

## Permeable Pavement

**Alternative Name: Porous Pavement**

**Types: Porous Concrete, Porous Asphalt**



### BENEFITS

#### Overall

- Reduces stormwater runoff volume, flow rate and temperature
- Increases groundwater infiltration and recharge
- Provides local flood control
- Treats stormwater runoff
- Improves quality of local surface waterways
- Reduces soil erosion
- Reduces the need for traditional stormwater infrastructure and can reduce overall project cost
- Extends life of paved area in cold climates due to less cracking and buckling from freezing and thawing
- Reduces the need for salt and sand use during the winter due to low/no black ice development
- Increases traction when wet

#### Pollutant Removal

As water permeates through the porous pavement system and into the ground, pollutants are mainly captured within the paver system and the uppermost layers of underlying soil. Permeable pavement can be very effective at eliminating many pollutants that are of concern in the Charles River watershed:

- Total Suspended Solids: 85% – 95%
- Total Phosphorus: 65% – 85%
- Total Nitrogen: 80% – 85%
- Nitrate (as N): 30%
- Metals: 98%<sup>5, 6</sup>

#### Volume Attenuation/Flow Reduction

Permeably paved areas are typically designed to infiltrate runoff from at least a two-year storm; therefore runoff will be reduced by 100% for most rainstorms. Permeably paved areas generally infiltrate 70% - 80% of annual rainfall.<sup>5</sup>

### DESCRIPTION

Permeable pavement allows rain water and snow melt to infiltrate through it to be filtered and recharged into the ground as groundwater. Permeable pavement is asphalt or concrete mixed with fewer fine particles to create more air space which allows water to permeate through it. An underlying layer of fine sediment filters water and below it a bed of uniform-grade stones stores water as it infiltrates into the ground. Permeable pavement is ideal for use in parking lots, walkways and low-traffic roadways. Areas that are paved with traditional, non-permeable pavement are a significant source of polluted stormwater runoff. The use of permeable pavement can greatly decrease stormwater runoff.

### MAINTENANCE

#### Needs and Frequency

Permeable pavement needs to be vacuum swept three to four times a year to prevent pores from becoming clogged and precluding infiltration.<sup>3</sup>

#### Cost

Approximately \$400 - \$500/year for vacuum sweeping of a half acre parking lot.<sup>3</sup>

#### Other

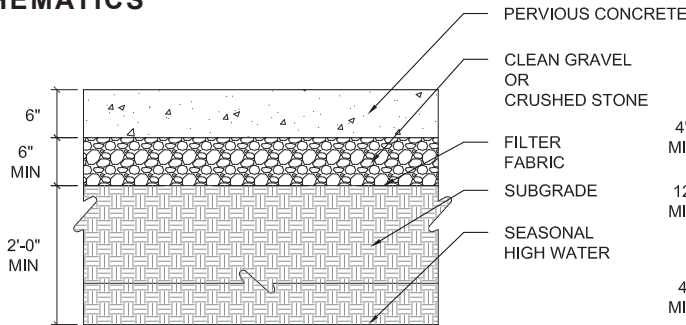
Area will need to be repaved roughly every 15 - 25 years in cold climates.<sup>1, 3</sup>

### INSTALLATION COST

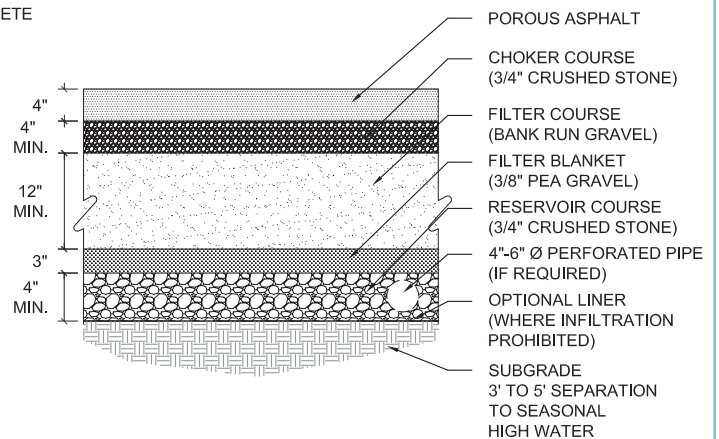
\$7 - \$15/square foot, including underground infiltration bed.<sup>8</sup> Can reduce overall project cost by eliminating the need for traditional stormwater infrastructure.



**SCHEMATICS**



Adapted from Porous Concrete  
<http://perviousconcrete.info>  
 Accessed 01/22/2008



Adapted from Porous Asphalt and Infiltration Bed  
<http://www.unh.edu/erg/cstev>  
 Accessed 01/22/2008

**EXAMPLE PROJECTS**

**New London Hospital**

*New London, New Hampshire*

Porous concrete was used to pave an employee parking lot to add parking without increasing flooding concerns.<sup>7</sup>

**Silver Lake Beach Parking Lot**

*Wilmington, MA*

Porous asphalt was used to pave approximately 16,600 square feet of parking area. Porous asphalt was ideal for this parking area as it abuts Silver Lake, a popular swimming, fishing and boating destination. Porous asphalt provides a sturdy parking surface without increasing polluted stormwater runoff into the lake.<sup>4</sup>

**ADDITIONAL CONCERNS OR UNKNOWNNS**

- Porous pavements are ideally situated on shallow slopes above soils with permeability rates greater than 0.25 inches/hour.
- All permeably paved areas must be equipped with an overflow control structure so that the porous surface never becomes saturated to street level.
- Permeable pavement is not appropriate for areas where spills are likely, such as gas stations or loading docks.
- Proper maintenance is essential to the functionality of permeable pavement. Without proper maintenance, infiltration rates can be significantly reduced.
- Cost to volume of stormwater treated ratio is higher than many other stormwater best management practices.<sup>2</sup>

**SOURCES**

<sup>1</sup>Ballestero, T., J. Briggs, K. Houle, R. Roseen, J. Houle. (2007, November 14). Why Porous Asphalt for Stormwater Management? University of New Hampshire University of New Hampshire Stormwater Center. PSU Cooperative Extension, the Centre County Conservation District and Clear Water Conservancy Workshop. Available at [http://www.unh.edu/erg/cstev/Presentations/porous\\_pavement\\_workshop\\_part\\_1\\_why.pdf](http://www.unh.edu/erg/cstev/Presentations/porous_pavement_workshop_part_1_why.pdf).

<sup>2</sup>Center for Watershed Protection. (2007, August). Urban Stormwater Retrofit Practices Appendices. Urban Subwatershed Restoration Manual Series.

<sup>3</sup>Low Impact Development Center (LIDC). (2005, November). Permeable/Porous Pavement. Low Impact Development for Big Box Retailers. Available at: [http://www.lowimpactdevelopment.org/bigbox/lid%20articles/bigbox\\_final\\_doc.pdf](http://www.lowimpactdevelopment.org/bigbox/lid%20articles/bigbox_final_doc.pdf).

<sup>4</sup>Massachusetts Department of Conservation and Recreation (DEP). Demonstration 3 Permeable Paving Materials in a Parking Lot. <http://www.mass.gov/dcr/waterSupply/ipswichRiver/demo3-paving.htm>.

<sup>5</sup>Milwaukee Metropolitan Sewerage District (MMSD). (2007). State of the Art Report; Chapter 4: Summary of Nonpoint Source Technology Analysis. Available at: <http://www.mmsd.com/wqi/>.

<sup>6</sup>Pennsylvania Department of Environmental Protection. (2005, January). Porous Pavement with Infiltration Bed. Pennsylvania Stormwater Best Management Practices Manual. Available at: <http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/subjects/stormwatermanagement/BMP%20Manual/BMP%20Manual.htm>.

<sup>7</sup>Quinton, A. (2007, November 13). Town Planners Look To New Designs to Control Floods. New Hampshire Public Radio Broadcast. Available at: <http://www.nhpr.org/node/140608>.

<sup>8</sup>Roy, S. (2007). Employee GeoSyntec. Personal Communication.