

Homeowners Permeable Pavement Do It Yourself Toolkit

What Is Permeable Pavement and Why Should It Be Used?

Permeable pavement is a hard, yet **porous**, surface used for sidewalks, walkways, patios, game courts, driveways, and parking lots. Most importantly, it lets water quickly soak into the ground rather than run off into the street and storm drains.

As a green infrastructure design practice, use of permeable pavement:

- **Reduces flooding** by delaying and/or reducing peak stormwater flows into the street.
- **Protects water quality** by filtering out oil and other road and car contaminants.
- **Provides safer walking or driving surface** as the porous pavement remains free of standing water or winter ice.

Where Can Permeable Pavement Be Used?

Permeable pavement can be used for walkways, patios, residential driveways, overflow parking areas (commercial and residential), and low-volume traffic use areas (like cul de sacs). It can also be used when developing or re-developing a site to reduce the size of the stormwater detention system.

Porous pavement is intended to **capture** and **filter** heavy rainfall. It should be part of an overall storm water management system on any property: from driveway or walkway surface, to rain garden, to an existing storm sewer system.

Proper site selection is important. Avoid areas with high amounts of sediment-laden runoff (as it will clog the porous pavement), high traffic volume, slopes steeper than 5%, poor soil drainage (i.e.; failure to drain within 24 hours).

What Types of Permeable Pavement Are Available?

- **Turf blocks** - specially designed concrete or plastic grid blocks which have a large central opening to hold soil and grass seed. When installed, the grass will grow over these blocks, visually concealing them. Turf block areas are intended for low-use areas (such as overflow parking and residential driveways). They are not intended for heavy trucks or persistent traffic loads.
- **Permeable pavers** - blocks of composite concrete material, brick, or cut stone that are designed to be installed with wider gaps between them than ordinary pavers. The gaps are filled with sand or other porous materials (not mortar), allowing water into a sub-grade storage layer. Paver installations must be designed and engineered for the specific type of traffic expected, such as foot traffic or automobile traffic.
- **Permeable asphalt or pervious pavement** - while similar in appearance to asphalt traditionally used on streets or parking lots, the composition of this material utilizes a special mix of particle sizes and materials allowing water to easily flow through to the sub-grade storage. Current mixes are for low-traffic areas, such as parking spaces, patios, walkways, and game courts. It is not intended for roadways.



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How Are Permeable Pavements Designed?

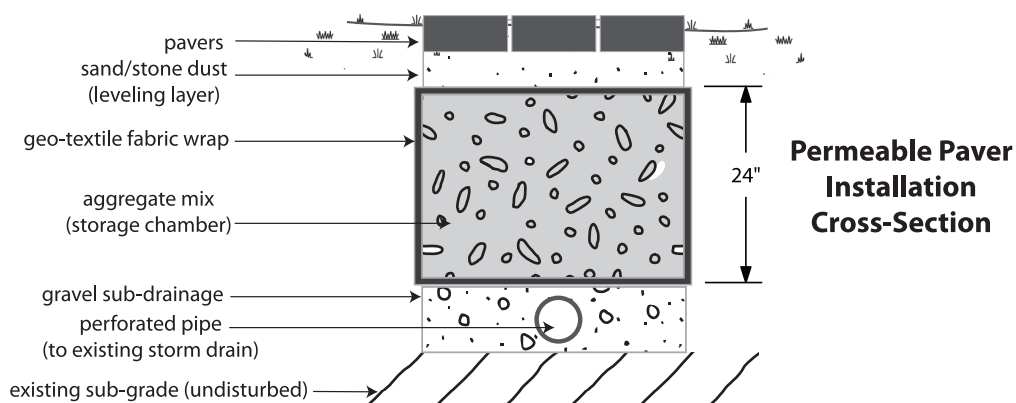
Permeable paving has three main design components: **surface, storage, and outflow**.

The **surface component** can be turf blocks, pavers, or permeable asphalt. Pavers can be laid in many different visual patterns. Adjacent impervious surfaces can be graded so that the runoff from the impervious area flows over the porous pavement. Where adjacent landscaped or paved areas drain onto porous pavement, a grass filter strip (minimum 4 ft. wide) is recommended to filter sediments and pollutants that might be in the runoff ("pre-treat").

The **storage component** is typically a 24"-deep section underneath the permeable surface. It includes a coarse, aggregate mix designed to store the stormwater prior to soaking into the soil. It helps to evenly distribute mechanical loads. The intended use of the pavement (patio, walkway, parking, etc.) determines the actual sub-grade storage layer's material specification, thickness, and compaction rate. The storage chamber should be wrapped in geotextile fabric to prevent clogging. With enough storage capacity, a pervious pavement may handle as much as 30-50-% or more of the annual site rainfall. Carefully follow the design guidelines provided by the manufacturer of the permeable pavement system you are installing. Design and review by a qualified Engineer or Architect of pervious pavement systems is highly recommended.

The **outflow component** is the soil or underdrain system underneath the storage component. Water from the storage chamber percolates directly into the underlying soil, recharging groundwater and filtering pollutants from the stormwater. An underdrain system of perforated pipe can also be provided to convey excess water from the bottom of the storage bed to an existing storm drain system.

Often, designs for residential areas such as walkways and patios do not have an underground storage component, and utilize a 6-8" gravel base only. Although far from ideal, these areas will still provide some filtering of stormwater, as well as reducing the amount and velocity of the runoff into the street and stream.



**Permeable Paver
Installation
Cross-Section**

Do List

- Ensure that the bottom of storage reservoir is at least 3 feet above groundwater table.
- Specify the storage area is at least 100 feet from an active well and 25 feet from structures and septic systems.
- Use in site retrofit design to improve stormwater handling and reduce impervious surfaces.
- Design storage chamber capacity according to surface area drained and the infiltration rate of underlying soil.
- Maintain the permeability by keeping porous surface clean of debris and free of weeds. Vacuuming and power washing are recommended methods for cleaning.
- If needed, snow plow carefully (i.e.; by setting the blade about one inch higher than usual).
- Examine paver installation each spring and after major storms for uneven "uplift" of turf or paver blocks so as to avoid tripping hazards. Minimal if engineered well.

Don't List

- Don't install permeable pavement on grades greater than 5%.
- Don't use in a high-volume traffic area or in areas subjected to heavy loads.
- Don't install in sites with slow draining sub-soils or in sites with high groundwater conditions. (See **Drainage Testing** on the companion **Rain Garden** handout or on **stormwatertools.org**.)
- Don't compact underlying sub-grade soils during construction.
- Don't sweep surface clean and don't apply sand in winter (salt is ok). Sweeping and sand will clog the surface and reduce or prevent infiltration. Vacuum or power wash.

Terms to Know

- **Downspout Disconnect** - A downspout is cut and re-routed such that roof water runs into a rain barrel, rain garden, grassy swale, vegetative filter, or other form of "green infrastructure" (on-site stormwater filtering, storage and processing), rather than flowing directly into a stormdrain.
- **First Flush** - the initial surface runoff of a rainstorm from roofs and driveways that carry debris and pollutants into storm drains.
- **Green Infrastructure** - An array of products, technologies, and practices that use natural systems - or engineered systems that mimic natural processes - to enhance overall environmental quality. As a general principal, green infrastructure techniques use soils and vegetation to filter, and/or recycle stormwater runoff. When used as components of a stormwater management system, green infrastructure practices, such as green roofs, porous pavement, rain gardens, and vegetated swales, will reduce pollution and area flooding.
- **Infiltration** - In order to help prevent flooding and improve water quality, it is important to slow water down and hold it temporarily to let it soak into the ground. Impervious surfaces (roof, patio, driveway, street) prevent such beneficial infiltration. Green infrastructure enhances it.
- **Porous Pavement** - Designed to allow rain and snowmelt to pass through it and into the soil below, where it is naturally filtered and pollutants are removed.
- **Stormwater Runoff** - Generated when precipitation from rain and snowmelt flows over land or impervious surfaces and accumulates debris, chemicals, fertilizers, pesticides, bacteria from pet waste, eroded soil, road salt, car fluids, grass clippings, leaves, litter and much more that could adversely affect water quality if the runoff is discharged untreated into a stream (USEPA).

Cornell's Urban Horticulture Institute (UHI) has developed a permeable pavement referred to as "Structural Soil", which allows tree roots to grow into the storage area without significant impact on surface paving or storage capacity. The storage area thus becomes a water source for trees and shrubs, stormwater planters in parking lots, and other street tree installations.