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

SECTION 321400 - UNIT PAVING

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

Revise subparagraphs below to suit Project.

Brick pavers.

Concrete pavers.

Stone pavers.

Edge restraints.

* + - * 1. Related Requirements:

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

Section 096313 "Brick Flooring" for brick flooring for interior applications.

Section 096340 "Stone Flooring" for dimension stone paving.

Section 310000 “Earthwork” for earth moving and compaction.

Section 321613.23 “Precast Concrete and Granite Curbing” for curbing.

Section 321313 "Concrete Paving" [**for concrete base under unit pavers**] [**and**] [**for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers**].

Section 321443 "Porous Unit Paving" for unit paving using grid pavers or pavers with openings between them.

* + - 1. REFERENCES
				1. American Association of State Highway and Transportation Officials

AASHTO M288 - A118.7 American National Standard Specifications for High Performance Cement Grouts for Tile Installation

* + - * 1. American Concrete Institute

ACI 212.3R – Report on Chemical Admixtures for Concrete

* + - * 1. American National Standards Institute

A108.10 - Installation of Grout in Tilework

A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar

A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation

A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation

* + - * 1. ASCE

ASCE 6 / TMS 602 - Specification for Masonry Structures

* + - * 1. ASTM International

ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

ASTM C33 - Standard Specification for Concrete Aggregates

ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile

ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

ASTM C144 - Standard Specification for Aggregate for Masonry Mortar

ASTM C150 - Standard Specification for Portland Cement

ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes

ASTM C270 - Standard Specification for Mortar for Unit Masonry

ASTM C615 - Standard Specification for Granite Dimension Stone

ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete

ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber

ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus

ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity

ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile

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

Revise list to coordinate with products retained in Part 2.

For the following:

Pavers.

Bituminous setting materials.

Mortar and grout materials.

Edge restraints.

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for concrete pavers within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

* + - * 1. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.
				2. Qualification Data: For Installer.

Delete "Adhesion and Compatibility Test Reports" paragraph below if latex additive is not used or if requirement for preconstruction adhesion and compatibility testing is deleted.

* + - * 1. Adhesion and Compatibility Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.
			1. QUALITY ASSURANCE
				1. Installer Qualifications: Installation shall be by a contractor and crew with at least one year of experience in placing unit pavers on projects of similar nature.
			2. PRECONSTRUCTION TESTING

Retain "Preconstruction Adhesion and Compatibility Testing" paragraph below if latex additives are specified and if testing is considered necessary.

* + - * 1. Preconstruction Adhesion and Compatibility Testing: Submit to latex-additive manufacturer, for testing as indicated below, Samples of flooring materials that will contact or affect mortar and grout that contain latex additives.

Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimal adhesion with, and will be non-staining to, installed brick and other materials constituting brick flooring installation.

* + - 1. DELIVERY, STORAGE, AND HANDLING
				1. 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.
				2. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
				3. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

Retain first paragraph below if liquid-latex compounds are used.

* + - * 1. Store liquids in tightly closed containers protected from freezing.
			1. FIELD CONDITIONS
				1. 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.
				2. Weather Limitations for Mortar and Grout:

Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602/ASCE 6.

Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.

When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set pavers within 1 minute of spreading setting-bed mortar.

1. PRODUCTS

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

* + - 1. MANUFACTURERS
				1. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.
			2. BRICK PAVERS

Consult Client Agency for style preference. Choose basis of design for paragraph below from Approved List of NYS DOT Brick, Block, and Pavers suppliers ([Brick Sidewalk and Driveway Pavers (704-08) (ny.gov)](https://www.dot.ny.gov/divisions/engineering/technical-services/technical-services-repository/alme/pages/brickside-1.html).

* + - * 1. Brick Pavers: <**Choose Manufacturer from NYS DOT approved list**>, <**Insert Manufacturer Address**>, color as indicated or as selected by the Director’s Representative.

Approved equivalent.

Consider retaining "Temporary Protective Coating" paragraph below if latex-modified mortar or grout is used. Temporary protective coating prevents staining.

* + - * 1. 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; handle brick to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.
			1. CONCRETE PAVERS
				1. Concrete Pavers:

Color: Coffee Creek.

Size: 6” x 6” x 2-3/4”, 6” x 12” x 2-3/4”, 12” x 12” x 2-3/4”.

Manufacturers:

Architectural Pavers Style - Stonehenge; Unilock New York, Inc., Brewster, NY.

Approved equivalent.

* + - * 1. Pavers shall meet the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence shall not be a cause for rejection.
				2. Pigment in concrete pavers shall conform to ASTM C 979. ACI Report No. 212.3R provides guidance on the use of pigments.
			1. STONE PAVERS
				1. Bluestone Pavers:

Sources: "North River Bluestone" by Heldeberg Bluestone and Marble, Inc., East Berne, NY, or "Elk Brook Bluestone" by Johnston and Rhodes Bluestone Co., East Branch, NY, Approved equivalent.

Quality: Free from laminations and open "reeds".

Finish: Natural cleft, free from noticeable tool marks. The exposed surface plane shall not vary more than 1/8 inch per sq ft.

Approved equivalent.

* + - 1. EDGE RESTRAINTS

Delete this article if edge restraints or if specified in other Sections. Other sizes and configurations are available besides those indicated below. See manufacturers' catalogs.

Second option in "Plastic Edge Restraints" paragraph below describes pave tech's "Industrial" edging.

* + - * 1. Plastic Edge Restraints: Manufacturer's standard triangular PVC extrusions [**1-3/4 inches high by 3-1/2 inches wide**] [**3-1/8 inches high by 9-1/2 inches 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 diameter by 12-inch-long steel spikes.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=5233) Subject to compliance with requirements, provide products by one of the following:

[Dimex Corporation](http://www.specagent.com/Lookup?uid=123457155884), (740) 374-3100, 28305 State Route 7, Marietta, OH 45750

[Oly-Ola Edgings, Inc](http://www.specagent.com/Lookup?uid=123457155885), (630) 833-3033, 124 E Saint Charles Rd, Villa Park, IL 60181

[Pave Tech Inc](http://www.specagent.com/Lookup?uid=123457155886), (262) 884-8000, 8626 Hollander Dr, Franksville, Wisconsin.

[Sure-loc Edging Corporation](http://www.specagent.com/Lookup?uid=123457155888), (800) 787-3562, 310 E 64th St, Holland, MI 49423.

Approved equivalent.

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

* + - * 1. Steel Edge Restraints: Manufacturer's standard painted steel edging [**3/16 inch thick by 4 inches high**] [**1/4 inch thick by 5 inches high**] with loops pressed from or welded to face to receive stakes at 36 inches O.C. and steel stakes 15 inches long for each loop.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=5234) Subject to compliance with requirements, provide products by one of the following:

[Border Concepts, Inc](http://www.specagent.com/Lookup?uid=123457155890), (800) 845-3343, 7621 Little Ave, Suite 426, Charlotte, NC 28226

[Collier Metal Specialties, Inc](http://www.specagent.com/Lookup?uid=123457155891), (972) 494-3900, 715 Easy St, Garland, TX 75042

[J. D. Russell Company (The)](http://www.specagent.com/Lookup?uid=123457155892), (800) 888-9708, PO Box 183471, Shelby Township, MI 48318

[Sure-loc Edging Corporation](http://www.specagent.com/Lookup?uid=123457155893), (800) 787-3562, 310 E 64th St, Holland, MI 49423

Approved equivalent.

Color: As selected by Director’s Representative from manufacturer's full range.

* + - * 1. Aluminum Edge Restraints: Manufacturer's standard [**straight, 1/8-inch-thick by 4-inch-high**] [**straight, 3/16-inch-thick by 4-inch-high**] [**L-shaped, 1/8-inch-thick by 1-3/8-inch-high**] [**L-shaped, 3/16-inch-thick by 2-1/4-inch-high**] extruded-aluminum edging with loops pressed from face to receive stakes at 12 inches O.C. and aluminum stakes 12 inches long for each loop.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=5236) Subject to compliance with requirements, provide products by one of the following:

[Curv-Rite, Inc](http://www.specagent.com/Lookup?uid=123457155897). (269) 792-0044, 3603 10th St Ste C, Wayland, MI 49348

[Permaloc Corporation](http://www.specagent.com/Lookup?uid=123457155898), (616) 399-9600, 13505 Barry St, Holland, MI 49424

Sure-loc Edging Corporation, (800) 787-3562, 310 E 64th St, Holland, MI 49423

Approved equivalent.

Precast Concrete Curbs: Made from normal-weight concrete with a compressive strength not less than [**5000 psi**] [**6000 psi**] and water absorption not more than 5 percent, in shapes and sizes indicated.

Color and Texture: [**Match Director's Representative’s sample**] [**As selected by Director’s Representative from manufacturer's full range**].

* + - 1. ACCESSORIES
				1. Cork Joint Filler: Preformed strips complying with ASTM D1752, Type II.

Retain "Cork Joint Filler" paragraph above or "Compressible Foam Filler" paragraph 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.

* + - * 1. Compressible Foam Filler: Preformed strips complying with ASTM D1056, Grade 2A1.
			1. AGGREGATE SETTING-BED MATERIALS

Review the subbase and base course requirements in Section 310001 carefully before utilizing either subparagraph below. For heavy-duty applications, consult highway-department requirements and revise to suit Project. See the Evaluations.

* + - * 1. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with [**requirements in Section 310001 "Earthwork Materials" for subbase material**].
				2. Graded Aggregate for Base: Sound, crushed stone or gravel complying with [**requirements in Section 310001 "Earthwork Materials" for base course**].

Revise "Sand for Leveling Course" requirements in Section 310001 to ASTM C144 for leveling course less than 1 inch thick.

* + - * 1. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with requirements in Section 310001 “Earthwork Materials” for Sand Leveling Course material.
				2. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone complying with requirements in Section 310001 “Earthwork Materials” for Sand for Joints material.

Retain "Separation Geotextile" paragraph below if separation geotextile is used between subgrade and aggregate setting bed. Revise to suit Project. Project's geotechnical report may include recommendations.

* + - * 1. 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 in "Survivability" subparagraph below 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.

Survivability: Class 2, AASHTO M 288.

Requirements in three subparagraphs below are default values in AASHTO M 288 for class 2 separation geotextiles.

Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.

Permittivity: 0.02 per second, minimum; ASTM D4491.

UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

Retain "Drainage Geotextile" 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.

* + - * 1. 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:

Retain "Survivability" 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.

Survivability: Class 2, AASHTO M 288.

Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.

Permittivity: 0.5 per second, minimum; ASTM D4491.

UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

* + - * 1. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.
			1. MORTAR SETTING-BED MATERIALS
				1. Portland Cement: ASTM C150, Type I.
				2. Hydrated Lime: ASTM C207, Type S.
				3. Sand: ASTM C144.

Retain "Latex Additive" 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.

* + - * 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 Portland cement and aggregate mortar bed, and not containing a retarder.
				2. Thin-Set Mortar for Bond Coat: Latex-Portland cement mortar complying with ANSI A118.4.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=5240) Subject to compliance with requirements, provide products by one of the following:

[ARDEX Americas](http://www.specagent.com/Lookup?uid=123457155921).

[Bostik, Inc](http://www.specagent.com/Lookup?uid=123457155911).

[C-Cure](http://www.specagent.com/Lookup?uid=123457155912).

[Parex USA, Inc](http://www.specagent.com/Lookup?uid=123457155916).

Approved equivalent.

Provide product that is approved by manufacturer for application thickness of [**5/8 inch**] <**Insert value**>.

* + - * 1. Water: Potable.

Retain "Reinforcing Wire Fabric" paragraph below if reinforced mortar bed is required. See the evaluations.

* + - * 1. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062 inch in diameter; comply with ASTM A1064 except for minimum wire size.
			1. GROUT MATERIALS

Grout in "Sand-Portland Cement Grout" paragraph below is a Project-site mix of portland cement and fine sand; delete if only factory-prepared products are allowed.

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

Retain "Colored Mortar Pigments for Grout" subparagraph below if job-mixed pigmented grout is used. See the evaluations.

Colored Mortar Pigments for Grout: Natural and synthetic iron and chromium oxides, compounded for use in mortar and grout mixes. Use only pigments that have proved, through testing and experience, to be satisfactory for use in Portland cement grout.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=11188) Subject to compliance with requirements, provide products by one of the following:

[Davis Colors](http://www.specagent.com/Lookup?uid=123457155923), (323) 265-8323, 3700 East Olympic Blvd., Los Angeles, CA 90023.

[Lanxess Corporation](http://www.specagent.com/Lookup?uid=123457155924), (336) 378-0965, 520 Broome Rd, Greensboro, NC 27406.

[Solomon Colors, Inc](http://www.specagent.com/Lookup?uid=123457155925). (800) 624-0261, 4050 Color Plant Road

Springfield, Illinois 62702

Approved equivalent.

Retain "Standard Cement Grout" or "High-Performance Tile Grout" paragraph below if packaged grout is used instead of job-mixed grout.

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

[Manufacturers:](http://www.specagent.com/Lookup?ulid=5241) Subject to compliance with requirements, provide products by one of the following:

[Boiardi Products Corporation; a QEP company](http://www.specagent.com/Lookup?uid=123457155930), (973) 256-1100, 453 Main Street,

Little Fall, NJ 07424

Bostik, Inc., 33-149-007-502, 420 rue d’Estienne d’Orves, 92700 Colombes, France

[Parex USA, Inc](http://www.specagent.com/Lookup?uid=123457155933)., (714) 778-2266, 2150 Eastridge Ave., Riverside, CA 92507

Approved equivalent.

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

[Manufacturers:](http://www.specagent.com/Lookup?ulid=11237) Subject to compliance with requirements, provide products by one of the following:

[ARDEX Americas](http://www.specagent.com/Lookup?uid=123457155940), (888) 512-7339, 400 Ardex Park Drive, Aliquippa, PA 15001

[Bostik, Inc](http://www.specagent.com/Lookup?uid=123457155943)., 33-149-007-502, 420 rue d’Estienne d’Orves, 92700 Colombes, France

Approved equivalent.

Polymer Type:

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

Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

[**Acrylic resin**] [**or**] [**styrene-butadiene rubber**] in liquid-latex form for addition to prepackaged dry-grout mix.

* + - * 1. Grout Colors: As selected by Director’s Representative from manufacturer's full range.

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

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

* + - * 1. 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 optimal performance characteristics. Discard mortars and grout if they have reached their initial set before being used.

Retain "Mortar-Bed Bond Coat" paragraph below if mortar bed is installed directly over concrete. Latex additive can be used with either latex-modified or unmodified, Portland cement-lime setting-bed mortar; water should be used only with unmodified, Portland cement-lime setting-bed mortar.

* + - * 1. Mortar-Bed Bond Coat: Mix neat cement and [**latex additive**] [**water**] to a creamy consistency.
				2. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C270, Proportion Specification.
				3. Thinset Mortar Bond Coat: Proportion and mix according to manufacturer's written instructions.
				4. Job-Mixed Portland Cement Grout: Proportion and mix job-mixed Portland cement and aggregate grout to match setting-bed mortar except omit hydrated lime and use enough water to produce a pourable mixture.

Retain "Pigmented Grout" or "Colored-Aggregate Grout" subparagraph below with "Job-Mixed Portland Cement Grout" paragraph above for job-mixed colored grout.

Pigmented Grout: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1 to 10, by weight.

Colored-Aggregate Grout: Produce color required by combining colored aggregates with Portland cement of selected color.

* + - * 1. Packaged Grout: Proportion and mix according to grout manufacturer's written instructions.
1. EXECUTION
	* + 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.

* + - * 1. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
				2. Where unit paving is to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.
				3. Proceed with installation only after unsatisfactory conditions have been corrected[**and waterproofing protection is in place**].
			1. PREPARATION

Coordinate first 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.

* + - * 1. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

Retain paragraph above and first paragraph below for concrete slabs under unit pavers. Retain paragraph above if pavers are set in mortar.

* + - * 1. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.
			1. INSTALLATION, GENERAL
				1. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
				2. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
				3. 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.

For concrete pavers, a block splitter may be used.

* + - * 1. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

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

* + - * 1. Joint Pattern: [**Running bond**] [**Herringbone**] [**Basket weave**] [**Grid**] [**As indicated**] [**Match and continue existing unit paver joint pattern**].

Retain "Pavers Over Waterproofing" paragraph below if pavers are used over waterproofing.

* + - * 1. 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 in subparagraph below will protect waterproofing against pavers and will form an expansion joint.

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**].

* + - * 1. Tolerances:

Retain one of two subparagraphs below. Retain first subparagraph for smooth pavers where slopes to drains are critical; retain second subparagraph when nominal control of paving surface is acceptable.

Do not exceed 1/32-inch unit-to-unit offset from flush (lippage) or 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.

Retain option in subparagraph below only for smooth, flat pavers.

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

* + - * 1. Expansion and Control Joints:

Retain one of two subparagraphs below if joints are required.

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."

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.

Retain first paragraph below if applicable; revise to suit Project. Aggregate and bituminous setting-bed applications in areas without surrounding walls require edge restraints.

* + - * 1. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

Retain first subparagraph below if plastic or metal edge restraints are retained in Part 2. If job-built edge restraints are required, indicate details on drawings.

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.

Retain first subparagraph below for metal edge restraints.

For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.

Retain paragraph below if steps surfaced with pavers are required.

* + - * 1. 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.

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.

* + - 1. AGGREGATE SETTING-BED APPLICATIONS

Revise overlap in first paragraph below to 24 or 36 inches for weak subgrade soils. Delete if geotextile is not required.

* + - * 1. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches. Place aggregate [**subbase and**] base, compact by tamping with plate vibrator, and screed to depth indicated.

Retain paragraph above or first paragraph below, or delete both, if subbase and base are specified in another section. Retain above for light-traffic uses; retain below for heavy-duty applications. Delete subbase if not required. Compaction below is an example only, although 100 percent compaction is usually easily achieved with highly granular materials used for base and subbase; revise to suit Project. ASTM D1557 is generally used instead of ASTM D698 for highly granular material when maximum compaction is required.

* + - * 1. Place aggregate [**subbase and**] base, compact to 100 percent of ASTM D1557 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.

* + - * 1. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.
				2. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.
				3. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, 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 with pieces cut to fit from full-size unit pavers.

When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

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

* + - * 1. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.

Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.

Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).

As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.

Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with non-staining plastic sheets to protect them from rain.

* + - * 1. 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.
				2. Do not allow traffic on installed pavers until sand has been vibrated into joints.
				3. Repeat joint-filling process 30 days later.
			1. MORTAR SETTING-BED APPLICATIONS
				1. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
				2. Apply mortar-bed bond coat over surface of concrete subbase about 15 minutes before placing mortar bed. Do not exceed 1/16-inch thickness for bond coat. Limit area of bond coat to avoid its drying out before placing setting bed.
				3. 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.

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

* + - * 1. 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 mortar bed. Hold edges back from vertical surfaces approximately 1/2 inch.
				2. Place mortar bed with reinforcing wire fully embedded in middle of mortar bed. Spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
				3. 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.

* + - * 1. Wet brick pavers before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.
				2. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch-thick bond coat to mortar bed or to back of each paver with a flat trowel.
				3. 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 "Spaced Joint Widths" paragraph below are examples only. Retain tolerance to suit manufacturing tolerances of pavers; rough-stone pavers and application PA brick pavers require large tolerances.

* + - * 1. Spaced Joint Widths: Provide [**3/8-inch**] [**1/2-inch**] [**3/4-inch**] nominal joint width with variations not exceeding plus or minus [**1/16 inch**] [**1/8 inch**] [**3/16 inch**].

Retain three paragraphs below for grouted joints.

* + - * 1. Grouted Joints: Grout paver joints complying with ANSI A108.10.
				2. Grout joints as soon as possible after initial set of setting bed.

Force grout into joints, taking care not to smear grout on adjoining surfaces.

Clean pavers as grouting progresses by dry brushing or rubbing with dry burlap to remove smears before tooling joints.

Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

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.

* + - * 1. Cure grout by maintaining in a damp condition for seven days unless otherwise recommended by grout or liquid-latex manufacturer.
			1. REPAIRING, POINTING, AND CLEANING
				1. 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.
				2. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
				3. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

Retain two subparagraphs below if applicable for brick pavers.

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

Do not allow protective coating to enter floor drains. Trap, collect, and remove coating material.

END OF SECTION 321400