

Porous (Permeable) Concrete Unit Paving

Description: Porous or Permeable Paving is a pavement system that allows water to seep through the paving material and enter the underlying aggregate (base) material below. The basic elements of the Permeable Paving system are; a hard surface material with large pore spaces or voids that allow water to move through the paving material; and a crushed stone bedding and base layer that supports the pavers while allowing water to drain away. Permeable Paving systems manage pollution, reduce peak flows and reduce runoff volume. The surface material alternatives for porous pavement include:

- Concrete Unit Pavers (with grass or gravel infill);
- Porous asphalt;
- Porous concrete; and
- Plastic grid systems (reinforced grass or gravel systems).

The most common Permeable Paving system available locally is Permeable Concrete Unit Pavers. Permeable Pavers are similar to regular concrete unit pavers but they have intentional gaps between the unit paver that allow water to infiltrate into the base below. Properly designed and constructed Permeable Pavement systems eliminate effective impervious area and therefore would not require any other mitigating BMPs. All of the four main types of Pervious Paving are expected to provide similar benefits, provided they are truly permeable systems which allow water to enter underlying base materials.

Permeable Pavements have been found to be very effective at removing pollutants with no significant soil contamination problems due to the efficiency of soil microbes.

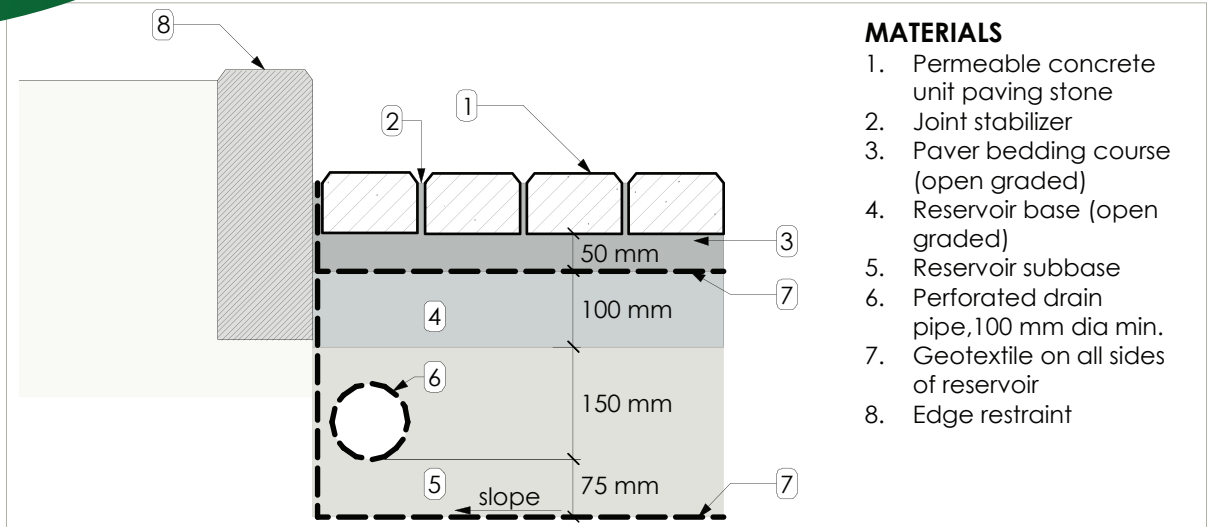
Common Uses: Permeable Paving is suitable for most hard surface installations including roads, parking areas, paths, driveways and patios. The best and most economical use is for parking areas where there is limited landscape available for rain gardens or vegetated swales. Permeable Pavement systems come in a variety of shapes and colours and can be incorporated into most designs. They are ideal for stormwater retrofit projects.

Limitations: Permeable Paving is not suitable on slopes greater than 8%, on high velocity roads, or in areas with high water tables (< 1.0 m deep). Drainage check dams are required on grades greater than 5%.

Size Factor: The size factor for Permeable Concrete Unit Paving is 1.00 based on the attached construction detail. This means that 1 m² of Permeable Concrete Unit Paving will manage the rain that falls on it. Basic requirements for Permeable Paving designs, include the following considerations:

- Where it is proposed to drain impermeable surfaces onto Pervious Pavement surfaces, a maximum ratio of 2:1 impermeable to permeable is used;
- Permeable Paving surface slope should be 1% minimum to avoid ponding on the surface;
- Paver bedding material should be lined with geotextile filter cloth on bottom and all sides;
- Minimum depth of 600 mm is required from base of drain rock reservoir to water table or solid bedrock;
- Avoid utility crossings through the Pervious Pavement area. Where a utility trench must be constructed, install trench dams to avoid infiltration water following the utility trench.
- Install permeable pavement after all building and landscaping has been completed. Where this is impractical, protect Permeable Paving from sediment during construction to reduce clogging.

Maintenance: Openings in Permeable Concrete Unit Pavers and porous asphalt or concrete require periodic removal of sediment and other materials. The frequency of cleaning is dependent on the amount of matter falling onto the surface and the traffic it sustains. Recommended cleaning frequency (by vacuum sweeper truck or dry sweeping) is once or twice annually. Weeds, if present, can be controlled by steaming methods.



MATERIALS

1. Permeable concrete unit paving stone
2. Joint stabilizer
3. Paver bedding course (open graded)
4. Reservoir base (open graded)
5. Reservoir subbase
6. Perforated drain pipe, 100 mm dia min.
7. Geotextile on all sides of reservoir
8. Edge restraint

Figure 1. Permeable Concrete Unit Paving - Typical Selection

Additional Expertise

CRITERIA	TECHNICAL EXPERT
Unstable sub-base condition	Geotechnical Engineering

General Specifications:

- 1) Pavers: Permeable Interlocking Concrete Pavers meeting CSA A231.2, designed and tested by the manufacturer for use as part of a permeable unit paving system with a initial infiltration rate >280 mm/hr. and a maintained >28 mm/hr infiltration rate over the pavement life. Pavers to be 80 mm thick for all driveable surfaces.
- 2) Paver bedding course (50 mm thick) and joint filling material shall be open-graded crush 5 mm aggregate (or ASTM No.8 - no sand).
- 3) Reservoir Base course shall be clean crushed stone graded from 5 mm to 20 mm.
- 4) Reservoir Subbase shall be clean crushed stone graded from 10 mm to 6 mm, with void space ratio >35% (or ASTM No. 57)
- 5) Pipe: Perforated drain pipe,PVC, DR 35, 100 mm min. diameter, with cleanouts. Practical depth of cover over the pipe may be a determinant in depth of base courses.
- 6) Geosynthetics: non-woven synthetic (polyester) (see specifications for detail).
- 7) Provide edge restraint to contain pavers.
- 8) Where utility trenches must be constructed below the reservoir, install trench dams to avoid infiltration water following the utility trench.



Technical aspects provided by: