

# POROUS PAVEMENT

Porous pavement is a type of pavement designed to allow water to pass through and infiltrate into the ground. Two types of porous pavement--porous asphalt and pervious concrete-- have become increasingly popular alternatives to traditional paving systems. While the main purpose of porous pavement is to promote infiltration and reduce runoff, porous pavement may also provide pollutant removal if properly maintained.

A common porous pavement installation begins with a layer of gravel covered by an open-graded stone reservoir. The porous pavement is then placed over the highly permeable layer of stone, while filter fabric lines the sides of the reservoir to prevent sediment from entering into the reservoir. Often times, a perforated pipe is installed just below the porous pavement layer to serve as an outlet for excess storm water to discharge when the reservoir is full.

## ADVANTAGES




- Reduced need for curbing and storm sewers
- Recharge to local aquifers
- Improved road safety because of better skid resistance













## LIMITATIONS

- May present challenges in cold weather climates

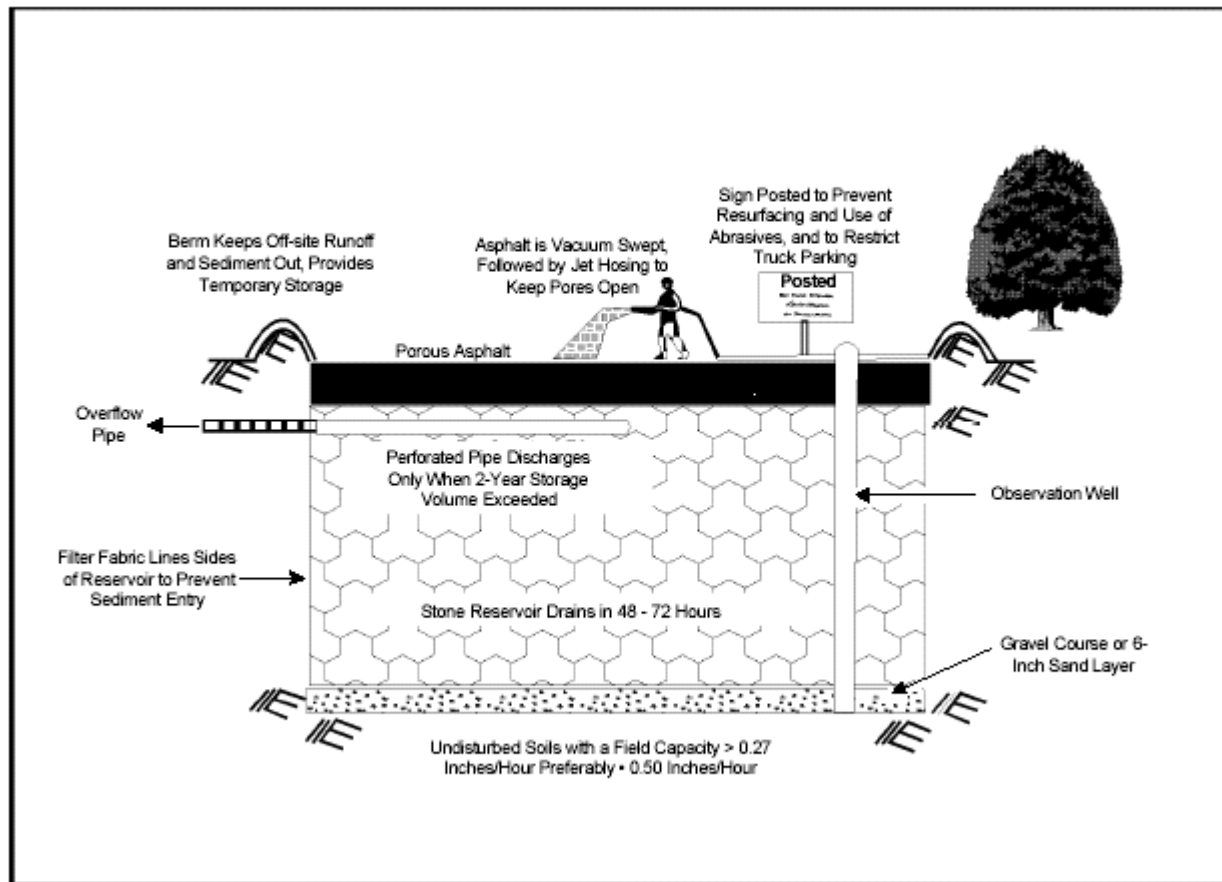
### AT-A-GLANCE SUMMARY

#### Benefit

- Major 
- Secondary 
- Minor/None 

Flow attenuation	
Runoff volume reduction	
<u>Pollutant Removals</u>	
Total Suspended Solids	
Floatables	
Heavy metals	
Oil and grease	
Fecal coliform	
BOD	
Total Phosphorous	
Nitrogen	
Costs	
Maintenance	

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Source: U.S. EPA; Modified from MWCOG, 1987.

- Groundwater contamination may be a factor if porous pavement is located near groundwater drinking supplies
- May perform poorly in soils with low permeability
- May become clogged if installed improperly
- Fuel may leak from vehicles and toxic chemical may leach from asphalt and/or binder surface
- Few engineers and contractors have experience with porous pavement

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## COSTS

Compared with other BMP's, porous pavement is a more expensive option. While traditional asphalt ranges in price from \$0.50 to \$1 per square foot, porous pavement can range from \$2 to \$3 per square foot. Sample total costs for a project are listed below.

<b>Component</b>	<b>Unit Cost</b>	<b>Total</b>
Excavation Costs	740 cy X \$5.00/cy	\$3,700
Filter Aggregate/Stone Fill	740 cy X \$20.00/cy	\$14,800
Filter Fabric	760 sy X \$3.00/cy	\$2,280
Porous Pavement	556 sy X \$13.00/sy	\$7,228
Overflow Pipes	200 ft X \$12.00/ft	\$2,400
Observation Well	1 at \$200 each	\$200
Grass Buffer	822 sy X \$1.50/sy	\$1,250
Erosion Control	\$1000	\$1,000
Subtotal		\$32,858
Contingencies (Engineering, Administration, etc.)	25%	\$8,215
<b>Total</b>		<b>\$41,073</b>

Source: EPA 832-F-99-023

In addition, annual maintenance costs for porous pavement are approximately \$200 per acre per year, assuming four inspections yearly with jet hosing and vacuum sweeping treatments.

## MAINTENANCE

In general, the primary maintenance task for porous pavement is keeping the pores clean and free from sediment. Vacuum sweeping is recommended at least three to four times per year to ensure that the pavement is functioning properly. Additional maintenance activities for porous pavement are outlined in the following table.

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## Typical Maintenance Activities for Porous Pavement

Activity	Schedule
Avoid sealing or repaving with non-porous materials	N/A
Ensure that paving area is clean of debris Ensure that paving dewaterers between storms Ensure that the area is clean of sediments	Monthly
Mow upland and adjacent areas, and seed bare areas Vacuum sweep frequently to keep the surface free of sediment (Typically three to four times a year)	As needed
Inspect the surface for deterioration or spalling	Annual

(Source: WMI, 1997)



Source: Invisible Structures

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## DESIGN SPECIFICATIONS

Design Criterion	Guidelines
Site Evaluation	<ul style="list-style-type: none"> <li>Take soil boring to a depth of at least 1.2 meters (4 feet) below bottom of stone reservoir to check for soil permeability, porosity, depth of seasonally high water table, and depth to bedrock.</li> <li>Not recommended on slopes greater than 5 percent and best with slopes as flat as possible.</li> <li>Minimum infiltration rate 0.9 meters (3 feet) below bottom of stone reservoir: 1.3 centimeters (0.5 inches) per hour.</li> <li>Minimum depth to bedrock and seasonally high water table: 1.2 meters (4 feet).</li> <li>Minimum setback from water supply wells: 30 meters (100 feet).</li> <li>Minimum setback from building foundations: 3 meters (10 feet) downgradient, 30 meters (100 feet) upgradient.</li> <li>Not recommended in areas where wind erosion supplies significant amounts of windblown sediment.</li> <li>Drainage area should be less than 6.1 hectares (15 acres).</li> </ul>
Traffic conditions	<ul style="list-style-type: none"> <li>Use for low-volume automobile parking areas and lightly used access roads.</li> <li>Avoid moderate to high traffic areas and significant truck traffic.</li> <li>Avoid snow removal operations; post with signs to restrict the use of sand, salt, and other deicing chemicals typically associated with snow cleaning activities.</li> </ul>
Design Storm Storage Volume	<ul style="list-style-type: none"> <li>Highly variable; depends upon regulatory requirements. Typically design for storm water runoff volume produced in the tributary watershed by the 6-month, 24-hour duration storm event.</li> </ul>
Drainage Time for Design Storm	<ul style="list-style-type: none"> <li>Minimum: 12 hours.</li> <li>Maximum: 72 hours.</li> <li>Recommended: 24 hours.</li> </ul>
Construction	<ul style="list-style-type: none"> <li>Excavate and grade with light equipment with tracks or oversized tires to prevent soil compaction.</li> <li>As needed, divert storm water runoff away from planned pavement area before and during construction.</li> <li>A typical porous pavement cross-section consists of the following layers: 1) porous asphalt course, 5-10 centimeters (2-4 inches) thick; 2) filter aggregate course; 3) reservoir course of 4-8 centimeters (1.5-3-inch) diameter stone; and 4) filter fabric.</li> </ul>
Porous Pavement Placement	<ul style="list-style-type: none"> <li>Paving temperature: 240° - 260° F.</li> <li>Minimum air temperature: 50° F.</li> <li>Compact with one or two passes of a 10,000-kilogram (10-ton) roller.</li> <li>Prevent any vehicular traffic on pavement for at least two days.</li> </ul>
Pretreatment	<ul style="list-style-type: none"> <li>Pretreatment recommended to treat runoff from off-site areas. For example, place a 7.6-meter (25-foot) wide vegetative filter strip around the perimeter of the porous pavement where drainage flows onto the pavement surface.</li> </ul>

Source: U.S. EPA, EPA 832-F-99-023

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## PROPRIETOR CONTACT INFORMATION

The following is a list of various manufacturers of porous pavement. This list is not exclusive and does not serve as an endorsement of any of the following.

- Tarmac America  
<http://www.tarmacamerica.com/tarmac>
- PermaPave  
<http://www.permapave.com.au/>
- Cahill Associates  
<http://www.thcahill.com>