

# YOU CAN Use Paving to Soak up Stormwater

## PERMEABLE PAVING



**DESCRIPTION:** A variety of materials can be poured in place or laid in a pattern with gravel filled gaps to create a permeable surface for use in driveways, parking areas, patios or walkways. Concrete and asphalt can be mixed to allow water to drain through, and other building materials such as stone, concrete or brick can be laid with spaces between for gravel to allow water to flow between them. Plastic grids filled with stone or loose soil and vegetation can also be used for paving to let water soak through.



**TIME/COMPLEXITY:** 2 to 3 days, complex

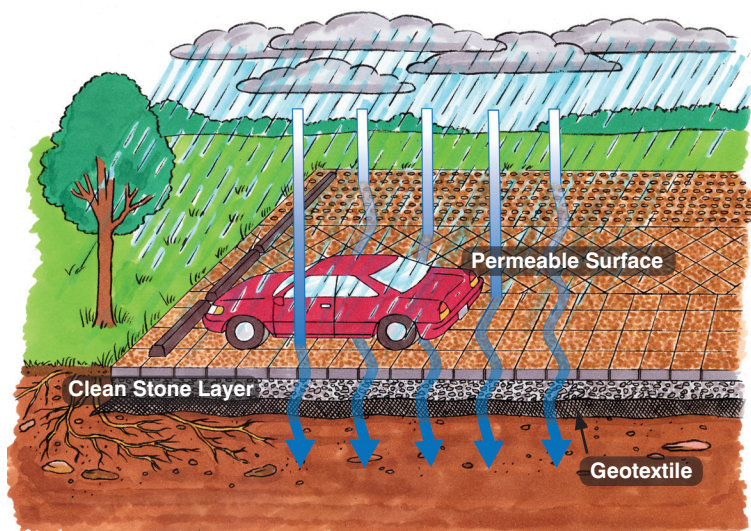


**COST:** Variable - \$2.50 to \$20 per square foot, depending on paving area and permeable paving system choices



**TOOLS/MATERIALS:** shovel or small excavator, geotextile fabric, AASHTO 57 stone, no. 8 stone, pavers, wheelbarrow, string and string level, measuring tape, optional underdrain: saw, drill, 4" perforated PVC pipe, 4" cap

### How does permeable paving work?



When it rains, this pavement drains! Water drains through the permeable surface, into the stone and soil layers below.

### STEPS:

**1. LOCATION:** Permeable paving can be used almost anywhere for walkways, patios, parking spaces and residential driveways. Permeable paving works best on level to gently sloping ground. The subgrade or clean stone base on which the permeable paving layers rest should be gently sloping away from a building foundation or slab. Perform a ONE-CALL\* prior to digging and contact your municipality to see if any permits are needed.

**2. DRAINAGE AREA:** Permeable paving systems are meant to handle the amount of water that falls on them, and should not be overloaded by runoff from outside its perimeter unless extra measures have been taken to provide extra storage in the underlying layers.

**3. CHOOSING A PAVING MATERIAL:** There are many options of permeable paving systems including loose clean gravel, plastic grids that hold loose clean gravel in place, concrete

blocks, bricks or poured in place concrete or asphalt. Refer to the 'Permeable Pavement Demonstrations in Southwestern Pennsylvania' fact sheet for some of the paving products available in this area.

**4. DESIGN:** Most permeable paving systems use square modules. Curves and angles may need to be cut, so it is best to layout areas with right angles and straight lines. If you would like curves in the design, consider the poured in place permeable paving products. Your design can be as creative as the number of products available!



Concrete pavers cut on a curve with a concrete edge

### 5. INSTALLATION:

- PREPARATION OF THE SITE:** Strip the grass sod or other surface material from the area.
- EXCAVATION:** The paving choice determines the depth to which the base for stone should be excavated. Otherwise an excavation should be made to the depth of the paving system and the depth of stone drainage layer to control a 2

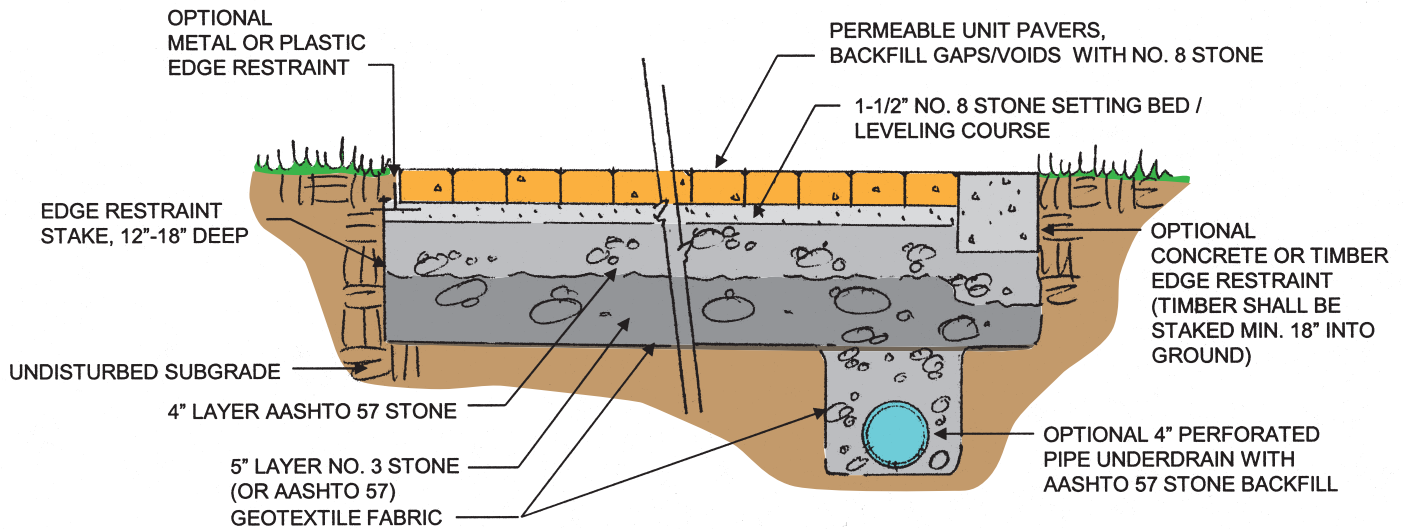


Remove grass and topsoil to create pavement base.



## PERMEABLE PAVER WITH EDGING

NOT TO SCALE



if underlying soils have too much clay in them. On steeper slopes, additional drains maybe placed across the slope in intervals so as to not overload one at the lowest point.

### C. DRAINAGE LAYERS:

- Geotextile:** Place a layer of geotextile fabric on the exposed soil to cover the entire area to be paved. Overlap pieces 6 inches and pin or staple them in place. The geotextile fabric should extend into the trench for an underdrain. The fabric separates the soil from clogging the stone layer.



Fabric layer with clean stone placed on top

- Stone:** A minimum 6 inches to 12 inches of clean stone drainage should be placed over the fabric. The addition of a plastic geo-grid on top of the stone may help stabilize the surface of the stone prior to laying the paving system in case of underlying soft areas. Tamp and level the stone layer to provide a solid base for the paving system.



Using a tamper to compact stone layer.

- Underdrain:** As stone is being placed, install the perforated pipe in the underdrain trench. Cap the upper end of the perforated pipe and install a tee with a riser pipe at the low end and extend it to the surface of the paving to act as a cleanout or inspection port. Leave the riser a little high and cut it off and cap it to the level of the finished paving when the project is complete. Extend the under-drain pipe to a safe outlet point.

An underdrain is always a good idea if you are not sure the soils underlying the paving will be able to soak up the excess water. Many of our soils have a high clay content and take a long time to soak up water, and an underdrain allows the system to slowly drain down when the pavement base is overloaded. Excavate for an underdrain to a safe outlet point.



Underdrain being installed with gravel around a perforated pipe. Elbow to receive vertical pipe for future inspections.



Vertical inspection pipe to be cut off and capped at the surface when paving is completed.



**d. PAVING:** Lay the paving system according to the manufacturer's directions. Similar to laying carpet or vinyl flooring, start along a straight edge, using sturdy stakes and string pulled tight, mark a right angle and take a line in that direction. Check to make sure your lines are square and parallel, and keep rechecking them as you progress with the project. The finished surface should be smooth and level with no raised edges that may be tripping hazards or may catch the edge of a snow plow blade.



cleaning options may include periodic sweeping, power blowing and pressure washing. Pressure washing of a clogged pervious concrete pavement can restore 80% to 90% of the permeability in some cases. An ASTM 1701 test for permeability is available.



Walking behind the vacuum for permeable paving.

**6. FINISHING TOUCHES:** Tamp or roll the final surface as recommended by the manufacturer and backfill any gaps with 1/4" angular gravel. Gravel can be broomed into the gaps with a stiff broom. This may need to be done several times in the first year as the stones settle in the gaps.



Vacuum truck on permeable concrete



Left - Tamping ; Right - Broom small clean gravel into place.

**7. MAINTENANCE:** The majority of pervious pavements function well with little or no maintenance. Maintenance primarily consists of preventing the porous surface from becoming clogged. In preparing the site prior to construction, check the surrounding area for sources of debris that may clog the surface, like bare soils, leaf litter. Stabilize these surfaces with vegetation or other surfacing to prevent any material and debris from washing onto the porous surface and clogging it. Sweep the surface regularly to prevent leaves from collecting.

Vacuuming annually or more often may be necessary to remove debris from the surface of the pavements. Other



Testing the infiltration rate of permeable paving using ASTM 1701 test standards.



# Permeable Pavement Demonstrations in Southwestern PA



Westmoreland Conservation District

The Westmoreland Conservation District has used many different types of permeable pavements around the county and at our own offices. Porous concrete, concrete unit pavers, and concrete and plastic cells which hold gravel in place all help reduce compaction of the underlying soil and allow rainwater to soak into the ground.

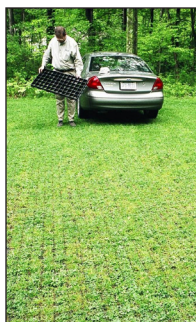
Local suppliers can be contacted for more information about these systems.

## Plastic units for gravel (and grass) paving systems and suppliers:

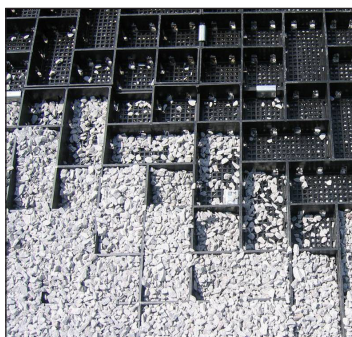
**ACF Environmental, Western Pennsylvania**  
412-487-9583  
<http://www.acfenvironmental.com>

Look for paving products under the 'Low Impact Development/Green Infrastructure Products' heading, including:

1. Geoblock, plastic grids clip together to hold clean stone in place, great for grassy overflow parking and emergency lanes
2. Geopave, the answer to Geoblock in non-turf areas, clipped together plastic grids for clean stone fill
3. Geoweb, flexible Cellular Confinement system to hold clean stone in place, top edges will get crushed over time from traffic



Installing plastic grids over stone.



Filling plastic grids with more stone.

## Invisible Structures Inc.

1. Gravelpave2 and Grasspave2, <http://www.invisiblestructures.com/gravelpave2.html>, plastic grids on a roll of geotextile to contain clean stone or soil for turf

## Concrete unit pavers and Suppliers:

### R.I. Lampus Company

Springdale, PA, 412-362-3800

1. 'Eco-Tek' pavers <http://www.lampus.com/land-et.html>, decorative brick shape laid in variety of patterns with varying porosity



Precast concrete pavers filled with stone

### Uni-Lock

Rittman OH, 330-927-4000

1. Eco-optilock and Eco-priora pavers <http://www.unilock.com/Products/Pavers/Permeable>, decorative brick shapes laid in variety of patterns for varying porosity
2. 'Turfstone' pavers, <http://www.lampus.com/land-turf.html>, tried and proven concrete lattice pavers which hold up under varying conditions, best value



Installing precast concrete pavers.

## Permeable Concrete Suppliers:

### Stone and Co

Connellsville PA, 724-628-2000  
<http://www.stoneconcrete.com/>

### Ligonier Stone and Lime Concrete

Latrobe PA, 724-537-6805  
<http://ligonierconcrete.com/>



Water disappears through permeable concrete.