

PERMEABLE CLAY PAVERS
SECTION _____

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Permeable clay paver units
- B. Open graded setting bed (#89)
- C. Open-graded base aggregate (#57)
- D. Open-graded sub-base aggregate (#2)
- E. Bedding and joint/opening filler materials
- F. Edge restraints
- G. Geotextiles (optional)

1.02 RELATED SECTIONS

- A. Section _____ – Earthwork and sub-grade preparation
- B. Section _____ – Bases, ballasts, pavements and appurtenances
- C. Section _____ – Cast-in place concrete

1.03 REFERENCES

- A. American Society of Testing Materials (ASTM):
 - 1. C902 Standard Specification for Pedestrian And Light Traffic Paving Brick
 - 2. C1272 Standard Specification for Heavy Vehicular Paving Brick
 - 3. C136 Method for Sieve Analysis for Fine and Coarse Aggregate.
 - 4. C67 Method of Sampling and Testing Brick and Structural Clay Tile.
 - 5. D448 Standard Classification for Sizes of Aggregates for Road and Bridge
- B. Definitions:
 - A. Base Course: Layer of open-graded washed aggregate beneath the bedding course comprised of small to medium particle-sized crushed stone (1/2” to 1” typ.). Recommended depth of base layer shall be 4” but shall not exceed 6”.
 - B. Bedding Course: Commonly called the setting bed is the layer of open-graded washed aggregate directly beneath the clay paver units comprised of small particle-sized crushed stone chips (1/4” to 3/8” typ.). Recommended depth of setting bed is 1” to 2” max.
 - C. Laying Face: The working edge of the pavement where the laying of the pavers is occurring.
 - D. Method Statement: The paver installer’s and manufacturer’s plan for construction and quality control of the pavers.

- E. Spacer Bars: Small protrusions on the sides of pavers which are used to create uniform joint spacing between pavers and minimize chipping.
- F. Sub-base Course: Layer of open-graded washed aggregate beneath the base course comprised of large particle-sized crushed stone (2-1/2" to 3" typ.). Recommended depth will vary depending on site conditions and specific water detention volume requirements. Minimum depth of sub-base course shall be 12".
- G. Void Filler: Open-graded aggregate used to fill the joints between pavers. The bedding course aggregate may be used as the void filler. Smaller particle-sized stone chips (1/8" to 1/4") are preferable if available.
- H. Wearing Course: The top surface of the paver.

1.04 QUALITY ASSURANCE

- A. Paver Installation Subcontractor Qualifications:
 - 1. Utilize an installer having successfully completed permeable paver installation similar in design, material and extent indicated on this project.
 - 2. Utilize an installer holding a completion certificate from the Pave Tech School for Advanced Segmental Paving Permeable Paving Systems course or equivalent.
- B. Regulatory Requirements and Approvals: [Specify applicable licensing, bonding or other requirements of regulatory agencies.].
- C. Review the manufacturers' quality control plan, paver installation subcontractor's Method Statement and Quality Control Plan with pre-construction meeting of representatives from the manufacturer, paver installer, general contractor, engineer and/or owners representative.

1.05 SUBMITTALS

- A. Submit shop or product drawings and
- B. Submit permeable clay paver product data.
 - 1. Manufacturer's (Pine Hall Brick Company, Inc.) product catalog sheets with specifications.
 - 2. Three representative full-size samples of each paver type, thickness, and color. Submit samples indicating the range of color expected in the finished installation.
 - 3. Accepted samples become the standard of acceptance for the work of this Section.
 - 4. Laboratory test reports certifying compliance of the clay pavers with ASTM C 902 or C1272.
 - 5. Manufacturer's material safety data sheets for the safe handling of the specified materials and products.
- C. Submit sieve analysis for grading of sub-base, base, and bedding materials per ASTM C136
- D. Submit minimum 3lb samples of sub-base, base and bedding aggregate materials.

- E. Submit test results for compliance of paving unit requirements to ASTM C 902 or ASTM C 1272 from and independent testing laboratory.
- F. Erosion and sediment control plan
- G. Submit installer qualifications: provide satisfactory evidence that the installer complies with the qualifications set out in section 1.03.
 - 1. The installer shall provide installation history, including references from projects of a similar size and complexity in writing with contact information, demonstrating to the owner's satisfaction their ability to perform the paver installation and related work indicated in the plans and specifications.
 - 2. The installer shall have experienced personnel and a management capability to execute the work detailed in the project drawings and specifications. The installer's foreman should have a minimum of 5 years experience in the installation of unit pavers including clay pavers.
- H. Schedule & Work Plan: submit a detailed schedule and work plan

1.06 MOCK UPS

- A. Install a 10 ft. x 10 ft. paver area. This area will be used to determine surcharge of the bedding layer, joint sizes, lines, laying pattern(s), color(s), and texture of the job. This area shall be the standard from which the work will be judged.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver brick pavers to the site in steel banded, plastic banded, or plastic wrapped cubes or on pallets capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.

1.08 ENVIRONMENTAL CONDITIONS

- A. Do not install bedding or pavers during heavy rain or snowfall.
- B. Do not install frozen bedding.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

Permeable clay brick pavers have spacer bars on each unit. These insure a minimum joint width between each unit in which the aggregate is placed. Spacer bars help prevent contact of the edges with adjacent pavers and subsequent chipping.

- A. Permeable clay brick pavers shall be A Grade pavers manufactured/supplied by a member of the Brick Institute of America (BIA). The BIA manufacturer/supplier shall be:

Name: **PINE HALL BRICK**

Address: P. O. Box 11044

2701 Shorefair Drive

Winston-Salem, NC 27116-1044

Phone: (800) 334-8689

- B. Product name/shape, overall dimensions, and thickness of the permeable clay paver units shall be:

1. Paver Type: RainPave™/StormPave™ (Specify type, thickness, etc.)
 - a. Material Standard: Comply with ASTM C 902 or C1272.
 - b. Color : [Specify color.]
 - c. Size: [Specify.] inches x [Specify.] inches x [Specify.] inches thick.
 - d. Manufacturer item number.

**** NOTE: WHEN USING THESE SPECS IN YOUR BID PACKAGE, SPECIFY THE SIZES OF PAVERS SPECIFIED ON THE PROJECT AND INSERT YOUR PRODUCT CHOICE AND COLOR. i.e. RainPave™ Full Range 4"x 8"x 2-1/4" AFTER INSERTING THIS INFORMATION DELETE THIS NOTE.**

- C. Pavers shall meet the following requirements set forth in ASTM C 902, Specification for Pedestrian and Light Traffic Paving Brick or C 1272 Specification for Heavy Vehicular Paving Brick and shall conform to the PX standard.

1. Minimum average compressive strength of 10,000 psi.
2. The average cold water absorption shall not be greater than 6% with no individual unit testing greater than 7%. Absorption test results may not be achieved through the use of sealers or other products applied to the clay paver. (Sealer protection degrades over time requiring re-application after several years.)
3. Resistance of 50 freeze-thaw cycles, when tested in accordance with ASTM C67. In addition the clay paver must pass CSA-A231.2 freeze thaw test in saline solution without the use of sealers or other products applied to the paver. A test report must be submitted by the manufacturer. (Salt is the most common substance used for de-icing during the winter months.)
4. Dimensional tolerances should meet the PX standard. In addition, the dimensional

tolerances around the mean values for length, width, and depth shall be 1/16". (Studies show that dimensional tolerances are directly linked to joint width size and proper interlock.)

5. The pavers should be solid units without core holes or other perforations.
6. The contractor shall ensure that the manufacturer conducts a test sampling of 24 pavers every 50,000 pavers manufactured to determine the pavers compliance with dimensional and water absorption characteristics. The 24 paver sample shall be representative of the color mix in the typical finished package and chosen on a consistent basis from one kiln car. (Proper control procedures and testing are standard operating procedure for high quality manufacturers.)

2.02 AGGREGATE MATERIALS

A. Bedding Course and Void Filler Aggregate

The bedding course and void filler aggregate shall be washed, crusher run, free of fines, organics and soluble salts or other contaminants likely to cause efflorescence. The grading requirement shall comply with the following table.

Table 1 – ASTM No. 89 Grading Requirements
for Bedding Course Aggregates

ASTM Sieve Size	Percent Passing (by weight)
½ in.	100
3/8 in.	90 to 100
No. 4	20 to 55
No. 8	5 to 30
No. 16	0 to 10
No. 50	0 to 5

B. Base Course Aggregates

The base course aggregate shall consist of washed open-graded stone and comply with the following table.

Table 2 – ASTM No. 57 Grading Requirements
for Base Course Aggregates

ASTM Sieve Size	Percent Passing (by weight)
1-½ in.	100
1 in.	95 to 100
½ in.	25 to 60
¼ in.	0 to 10
No. 4	0 to 5

C. Sub-Base Course Aggregate

The sub-base course and void filler aggregate shall be washed, open graded stone and comply with the following table.

Table 3 – ASTM No. 2 Grading Requirements
for Sub-Base Course Aggregates

ASTM Sieve Size	Percent Passing (by weight)
3 in.	100
2-1/2 in.	90 to 100
2 in.	35 to 70
1-1/2 in.	0 to 15
1 in.	0 to 5

2.03 EDGE RESTRAINTS

- A. Edge restraints are required on all installations. Edge restraints are to be pre-cast or cast-in-place concrete, plastic, or steel as specified in the drawings. Install as per manufacturer's specifications.

2.04 FILTER GEOTEXTILE (IF APPLICABLE)

- A. A non-woven geotextile fabric shall be used if specified

****NOTE: ELIMINATE THE TEXT IN THIS SECTION (2.05) IF NO FILTER GEOTEXTILE IS SPECIFIED. CHANGE TITLE TO (NOT APPLICABLE). DELETE THIS NOTE AFTER MAKING THE APPROPRIATE CHANGES.**

PART 3 EXECUTION

3.01 SUBGRADE

- A. The site engineer shall verify that the sub-grade has been shaped and compacted in conformance to the lines, grades and cross-sections shown on the plans.
- B. If necessary, site grades can be raised using the same material as the largest base course (i.e. #2 or #57) being used on the project. The stone should be laid in 6" lifts and compacted using a vibratory smooth-drum roller.
- C. The requirements to include sub-drains in the pavement base design would depend on the sub-grade soil conditions. It is recommended that an experienced, qualified geotechnical engineer determine the requirements for sub-drains. If required, the sub-drain pipe shall consist of a four inch diameter pvc perforated pipe wrapped with filter fabric. The pipe would be placed at sub-grade elevation and surrounded with a minimum of four inches of approved open-graded stone. The sub-drain shall drain into a catch basin or other frost-free positive outlet.

3.02 SUB-BASE COURSE

- A. The thickness of the sub-base course layer will depend upon the sub-grade soil conditions and the anticipated traffic loadings. It is recommended that a site assessment be carried out by an experienced qualified geotechnical engineer to determine the required thickness of the sub-base course.
- B. The sub-base shall consist of a minimum thickness of twelve inches and be compacted using a vibratory smooth-drum roller. It shall be installed in lifts not to exceed six inches. Upon completion of the sub-base course installation, the area shall be proof-rolled using a heavy rubber tired vehicle (such as a loaded tandem truck) to identify any areas requiring additional compaction. The sub-base course shall be installed to the elevation and cross section per the plan documents.

3.03 EDGE RESTRAINTS

- A. All edge restraints shall be constructed as shown on the plans and in place prior to the installation of the base course, bedding course and pavers. Poured-in-place concrete curbs are recommended for commercial permeable paver installations.

3.04 BASE COURSE

A. The base course shall consist of a thickness of four inches of aggregate placed in one lift and compacted using a vibratory smooth-drum roller until there is no visible movement of aggregate under static rolling. The base course shall be installed to the elevation and cross section per the plan documents.

3.05 BEDDING COURSE

A. The bedding course shall be spread loose in a uniform layer to give a depth after compaction of the pavers of two inches, plus or minus $\frac{1}{2}$ ". The contractor shall screed the bedding course using either a mechanical screed beam apparatus or by the use of screed guides and boards.

B. The screeded bedding aggregate shall not be subjected to any traffic by either mechanical equipment or pedestrian use prior to the installation of the pavers. The voids left after the removal of the screed rails shall be filled with loose aggregate as the paver bedding course proceeds.

3.06 PERMEABLE CLAY PAVERS

- A. The pavers should be installed according to the information on the cube tag. The pavers should be laid from several cubes throughout the installation.
- B. Lay pavers in the pattern as shown on the drawings. Lay pavers away from the existing laying face or edge restraint in such a manner as to ensure that the pattern remains square. Chalk lines (use a heavier chalk cord) shall be used upon the bedding course to maintain straight lines. Joint spacing between pavers shall be between $\frac{1}{8}$ " and $\frac{1}{4}$ "; however the joint width may need to be increased to $\frac{3}{8}$ " to maintain straight lines. Lines and grades shown on the plans shall be established and maintained during the installation of the pavers.
- C. Pavers should be cut according to the instructions on the cube tag. Pavers shall be cut using a table mounted masonry wet saw.
- D. Once the pavers have been placed upon the bedding course and all cut pavers have been inserted to provide the complete surface, inspect the pavers for damaged units and remove and replace those units. Once all pattern lines have been straightened, the void filler shall then be placed into the paver openings to the top of the chamfer on the pavers and the surface swept broom clean.
- E. The pavement surface shall be compacted to achieve consolidation of the bedding course

and pavers and brought to design levels and profiles by two passes of a suitable plate compactor. Compaction of the pavers shall be accomplished by the use of a vibratory plate compactor capable of a minimum of 4,500 pounds of compaction force. No compaction shall be permitted within three feet of unrestrained edges of the pavement. After compaction, inspect the pavers for damaged units and remove and replace those units.

- F. After completing compaction, the surface tolerances shall be plus or minus 1/2" from finished grades. The pavers shall be flush to 1/2" above edge restraints. Additional void filler material shall be swept into the joints as required, to within 1/2" from the bottom of the chamfer on the paver. Upon completion, the pavement surface shall be swept clean of all excess materials. Remove from the site all surplus materials, equipment and debris resulting from these operations.

End of Section

**PLEASE NOTE BEFORE USING THESE SPECS:
THESE SPECIFICATIONS ARE BASED ON GENERALLY ACCEPTED
INDUSTRY STANDARDS FOR PERMEABLE PAVER
INSTALLATIONS. NO SINGLE SPECIFICATION CAN BE APPLIED TO
EVERY PROJECT OR COVER ALL APPLICATIONS OR
CIRCUMSTANCES. AS A RESULT, THESE SPECIFICATIONS ARE
OFFERED TO THE DESIGNER AS A GUIDELINE TOOL ONLY. IT IS
UP TO THE DESIGNER TO CUSTOMIZE AND APPLY THESE
GENERAL PROCEDURES TO THE INDIVIDUAL CIRCUMSTANCES OF
THEIR INDIVIDUAL PROJECT.**