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(Consultant shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all “Underlines”)

SECTION 321400 - UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Brick pavers in bituminous setting beds.
 - 2. Concrete pavers in bituminous setting beds.
 - 3. Steel edge restraints.
- B. Related Requirements:
 - 1. Division 32 for concrete base under unit pavers.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Brick Pavers.
 - 2. Concrete Pavers.
 - 3. Bituminous setting materials.
 - 4. Expansion joint materials.
 - 5. Edge restraints.
 - 6. Asphaltic joint filler and cap.
 - 7. Joint sealant.
- B. Samples for Verification:
 - 1. Full-size units of brick paver, (min. 3) showing the full range of variations expected in these characteristics.
 - 2. Full-size unit (sample size) of concrete paver.
 - 3. Joint material involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

Select A or B below, based on complexity of the project.

- A. Installer Qualifications: An experienced installer who has completed unit paver installation similar in material, design, and extend to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Installer Qualifications: A qualified unit paving installer. Installer's [**field supervisor**] [**personnel assigned to the Work**] shall have Concrete Paver Installer Certification from the Interlocking Concrete Pavement Institute (ICPI) with [**one of**] [**both of**] the following designations:
 - 1. Residential Paver Technician Designation.
 - 2. Commercial Paver Technician Designation.

1.6 FIELD CONDITIONS

- A. Weather Limitations for Bituminous Setting Bed:
 - 1. Install bituminous setting bed only when ambient temperature is above 40 deg F and when base is dry.
 - 2. Apply asphalt adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.
- B. Weather Limitations for Mortar and Grout:
 - 1. Cold-Weather Requirements. Comply with cold-weather construction requirements contained in ACI 530.2/ASCE 6/TMS 602.
 - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/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.

PART 2 - PRODUCTS

2.1 BRICK PAVERS

- A. Manufacturer:
 - 1. Glen Gery Corporation, Wyomissing, PA 19610. Color: Steel City.
 - 2. Pine Hall Brick of Winston-Salem, NC 27105. Color: Pathway Red.
- B. Characteristics:
 - 1. Thickness: 2 ¼ inches.
 - 2. Face Size: 4 by 8 inches.
 - 3. Finish: Wire Cut.
 - 4. Edge condition: Square.
 - 5. Efflorescence: Brick shall be rated as “not effloresced” when tested according to ASTM C 67.

2.2 CONCRETE PAVERS

- A. Manufacturer: Hanover Prest Paver, Distributed by Hanover Architectural Products, 240 Bender Road, Hanover, PA 17331.
- B. Characteristics:
 - 1. 85 psi compressive strength, 1100 flexible strength, less than 5% water absorption.
 - 2. Color: Matrix M11385.
 - 3. Face Finish: Tudor.
 - 4. Edge Condition: Manufacturer's standard bevel edge.
 - 5. Size:
 - a. 17 5/8" x 23 1/2" x 2", or match existing thickness for patching or infill.
 - b. 11 3/4" x 11 3/4" x 2 1/2" (for driveway crossings),

2.3 EDGE RESTRAINTS

- A. Steel Edge Restraints: Galvanized steel angle- 2 1/2" high x 5" horizontal leg x 3/16" thick. Attach at top of concrete base at 15" o.c. for finished height to be minimum 1/2" below face of brick pavers.

2.4 EXPANSION JOINT FILLER

- A. Joint Filler: Asphalt Expansion Joint complying with ASTM D994, 1/2" thick.
 - 1. Provide 1/2" high temporary joint spacer cap for proper configuration and ready to seal. Snap-Cap by W.R. Meadows or approved equal.
- B. Horizontal Joint Sealant: One-component, low modulus, neutral-curing silicone or urethane joint sealant.
 - 1. Manufacturer:
 - a. DOWSIL 790 by Dow Corning.
 - b. Pecora 300 SL by Pecora.
 - c. Dymonic 100, by Tremco.

2.5 BITUMINOUS SETTING-BED MATERIALS

- A. Primer for Base: ASTM D2028/D2028M, cutback asphalt, grade RC 70 Tack Coat by reliable Contracting Co. Inc., or as recommended by brick or unit paver manufacturer.
- B. Fine Aggregate for Setting Bed: ASTM D1073, No. 2 or No. 3.
- C. Asphalt Cement: ASTM D3381/D3381M, Viscosity Grade AC-10 or Grade AC-20.
- D. Neoprene-Modified Asphalt Adhesive: Paver mastic adhesive consisting of oxidized asphalt combined with 2 percent neoprene and 10 percent long-fibered mineral fibers containing no asbestos, by Hanover Architectural Products, or as recommended by brick or unit paver manufacturer.

- E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

2.6 BITUMINOUS SETTING-BED MIX

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining 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.
 - 1. For concrete pavers, a block splitter may be used.
- D. Joint Pattern:< **As indicated**> <**Match and continue existing unit paver joint pattern**>.
- E. Tolerances:
 - 1. 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.
- F. Expansion and Control Joints.
 - 1. Provide 1/2" joint with joint filler at change in paver materials, at locations indicated, and at width recommended for proper installation. Install joint filler before setting pavers.

- a. Make top of joint filler ½” below top of pavers, using temporary joint spacer caps.
- G. Provide edge restraints where no concrete edge (planned or existing) can serve as an edge restraint, and where paver meets a grass or planting surface.
 - H. 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.
 1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
 - I. 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.
 1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
 2. Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).
 3. 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.
 4. 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.
 - J. 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.
 - K. Do not allow traffic on installed pavers until sand has been vibrated into joints.
 - L. Repeat joint-filling process 30 days later.
- ### 3.4 BITUMINOUS SETTING-BED APPLICATIONS
- A. Apply primer for base (tack coat) to concrete slab or binder course immediately before placing setting bed.
 - B. Prepare for setting-bed placement by locating 3/4-inch-deep control bars approximately 11 feet 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. Strike setting bed smooth, firm, even, and not less than 3/4 inch 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. 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.
2. Small areas may use plate tamper, where approved by the University.

D. Apply neoprene-modified asphalt adhesive (paver mastic) to cold setting bed by squeegeeing or troweling to a uniform thickness of 1/8-inch. 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:

1. Place brick pavers with hand-tight joints, providing maximum 1/8" joint space.
2. Place concrete pavers with 1/16" to 1/8" joint space.
3. Fill joints by sweeping sand over paved surfaces until joints are filled. Remove excess sand after joints are filled.

3.5 REPAIRING, POINTING, AND CLEANING END OF SECTION 321400

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.

END OF SECTION 321400