



**SPECIAL PROVISIONS  
FOR  
PERMEABLE PAVING**

**Butler County  
HDP-014-7(036)--3C-12**

**Effective Date  
May 15, 2012**

**THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

**090213.01 DESCRIPTION.**

**A. Description of Work.**

1. This work consist of installing a permeable interlocking concrete pavement system, including all labor, materials, tools, equipment, and supervision required to furnish and install the permeable interlocking concrete pavement system indicated in the plans and specified herein.
2. Section includes:
  - a. Subgrade preparation.
  - b. Engineering fabric.
  - c. Permeable interlocking concrete pavers.
  - d. Sub-base course aggregate.
  - e. Base course aggregate.
  - f. Bedding aggregate.
  - g. Joint/filler aggregate.

**B. Submittals.**

1. Product Data for the following:
  - a. Pavers.
  - b. Engineering Fabric.
2. Sieve Analyses: For aggregate materials, according to ASTM C 136.
3. Samples:
  - a. Full-size units of each paver type, thickness, color, and finish. Submit samples indicating the range of color expected in the finished installation. For blended colors,

increase the number of samples as need to provide samples that show the full range of colors.

- b. Bedding course aggregate (minimum 2 pound sample in re-sealable clear plastic bag).
- c. Base course aggregate (minimum 2 pound sample in re-sealable clear plastic bag).
- d. Sub-base Course Aggregate (minimum 2 pound sample in re-sealable clear plastic bag).
- e. Filter Fabric (12 inch by 12 inch).
- f. Joint/Filler aggregate (minimum 2 pound sample in re-sealable clear plastic bag).

**C. Informational Submittals.**

- 1. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with applicable ASTM standards. Provide for each type and size of unit.
- 2. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
  - a. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C 67.
  - b. Aggregate: Project specific or producer/manufacturer source test results for void ratio and bulk density of the base course aggregate and subbase course aggregate.
- 3. Source Information:
  - a. Joint/Filler Aggregate
  - b. Bedding Course Aggregate
  - c. Base Course Aggregate
  - d. Sub-base Course Aggregate

**D. Quality Assurance.**

- 1. Paver Installation Contractor Qualifications:
  - a. Contractor's foreman shall hold a current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program or be an approved installer of the permeable PCC paver manufacturer.
  - b. Installation shall be performed by personnel with at three years of experience in placing permeable interlocking concrete pavers on projects of similar nature and dollar cost.
- 2. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - a. Install a 6 foot by 6 foot paver area as describe.
  - b. This area will be used to determine surcharge of the bedding layer, joint sizes, lines, laying pattern, color, and texture of the job.
  - c. This area shall be the standard from which the work will be evaluated. This mock-up area shall not be incorporated into the work and shall be removed upon approval of the paver installation and as approved by Engineer
  - d. Approval of mockup does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.

**E. Delivery, Storage, and Handling.**

- 1. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- 2. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by forklift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.

3. 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.
4. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided. Cover aggregate materials with waterproof covering to prevent exposure to elements. Secure the covering in place.
5. Any products that are damaged or contaminated shall be removed from the site and replaced with new and clean materials.

#### **F. Environmental Requirements.**

1. Do not install any of the system's components during rain or snowfall.
2. Do not install any of the systems components over frozen base materials.
3. Do not install frozen bedding aggregates.

### **090213.02 MATERIALS.**

#### **A. Permeable Concrete Unit Pavers.**

1. Source Limitations: Obtain each type of paver from single source that has resources to provide materials and products of consistent quality in appearance and physical properties.
2. Solid Concrete Pavers for Porous Paving: Solid interlocking paving units of shapes that provide openings between units, complying with ASTM C 936, resistant to freezing and thawing when tested according to ASTM C 67, and made from normal-weight aggregates.
  - a. Color pigment material standard: Comply with ASTM C 979.
  - b. Units shall be of a true rectangular size ratio to achieve interlock stability.
  - c. Permeable pavers and completed permeable paving system shall be ADA compliant.
  - d. All paver units shall have a beveled edge.
  - e. Pavers shall be prismatic in plan and formed with straight, uniform edges. The tolerance for the flat portions of the sides shall not exceed 1/32 inch as measured with a steel straight edge. Slumped pavers exceeding this tolerance for either concave or convex warpage will be rejected. The length, width, and thickness of the pavers shall be the allowable tolerances specified in ASTM C 936.
  - f. No paver shall be used which has been manufactured in a mold exceeding the mold life specified in the Method Statement.
  - g. The measurement across a cluster from any cube shall not vary by more than the allowable tolerance of the individual paver units (1/32 inch per paver times the number of pavers across the cluster).
3. Acceptable manufacturers: Subject to compliance with requirements, following are acceptable manufacturers:
  - a. Belgard Hardscapes  
 Contact: Chris Boyd  
 Phone 877-235-4273                      Mobile: 515-202-2404  
 Style: Aqua Roc (9 inch x 4 1/2 inch x 3 1/8 inch)  
 Paver Colors are specified in drawings: Color 1: Burn Ash; Color 2: Burnt Red – All samples to be approved by the Engineer prior to placing ordering.

- b. Unilok  
 Contact: Jay Reints  
 Phone: 630-892-9191      Mobile: 630-327-7530  
 Style: Eco-Priora (9.36 inch x 4.68 inch x 3.12 inch)  
 Paver Colors: Color 1: River; Color 2: Heritage Brown – All samples to be approved by the Engineer prior to ordering.
- c. Hanover Architectural Products  
 Phone: 717-637-0500  
 Style: Prest Brick Permeable 4 inch x 9 inch (9 1/4 inch x 4 5/8 inch x 3 inch); Natural Finish  
 Paver Colors: Color 1: Charcoal; Color 2: Red/Charcoal Blend – All samples to be approved by the Engineer prior to ordering.

**B. Aggregate Setting Bed Materials.**

**1. General.**

- a. Do not use rounded river rock.
- b. All stone materials shall be washed with less than 1% passing the No. 200 sieve.
- c. Aggregates shall conform to ASTM D 448 gradation as shown in Tables 090213.02-1 thru 090213.02-4.
- d. Aggregates shall be A quality.

**2. Joint/Filler Aggregate.**

- a. Aggregate shall be washed, crusher run, and free of organic material and soluble salts or other contaminants likely to cause efflorescence.
- b. Jointing material shall be ASTM No. 89, ASTM No. 9, or ASTM No. 8, depending on the size of joints that need to be filled. The gradations for the aforementioned shall comply with the following.

Table 090213.02-1  
 ASTM No. 89, ASTM No. 9 and ASTM No. 8 Jointing Materials  
 Grading Requirements

Sieve Size	ASTM No. 89 Percent Passing	ASTM No. 9 Percent Passing	ASTM No. 8 Percent Passing
1/2 Inch	100	-----	100
3/8 Inch	90 to 100	100	85 to 100
No. 4	20 to 55	85 to 100	10 to 30
No. 8	5 to 30	10 to 40	0 to 10
No. 16	0 to 10	0 to 10	0 to 5
No. 50	0 to 5	0 to 5	-----

**3. Bedding Course Aggregate.**

Aggregate shall be washed, crusher run, and free of organic material and soluble salts or other contaminants likely to cause efflorescence. The gradation requirements shall comply with the following:

Table 090213.02-2  
ASTM No. 8 (Choke Stone)  
Grading Requirements

Sieve Size	ASTM No. 8 Percent Passing
1/2 Inch	100
3/8 Inch	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

**4. Base Course Aggregate.**

Aggregate shall be washed, crusher run, open-graded stone and meet the gradation requirements in Table 090213.02-3.

Table 090213.02-3  
ASTM No. 57 Washed Stone (1 inch Clean)  
Grading Requirements

Sieve Size	ASTM No. 57 Percent Passing
1 1/2 Inch	100
1 Inch	95 to 100
1/2 Inch	25 to 60
No. 4	0 to 10
No. 8	0 to 5

**5. Sub-Base Course Aggregate.**

Aggregate shall be washed, crusher run, open-graded stone and meet the gradation requirements in Table 090213.02-4.

Table 090213.02-4  
ASTM No. 2 Washed Stone (3 inch Clean)  
Grading Requirements

Sieve Size	ASTM No. 2 Percent Passing
3 Inch	100
2 1/2 Inch	90 to 100
2 Inch	35 to 70
1 1/2 Inch	0 to 15
3/4 Inch	0 to 5

**6. Geotextile (Engineering Fabric).**

Geotextile fabric shall be in conformance with Section 4196 of the Standard Specifications, meeting the requirements for subsurface drainage. Material I.M. 496.01 shall also apply.

**090213.03 CONSTRUCTION.**

**A. Subgrade Preparation.**

Meet the requirements of Section 2109 of the Standard Specifications and the following:

1. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Remove unstable soil and replace with clean, dry compacted earth fill.

2. Proceed with porous paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for porous paving.
  - a. The final sub-grade profile shall be uniformly compacted and stable.
  - b. The Engineer will verify that the sub-grade has been shaped and compacted in conformance to the lines and grades on the plans to provide for the construction of the permeable paving areas.

**B. Examination.**

1. Contactor shall inspect and verify that site conditions meet specifications for the following items prior to installation of interlocking concrete pavers.
  - a. Verify that subgrade preparation, compaction and elevations conform to specified requirements.
  - b. Verify location, type, and elevations of adjacent sidewalks, decorative architectural walls, concrete banding and edging, decorative concrete, utility structures, bench footings, and drainage pipes.
2. Do not proceed with installation of bedding and interlocking concrete pavers until subgrade soil conditions are corrected. The modification of aggregate thickness for any of the courses (bedding, base and sub-base) will not be allowed to adjust for incorrect elevations in subgrade/deficiencies in excavating and grading of subgrade.
3. Verify that soil subgrade is free from standing water.
4. Verify that plaza walls and all adjacent concrete pavement (including banding, decorative concrete paving and mowing edges) are constructed and have been accepted prior to initiating installation of permeable paving system.

**C. Installation, General.**

1. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be structurally unsound or visible 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. All cut faces shall be vertical. Dry cutting of the pavers shall be performed using a dust collection system. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable. Block splitting will not be permitted.
4. Tolerances:
  - a. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/16 inch unit-to-unit offset from flush.
  - b. Variation from Level or Indicated Slope: Do not exceed 1/8 inch in 24 inches and 1/4 inch in 10 feet or a maximum of 1/2 inch.
5. Keep area where pavement is to be constructed free from sediment during entire job. Geotextile, subbase, base and bedding materials contaminated with sediment shall be removed and replaced with clean materials.
6. Do no damage walls, pavement, drainpipes, or any other drainage appurtenances during installation. Report any damage immediately to the Engineer.

7. Compaction equipment: Use a smooth dual or single smooth drum, minimum 10 ton vibratory roller or a minimum 13,500 pounds force centrifugal force, reversible vibratory plate compactor that provides maximum compaction force without crushing the aggregate.

**D. Setting Bed Installation.**

1. 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 Engineer, and replace with compacted backfill or fill as directed. Compact until subgrade is stable and well compacted. No footprints shall be visible in the subgrade.
2. **Geotextiles:**
  - a. Place on bottom and sides of soil subgrade. Secure in place to prevent wrinkling from vehicle ties and tracks.
  - b. Overlap ends and edges at least 24 inches in the direction of drainage.
3. **Sub-base Course**
  - a. Moisten, spread and compact the No. 2 subbase in 4 to 6 inch lifts without puncturing, wrinkling, or folding the geotextile. Place subbase to protect geotextile from wrinkling under equipment tires and tracks.
  - b. Compact using a vibratory smooth-drum roller or vibratory plate until there is no visible movement of the No. 2 stone. Do not crush aggregate with the roller or plate.
  - c. The maximum surface tolerance of the compacted No. 2 subbase shall be +/- 3/4 inches over a 10 foot straightedge.
4. **Base Course**
  - a. Moisten, spread and compact the No. 57 base layer in one 6 inch thick lift.
  - b. Compact using a vibratory smooth-drum roller or vibratory plate until there is no visible movement of the No. 57 stone. Do not crush aggregate with the roller or plate.
  - c. The maximum surface tolerance of the compacted No. 57 base shall be +/- 1/2 inch over a 10 foot straight edge.
5. **Bedding Course.**
  - a. Moisten, spread and screed the No. 8 stone bedding material to a thickness of 1 1/2 inches to 2 inches, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.
  - b. Contractor shall screed the bedding course using either a mechanical screed beam apparatus or by the use of screed guides and boards.
  - c. Fill voids left by removed screed rails with No. 8 stone.
  - d. The maximum surface tolerance of the screeded No. 8 bedding layer shall be +/- 3/8 inch in over a 10 foot straightedge.
  - e. The screeded bedding aggregate shall not be subjected to any traffic by either mechanical equipment or pedestrian use prior to the installation of the paver units.

**E. Paver Installation.**

1. Lay pavers in the pattern(s) shown on the drawings. Maintain straight pattern lines and take measures necessary to ensure that the pattern remains square. Chalk lines shall be used upon the bedding course to maintain straight joint lines.
2. Set unit pavers on leveling course, being careful not to disturb leveling base. If pavers have lugs or spacer bars to control spacing, place pavers hand tight against lugs or spacer bars. If pavers do not have lugs or spacer bars, place pavers with a 1/16 inch minimum and 1/8 inch maximum joint width. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size pavers.
  - a. When installation is performed with mechanical equipment, use only unit pavers with lugs or spacer bars on sides of each unit.



**090213.04 METHOD OF MEASUREMENT.**

The Engineer will measure and compute the area in SQUARE FEET to the nearest 0.5 square feet of completed and accepted PERMEABLE PAVING in the locations shown on the contract documents. Sub-grade, sub-base course, base course, bedding course, joint filler, backfill, and geotextile fabric will not be measured separately.

**090213.05 BASIS OF PAYMENT.**

- A.** The Contractor will be paid the contract unit price per SQUARE FOOT price for PERMEABLE PAVING. This payment shall be full compensation for furnishing all equipment, labor, and materials for the field staking, layout, transporting, furnishing, and installing of sub-base course, base course, bedding course, and permeable pavers and the associated and incidental work.
  - a.** Ninety-five percent of the payment will be paid upon completion and acceptance of acceptable work.
  - b.** The remaining 5% of the payment will be paid upon the completion of the final 6 month visit and associated acceptable work as described in Article 090213.03, G, 2.
- B.** Backfill and subgrade preparation will not be paid for directly, but shall be considered incidental to the permeable paving.
- C.** Subdrains are not included and are paid for separately.