to compliance with requirements, provide latex additive by one of the following:
 - a. Boiardi Products Corporation.
 - b. Bonsal, W. R. Company.
 - c. Bostik Findley Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. DAP Inc.
 - g. Jamo Inc.
 - h. Laticrete International, Inc.
 - i. MAPEI Corp.
 - j. SGM.
 - k. Summitville Tiles, Inc.
 - l. TEC Incorporated; H. B. Fuller Company.
 - m. <**Insert manufacturer's name.**>

- E. Water: Potable.

Retain paragraph below if reinforced mortar bed is required. See Evaluations.

- F. Reinforcing Wire: Galvanized, welded, 0.062-inch- (1.57-mm-) diameter wire; 2-by-2-inch (51-by-51-mm) mesh; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

2.9 GROUT MATERIALS

Delete this Article if no grouted joints.

- A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement[, **unfading mineral pigments**] and white or colored sand as required to produce required color.

Retain first subparagraph below if latex additive is required to improve flexibility and other properties of grout.

1. 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 sand-portland cement grout.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering latex additives that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

- b. Manufacturer: Subject to compliance with requirements, provide latex additive by one of the following:
 - 1) Boiardi Products Corporation.
 - 2) Bonsal, W. R. Company.
 - 3) Bostik Findley Inc.
 - 4) C-Cure.
 - 5) Custom Building Products.
 - 6) DAP Inc.
 - 7) Jamo Inc.
 - 8) Laticrete International, Inc.
 - 9) MAPEI Corp.
 - 10) SGM.
 - 11) Summitville Tiles, Inc.
 - 12) TEC Incorporated; H. B. Fuller Company.
 - 13) <**Insert manufacturer's name.**>

Delete paragraph and subparagraphs above if only prepackaged products are acceptable. Grout above is field-mixed portland cement and fine-graded sand that is not included in ANSI A118.6 but whose materials are covered in ANSI A108.10. Retain first paragraph and subparagraphs below if only prepackaged products are allowed.

- B. Polymer-Modified Grout: ANSI A118.7, sanded grout; in color indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering polymer-modified grouts that may be incorporated into the Work include, but are not limited to, the following:

Retain subparagraph above for nonproprietary or subparagraph below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

2. Manufacturer: Subject to compliance with requirements, provide polymer-modified grout by one of the following:
 - a. Boiardi Products Corporation.
 - b. Bonsal, W. R. Company.
 - c. Bostik Findley Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. DAP Inc.
 - g. Jamo Inc.
 - h. Laticrete International, Inc.
 - i. MAPEI Corp.
 - j. SGM.
 - k. Summitville Tiles, Inc.
 - l. TEC Incorporated; H. B. Fuller Company.
 - m. <Insert manufacturer's name.>

Retain one of three subparagraphs below with paragraph above.

3. Product Type: Dry mix, containing ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients.
 4. Product Type: Two-component mix, containing [**acrylic resin**] [**or**] [**styrene-butadiene rubber**] in liquid-latex form and prepackaged dry-grout mix complying with ANSI A118.6 and recommended by latex-additive manufacturer.
 5. Product Type: Either dry mix, containing ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients, or two-component mix, containing acrylic resin or styrene-butadiene rubber in liquid-latex form and prepackaged dry-grout mix complying with ANSI A118.6 and recommended by latex-additive manufacturer.
- 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 prepackaged grout formulations that only require adding water. Delete if latex additive is limited to emulsions of styrene-butadiene-rubber or prediluted acrylic formulations.

- D. Water: Potable.

2.10 BITUMINOUS SETTING-BED MIX

Delete this Article if bituminous setting bed is not used.

- 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).

2.11 MORTAR AND GROUT MIXES

Delete this Article if no mortar or grout. 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 for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars and grout if they have reached their initial set before being used.

Retain first paragraph below if mortar bed is installed directly over concrete. Latex additive can be used with either latex-modified mortar or unmodified portland cement mortar; water should be used only with unmodified portland cement mortar.

- B. Mortar-Bed Bond Coat: Mix neat cement or cement and sand with [**latex additive**] [**water**] to a creamy consistency.
- C. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C 270, Proportion Specification.

Delete paragraph above or below. Use of latex-modified portland cement mortar can make curing times undesirably long. See Evaluations.

- D. Latex-Modified, Portland Cement Setting-Bed Mortar: Proportion and mix portland cement, sand, and latex additive for setting bed to 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 paragraph below with either latex-modified, portland cement-lime mortar or unmodified portland cement mortar.

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

Delete three paragraphs and associated subparagraphs below if pavers are laid with ungrouted joints.

- F. Job-Mixed Portland Cement Grout: Proportion and mix job-mixed portland cement and sand to match setting-bed mortar, except omit hydrated lime and use enough water to produce a pourable mixture.

Select paragraph above for job-mixed grout without polymer additive or paragraph below for job-mixed grout with liquid-latex additive.

- G. Job-Mixed, Polymer-Modified Portland Cement Grout: Add liquid-latex additive to portland cement and sand in proportion and concentration recommended by liquid-latex manufacturer. Proportion cement and sand to comply with written instructions of latex-additive manufacturer.

Retain one of two subparagraphs below with either of last two paragraphs above for job-mixed colored grout.

1. Pigmented Grout: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
2. Colored-Aggregate Grout: Produce color required by combining colored sand with portland cement of selected color.

Retain one of last two paragraphs and associated subparagraphs above for job-mixed grout or paragraph below if packaged grout is used.

- H. Packaged, Polymer-Modified Grout Mix: Proportion and mix grout ingredients according to grout manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

Coordinate conditions required by Work of this Section with requirements in Section where substrate is specified. Delete this Article if aggregate setting-bed method is used.

- A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

Delete subparagraph below if no pavers are installed over waterproofing.

2. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations. Examine areas where waterproofing system is turned up or flashed against vertical surfaces and horizontal waterproofing. Proceed with installation only after protection is in place.

3.2 PREPARATION

Coordinate paragraph below with the Section that specifies concrete substrate. Include a requirement in that Section that forbids use of curing and sealing compounds on surfaces to be covered by unit pavers set in mortar.

- A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

Delete paragraph above and below if no concrete slabs under unit pavers. Delete above if no pavers are set in mortar.

- B. Clean concrete substrates to remove dirt, dust, debris, and loose particles.

Retain paragraph below for aggregate setting-bed applications where paving will be subjected to heavy traffic if subgrade compaction is specified in Division 2 Section "Earthwork." Delete if subgrade compaction is specified in this Section.

- C. Proof-roll prepared subgrade according to requirements in Division 2 Section "Earthwork" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive [subbase and base] [base] course for unit pavers.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

Consider deleting subparagraph below; delete if no concrete pavers.

- 1. For concrete pavers, a block splitter may be used.

Delete paragraph below if no brick pavers with temporary protective coating are used.

- D. Exercise care in handling coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. Remove coating from bonding surfaces before setting brick.

Select one of five options in paragraph below or revise to suit Project. Patterns below are not applicable to all paver shapes.

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

Delete first paragraph below if no pavers over waterproofing.

- F. 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. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.

Joint filler below 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**].

- G. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.

Delete paragraph above or first paragraph below. Retain above for smooth pavers where slopes to drains are critical. Retain below when nominal control of paving surface is acceptable.

- H. 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.

- I. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide 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 Division 7 Section "Joint Sealants."

Delete paragraph above or below, or both if no joints are required. See Evaluations.

- J. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

Delete paragraph below if not applicable or revise to suit Project. Aggregate and bituminous setting-bed applications in areas without surrounding walls require edge restraints.

- K. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

Delete subparagraph below if plastic or metal edge restraints are not retained in Part 2. If job-built edge restraints are required, indicate details on Drawings.

1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.

Delete subparagraph below if no metal edge restraints.

2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch (25 mm) below top edge.

Delete first subparagraph below if no job-built concrete edge restraints or if specified in another Section.

3. Install job-built concrete edge restraints to comply with requirements in Division 3 Section "Cast-in-Place Concrete."
4. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.

Retain subparagraph above or below and detail on Drawings if pavers set in mortar or embedded in concrete are used as edge restraints for aggregate-set pavers.

5. Where pavers embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

Delete paragraph and subparagraph below if no steps surfaced with pavers are required.

- L. Provide steps made of pavers as indicated. Install paver steps before installing adjacent pavers.

Retain subparagraph below and detail on Drawings if pavers set in mortar are used as steps with aggregate-set pavers.

1. Where pavers set in mortar bed are indicated for steps constructed adjacent to pavers set in aggregate setting bed, install steps and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.

3.4 AGGREGATE SETTING-BED APPLICATIONS

Retain paragraph below if compaction is not covered in Division 2 Section "Earthwork." 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.

Retain paragraph below for aggregate setting-bed applications where paving will be subjected to heavy traffic if retaining paragraph above. Delete if deleting paragraph above.

- B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

Revise overlap in paragraph below to 24 or 36 inches (600 or 900 mm) for weak subgrade soils. Delete if geotextile is not required.

- C. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches (300 mm).
- D. Place aggregate[**subbase and**] base, compact by tamping with plate vibrator, and screed to depth indicated.

Retain paragraph above or below, or delete both if subbase and base are specified in another Section. Select above for light-traffic uses, below for heavy-duty applications. Delete subbase if not required. Compaction below is an example only; revise to suit Project.

- E. Place aggregate[**subbase and**] base, compact to 100 percent of ASTM D 1557 maximum laboratory density, and screed to depth indicated.

Retain first paragraph below for open-graded base course material to prevent leveling course from washing into subbase or base course.

- F. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches (300 mm).
- G. 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 constant until pavers are set and compacted.
- H. Treat leveling course with herbicide to inhibit growth of grass and weeds.
- I. 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) with pieces cut to fit from full-size unit pavers.
 - 1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

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

- J. 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. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
 - 1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
 - 2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches (900 mm) of the laying face. Cover pavers that have not been compacted, and leveling course on which pavers have not been placed, with nonstaining plastic sheets to protect them from rain.

- K. 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.
- L. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- M. Repeat joint-filling process 30 days later.

3.5 BITUMINOUS SETTING-BED APPLICATIONS

Retain this Article for asphalt block or brick set with bituminous setting bed.

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 where indicated, in panels, by spreading bituminous material 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. After each panel is completed, advance first control bar to next position in readiness for striking adjacent panels. 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 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. Advance protective panels as work progresses, but maintain protection in areas subject to continued movement of materials and equipment to avoid creating depressions or disrupting alignment of pavers. If additional leveling of paving is required, and before treating joints, roll paving with power roller after sufficient heat has built up in the surface from several days of hot weather.
- 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.

3.6 MORTAR SETTING-BED APPLICATIONS

Retain this Article for pavers set in either portland cement-lime or latex-modified, portland cement mortar.

- 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 setting 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 immediately after applying bond coat. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

Delete paragraph above or first two paragraphs below. Retain above if reinforcing wire is not used. Retain below if reinforcing wire is used.

- D. Place reinforcing wire over concrete subbase, lapped at joints by at least one full mesh and supported so mesh becomes embedded in the middle of setting bed. Hold edges back from vertical surfaces approximately 1/2 inch (13 mm).
- E. Place mortar bed with reinforcing wire fully embedded in middle of setting bed. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
- F. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Cut back, bevel edge, remove, and discard setting-bed material that has reached initial set before placing pavers.

Delete first paragraph below if brick pavers are not used.

- G. 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 per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- H. Place pavers before initial set of cement occurs. Immediately before placing pavers on setting bed, apply uniform 1/16-inch- (1.5-mm-) thick, slurry bond coat to bed or to back of each paver with a flat trowel.
- I. 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. Select tolerance to suit manufacturing tolerances of pavers; rough-stone pavers and Application PA brick pavers require large tolerances.

- J. 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)**].
- K. 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. Clean pavers as grouting progresses by dry brushing or rubbing with dry burlap to remove smears before tooling joints.
 - 3. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
 - 4. If tooling squeezes grout from joints, remove excess grout and smears by dry brushing or rubbing with dry burlap and tool joints again to produce a uniform appearance.
- L. Cure grout by maintaining in a damp condition for seven days, unless otherwise recommended by grout or liquid-latex manufacturer.

3.7 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point up joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

Delete paragraph above and paragraph and subparagraph below if only ungrouted applications are specified.

- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

Delete subparagraph below if not applicable for brick pavers.

- 1. Remove temporary protective coating from brick pavers as recommended by protective coating manufacturer and as acceptable to unit paver and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

END OF SECTION 02780