



Installation Manual

Note: This guide specification for applications describing construction of Percoa Pervious Concrete Pavers on a permeable, open-graded crushed stone bedding layer (typically ASTM No. 8 stone). This 2 in. (50 mm) layer is placed over an open-graded base (typically No. 57 stone, 4 in. or 100 mm thick) and a subbase (typically No. 2 stone or similar sized material such as No. 3 or 4 stone). The pavers and bedding layer are placed over an open-graded crushed stone base with exfiltration to the soil subgrade. In low infiltration soils or installations with impermeable liners, some or all drainage is directed to an outlet via perforated drain pipes in the subbase. While this guide specification does not cover excavation, liners and drain pipes, notes are provided on these aspects.

Installation steps include job planning, layout, excavating and preparing the soil subgrade, applying geotextiles (optional), spreading and compacting the rock sub-base and/or base aggregates, placing the bedding layer, constructing edge restraints and placing the pavers.

Job Planning

1. Prior to excavating, check with the local utility companies to ensure that digging does not damage underground pipes or wires. Many localities have one telephone number to call (811) at least two days before excavation. Mark excavation location in white.
2. Overhead clearances should be checked so that equipment does not interfere with wires.
3. Site access by vehicles and equipment should be established so that the job can be built without delays.

Choosing a Paver

1. Determine the correct type and size of Percoa® pervious paver that is ideal for project.

Type and size of Percoa® Paver for ideal Applications:

2 x 2 x 6	2 x 2 x 6	2x 2 x 6
All non-vehicular traffic	Non / Light Vehicular Traffic	Vehicular Traffic*
Walkways, Tree Surrounds, Strip Drains, Pathways, Dog Parks, Green Roofs, Patios, Bioswales, Water Harvesting Systems, etc.	Inter-City Sidewalks, Patios	Inter-City Green Alleyway Projects, parking lots, stormwater runoff strips, gutter runoffs.

Layout

1. In preparing for excavation, the area to be removed should be marked with stakes. The stakes should be at least 12 inches away from the area to be removed so that they are not removed during excavation. The stakes

should be marked to establish grades, or have string lines pulled and tied to them. Grade stakes should be checked periodically during the job to ensure that they have not been disturbed.

Excavating, Drainage and Preparing the Soil Subgrade

1. During and after excavation, the soil should be inspected for organic materials or large rocks. If organic materials, roots, debris, or rocks remain, they should be removed and replaced with clean, compacted backfill material.
2. Free-standing water saturating the soil should be removed. After it is removed, low, wet areas can be stabilized with a layer of crushed stone and/or pour-in-place pervious concrete. Additional drainage may be needed in clay soils or other slow draining, (C&D) soils subject to vehicular traffic.
3. After Excavation, light compacting of the subgrade is recommended to compact any loose soil however always refer to installation guidelines stated by a registered professional engineer. Monitoring the soil moisture content is important to reaching the desired soil stability. The moisture content of the subgrade soil should always be verified for compliance to specifications before installing recommended geotextiles.

Applying Geotextiles (Optional)

Geotextile fabric may be used in areas where soil remains saturated part of the year, where there is freeze and thaw, over clay and moist silty subgrade soils, or where traffic loads require additional support. When geotextiles are used, they preserve the load bearing capacity of the base over a greater length of time and avoid migration of base material into the subgrade.

1. As a separation layer, they prevent soil from being pressed into the aggregate base under loads, especially when saturated, thereby reducing the likelihood of rutting.
2. The minimum fabric overlap should be at least 12 in. (300 mm).
3. When placing the fabric in the excavated area, it should continue up the sides of the opening to help wrap and contain the rock sub-base and base layers above. (A minimum of 6 to 12 inches of fabric is recommended as a wrap, over the top edges of the base, depending on over excavation.)
4. Fabric should be free of wrinkles on all sides. When the aggregate is dumped on the fabric, the tires from trucks should be kept off the fabric to prevent wrinkling.

Spreading and Compacting the Rock Sub-base and/or Base Aggregates

1. The rock sub-base, if needed, should be composed of a free draining material, with gradation of 3 in. (75mm) to ¾ in. (19mm), clean crush, no fines. (ASTM No. 2 Grading Requirement.) See: Table 1

Note: ASTM No. 3 or No. 4 stone may be used as subbase material if ASTM No. 2 stone is unavailable.

Table 1		Table 2	
Grading Requirement for ASTM No. 2 Subbase		ASTM No. 57 Base	
Grading Requirements		Grading Requirements	
Sieve Size	Percent Passing	Sieve Size	Percent Passing
75 mm (3 in.)	100	37.5 mm (1 1/2 in.)	100
63 mm (2 1/2 in.)	90 to 100	25 mm (1 in.)	95 to 100
50 mm (2 in.)	35 to 70	12.5 mm (1/2 in.)	25 to 60
37.5 mm (1 1/2 in.)	0 to 15	4.75 mm (No. 4)	0 to 10
19 mm (3/4 in.)	0 to 5	2.36 mm (No. 8)	0 to 5

2. The rock base should be composed of a free draining material, with gradation of 1 ½ in. (37.5mm) to No. 8 (2.36mm), clean crush, no fines. (ASTM No. 57 Grading Requirement.) See: Table 2

3. The thickness of the sub-base and base is determined by traffic, soil type, subgrade soil drainage / moisture, and climate. Commercial sidewalks, patios and pedestrian areas should have a minimum base thickness (after compaction) of 4 in. (100 mm) over well-drained soils. Residential driveways on well-drained soils should be at least 6 in. (150 mm) thick. In colder climates, continually wet or weak soils will require that bases be at least 2 in. (50mm) to 4 in. (100mm) thicker.
4. Frozen base material should not be installed, nor should material be placed over a frozen soil subgrade.
5. Adequate compaction of the base, and sub-base, if needed, is critical to minimizing settlement of the pavers. Special attention should be given to achieving compaction standards adjacent to edge restraints, catch basins and utility structures. (Generally, spread and compact in 3 to 4-inch lifts.)
6. The aggregate base should be at its optimum moisture, when spread and compacted.
7. Installing aggregate base in 3-inch lifts and keeping damp will aid in obtaining desired Proctor density of compaction.
8. Bases for commercial pedestrian areas and residential driveways should be compacted a minimum 95% of Standard Proctor density. While the highest percentage compaction (100%) is preferred, it may not be achievable on weak or saturated soils. Maintaining consistent lift thickness during compaction will help achieve consistent density.
9. Variation in final base surface elevations should not exceed $\pm 3/8$ in. (± 10 mm) when tested with a 10 ft. (3 m) straight edge.

Constructing Edge Restraints

Edge restraints are recommended for all Percoa® installations. By providing lateral resistance to loads, they maintain continuity among the paving units. Aluminum, steel, plastic, or concrete are typical edge restraints.

1. Edge restraints must be set at the correct level and their elevations should be checked prior to placing the pavers. Edge restraints are typically installed before the bedding layer and pavers are laid. However, some restraints can be secured into the base as the laying progresses.
2. For walkways, set one side of edging, then using a 2x4 (cut to path width) lay across stone base and set edging at other side of walk to maintain consistent spacing. (Measure a course of full pavers to desired width of path, to decrease cuts.)
3. Mechanical edge restraint is accepted for pedestrian applications.
4. For vehicular applications, concrete curb edge restraints are recommended.

Bedding Layer for Percoa® pervious concrete pavers

1. For the bedding layer, 2 in. (50 mm) of clean crushed aggregate, 1/4 in. to 3/8 in. (6 mm to 10 mm) stones containing no fines should be installed over the rock base. (See: Table 3)

Table 3	
Grading Requirement for ASTM No. 8 Bedding-Layer	
Grading Requirements	
Sieve Size	Percent Passing
12.5 mm (1/2 in.)	100
9.5 mm (3/8 in.)	85 to 100
4.75 mm (No. 4)	10 to 30
2.36 mm (No. 8)	0 to 10
1.16 mm (No. 16)	0 to 5

2. Bedding layer should be spread and screeded to proper thickness. (Do not compact bedding layer, unless it is for a vehicular application, or instructed to do so by the design professional)

Bedding sand which is used in traditional paver installations, is NOT RECOMMENDED for Percoa® as it reduces filtration rates and sand may shift due to high rate of permeability of pavers.

Placing the Pavers

(NOTE) Pavers are to be laid as they are stacked on the pallet. The top edges of the paver are “rounded” and the bottom edge is square.

1. With the installation of Percoa®, users must differentiate between the sides of the pavers and how the interlocking “keyway” system will place with the previous paver.
2. When placing Percoa® pavers, regardless of application, a “running-bond” pattern is preferred over a “stack-bond” Half pavers can be made by cutting paver in half to make this design easier. With sidewalk or green alleyway projects, 2-sided pavers make this possible since the pavers will be placed in a “sailor” (end-to-end) pattern.
3. Chalk lines snapped on the bedding grade or string lines pulled across the surface of the pavers should be used as a guide to maintain straight joint lines. Buildings, concrete collars, inlets, etc., are generally not straight and should not be used for establishing straight joint lines.
4. Caution should be observed when setting pavers in-place that bedding-layer aggregate is not lodged between the pavers thus causing anything other than a closed joint-line. Lightly, drop pavers into place, do not slide them.
5. Percoa® Pervious Concrete Pavers weigh 225 lbs. each. Using the Percoa dolly is suggested. Otherwise good quality straps and specialty lifting equipment should be considered.
6. It is recommended to boarder project with full size pavers and any necessary cuts will be in the field. In the case that process cannot be achieved, cut pavers should be used to fill gaps along the edge of the pavement at a size no smaller than 3”. Pavers may be cut with a diamond bladed masonry saw fitted with continuous water feed. DO NOT ATTEMPT TO CUT THE PAVERS DRY. Wash cut paver immediately to remove any dust or slurry particulates. NOTE: Caution should be observed involving silica dust and its hazards to health.
7. After an area of pavers is placed, it should be compacted with a vibrating rubber plate. (Do not use metal plate directly on pavers.) 3/8” Plywood can also be placed over project when rubber guard is not available.
8. While a small amount of settling is typical for all flexible pavements, final surface elevations should not vary more than $\pm 3/8$ in. (+10 mm) under a 10 ft (3 m) straightedge, unless otherwise specified. Bond or joint lines should not vary $\pm 1/2$ in. (15 mm) over 50 ft (15 m) from taunt string lines.
9. The top of the pavers should be 1/8 in. to 3/8 in. (3 mm to 10 mm) above adjacent catch basins, utility covers, or drain channels, with the exception of areas required to meet ADA design guideline tolerances. The top of the installed pavers may be 1/8 in. to 1/4 in. (3 mm to 6 mm) above the final elevations to compensate for possible minor settling.
10. Grout is not needed or recommended for Percoa® Pervious Concrete Pavers. However, if desired, insert appropriate backer rod into joints where the pavers meet concrete edging. Apply elastomeric sealant (available in colors), with a caulk gun, ensuring exposed surfaces are protected from spillage. Caulk joints should be filled and ironed in with a pointing tool. (For more detailed information of vehicular applications, please contact the manufacturer). The use of any type of polymeric sand on Percoa® pervious concrete pavers automatically voids the warranty.

WARNING: The Percoa® Pervious Concrete Pavers installation manual is intended for use only as a guideline. It is NOT intended for use or reliance upon as an industry standard, certification or as a specification. Percoa® makes no promises, representations or warranties of any kind, expressed or implied, as to the

content of this manual and disclaims any liability for damages resulting from the use of this manual. Professional assistance should be sought with respect to the design, specifications and construction of each project.

Aggregate selection:

PRODUCT SUBSTITUTIONS

A. Substitutions: Permitted for gradations for crushed stone for bedding, base and subbase materials. Base and subbase materials shall have a minimum 0.32 porosity. All substitutions shall be approved in writing by the project engineer.

B. CRUSHED STONE BEDDING, BASE AND SUBBASE

1. Crushed stone with 90% fractured faces, LA Abrasion < 40 per ASTM C 131.
2. Do not use rounded river gravel for vehicular applications.
3. All stone materials shall be washed with less than 2% passing the No. 200 sieve.

ACCESSORIES

Note: Curbs will typically be cast-in-place concrete or precast set in concrete haunches. Concrete curbs may be specified in another Section. Concrete curbs or a minimum of 4" concrete ribbon is recommended for all paving units involving vehicular applications.

FIELD QUALITY CONTROL

- A. After sweeping the surface clean, check final elevations for conformance to the drawings.
B. Lippage: No greater than 1/8 in. (3 mm) difference in height between adjacent pavers.

Note: The surface of the pavers may be 1/8 to 1/4 in. (3 to 6 mm) above the final elevations after compaction. This helps compensate for possible minor settling normal to pavements.

- C. The surface elevation of pavers shall be 1/8 to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.
D. Bond lines for paver courses: $\pm\frac{1}{2}$ in. (± 15 mm) over a 50 ft (15 m) string line.
E. Verify the surface infiltration at a minimum of 100 in./hour using test method C 1781.

PROTECTION

- A. After work in this section is complete, the General Contractor shall be responsible for protecting work from sediment deposition and damage due to subsequent construction activity on the site. This condition is normally handled for no less than 6 months after completion of project and no more than 18 months.
B. Percoa® Pervious Concrete Pavers installation contractor shall return to site after 6 months from the completion of the work and provide the following as required: Inspect all pavers for alignment, replace broken or cracked pavers, and re-level settled pavers to initial elevations. Inspect all edging restraint for possible movement, and correct if necessary.

Additional work shall be considered part of original bid price and with no additional compensation.