

## Permeable Pavement

Imagine looking down on a cityscape from a plane. You would likely note that a high percentage of the land is covered by impermeable surfaces: streets, parking lots, sidewalks, driveways, and rooftops. Instead of percolating into the ground, the majority of rain lands on these impermeable surfaces and flows into stormwater sewers, picking up pollutants like motor oil, anti-freeze, and pesticides as it goes.

In essence, our cities are enormous catch basins, collecting polluted water and diverting it into waterways. This stormwater is a major source of pollution in the San Francisco Bay. When stormwater is directed into streams, volumes are much greater than historic levels, substantially eroding stream beds and banks and flooding surrounding areas. To address these issues, municipalities typically widen channels and armor the banks with concrete, drastically disrupting the streams' ecological value.

A green site design approach would treat as much stormwater as possible on-site. This approach would reduce flooding and non-point source pollution, minimize stormwater infrastructure costs, and maximize groundwater recharge and the ecological value of streams and other waterways. When utilized in an appropriate comprehensive design, permeable pavement can be an effective tool in on-site stormwater treatment if properly installed and maintained.

There are three general categories of permeable (also called porous or pervious) pavement:

- 1) Conventional asphalt or concrete with the fine materials left out of the mix
- 2) Grids that are filled with aggregate and planted with vegetation
- 3) Unit paving blocks that are spaced apart

Each of these options reduces run-off by allowing water to percolate through the surface. When incorporated into a proper site design, these systems can promote the recharge of local aquifers, reduce run-off pollutants, and reduce or eliminate the need for curb gutters and storm sewers.

### ***PRODUCT COMPARISONS***

#### **Permeable Pavement**

- Recharges local aquifers
- Reduces flooding
- Reduces need for expensive stormwater infrastructure
- Large surface area allows pollutants to be broken down naturally
- Contributes indirectly to healthy riparian habitat

#### **Conventional Pavement**

- Removes water from site
- Promotes flooding
- Requires expensive stormwater infrastructure
- Concentrates pollutants into waterways, where they cannot be completely broken down
- Contributes indirectly to the destruction of riparian habitat

### ***LEED CREDITS***

Using this material potentially contributes to obtaining these credits in the US Green Building Council's LEED certification program:

#### **Sustainable Sites**

SS Credit 6.1 Stormwater Management: Rate and Quantity



SS Credit 6.2 Stormwater Management: Treatment

SS Credit 7.1 Heat Island Effect: Non-roof (some porous pavements, such as grass pavers, reduce heat island effect)

### **Materials & Resources**

MR Credit 4.1 Recycled Content (some porous pavements are made with recycled content)

MR Credit 4.2 Recycled Content (some porous pavements are made with recycled content)

LEED stands for Leadership in Energy and Environmental Design. To find out more about it, visit [www.leedbuilding.org](http://www.leedbuilding.org).

## ***ENVIRONMENTAL ATTRIBUTES***

### **Energy Performance**

By reducing the heat island effect caused by conventional paving, grass pavers can reduce the need for air conditioning, saving energy.

### **Resource Impacts**

Because permeable pavements promote water infiltration, they can help recharge local aquifers, reduce erosion, and prevent pollutants from being washed into stormwater systems. These pollutants are much more readily broken down on-site by the many soil microbes contained in the large surface area of land. The paving products are composed of the same materials as their conventional counterparts, which are generally recyclable.

### **Health Considerations**

Natural biological processes in the soil filter and break down run-off pollutants. However, if the system is improperly designed, ground water can become contaminated if more pollutants enter the ground than the soil can process. Permeable pavements are more skid resistant, making roads and parking lots safer.

## ***FUNCTIONAL CONSIDERATIONS***

### **Cost**

Permeable paving can have a cost premium over conventional paving. There may be additional unit costs if sub-surface reservoirs need to be installed. However, when installed as part of a good design, expensive stormwater infrastructure such as curbing, storm sewers, and treatment facilities can be downsized or eliminated, creating net savings.

### **Installation**

Permeable paving should only be used where the soils are also permeable and allow proper drainage. Expansive soils, sub-soils that have high clay or fine content, or locations of shallow bedrock are usually not appropriate for this type of pavement. **Permeable soil** is defined as having a **percolation rate** of one-hundred twenty (120) minutes per inch or faster. A percolation test should be performed on soils where paving is to be installed. Permeable paving is best suited for sandy, well-drained soils such as found in San Francisco. Due to problems with cracking,



permeable paving is not recommended in areas of expansive soils, such as Berkeley and much of the East Bay coast side. Contact your local county for information and recommendations specific to your locality. For EPA design criteria, see: [www.epa.gov/ednrmrl/repository/abstrac2/abstra2.htm](http://www.epa.gov/ednrmrl/repository/abstrac2/abstra2.htm)

Where the rate of percolation through the sub-soil is inadequate, stone reservoir drains can sometimes be constructed under the pavement to manage stormwater. To ensure successful installation and avoid failure of the paving system, contractors should be experienced and have a clear understanding of how the system will work.

### **Maintenance**

To prevent clogging, porous concrete and asphalt systems must be periodically vacuumed or pressure washed to remove fine debris. For an overview of recommended maintenance for permeable/ pervious paving, see: [www.scvrppp-w2k.com/Treatment\\_Control\\_BMPs/20\\_Poroaus%20Pavement.pdf](http://www.scvrppp-w2k.com/Treatment_Control_BMPs/20_Poroaus%20Pavement.pdf)

### **Other Data / Comments**

To maximize the effectiveness of permeable pavement, it should be used as part of the larger site design that utilizes a variety of techniques in dealing with run-off such as swales, roof rainwater collection, catchments, and strategic landscaping with native vegetation. Furthermore, some permeable pavements perform best in low-traffic areas, such as supplemental parking lots.

For a comprehensive description of urban runoff management strategies, read the EPA's New Development Management Measure for Urban Runoff: [www.epa.gov/owow/NPS/MMGI/Chapter4/ch4-2a.html](http://www.epa.gov/owow/NPS/MMGI/Chapter4/ch4-2a.html)

## **RESOURCES**

**Concrete Promotion Council of Northern California** [www.cpcnc.org](http://www.cpcnc.org)

For more information about permeable concrete, contact the CPCNC at (888) 633-0393.

**Georgia Concrete & Products Association** [www.gcpa.org/specification.htm](http://www.gcpa.org/specification.htm)

Recommended Specifications for Portland Cement Pervious Pavement

### **Porous Concrete and Asphalt**

With the proper specifications, most contractors can install permeable pavement. Find a reputable contractor in your area.

**American Asphalt Repair & Resurfacing**  
27601 Industrial Blvd  
Hayward, CA 93435  
(800) 541-5559 or (650) 366-0144  
[www.Americanasphalt.com](http://www.Americanasphalt.com)

**Bauman Landscape Inc**  
San Rafael, CA  
(415) 492-8555

**Graniterock/ Peninsula Road Materials**  
365 Blomquist Street  
Redwood City, CA 94063  
(650) 482-3800  
[www.graniterock.com](http://www.graniterock.com)

**Graniterock/ San Jose Road Materials**  
11711 Berryessa Road  
San Jose, CA 95133



**Central Concrete**  
755 Stockton Ave.  
San Jose, CA 95126  
(408) 293-6272

**Crowton AJ**  
San Francisco, CA  
(415) 671-0727

**Diamond D Company**  
310 D Kennedy Drive  
Capitola, CA 95010  
(831) 464-7369  
[www.diamonddcompany.com](http://www.diamonddcompany.com)

(408) 487-3100  
[www.graniterock.com](http://www.graniterock.com)

**Graniterock/ South San Francisco Road Materials**  
1321 Lowrie Avenue  
South San Francisco, CA 94080  
(650) 869-3300  
[www.graniterock.com](http://www.graniterock.com)

**Stoney Creek Materials**  
25 Stoney Creek Cove  
Austin, TX 78734  
(512) 261-0821  
[www.stoneycreekmaterials.com](http://www.stoneycreekmaterials.com)

## Open Grid Products

**Bauman Landscape Inc**  
(Installer)  
San Rafael, CA  
(415) 492-8555

**Invisible Structures, Inc.**  
(Grasspave2, Gravelpave2)  
Golden, CO  
(800) 233-1510  
[www.invisiblestructures.com](http://www.invisiblestructures.com)

**NDS, Inc.**  
(TuffTrack Grass Pavers, GrassRoad Paver8 Plus)  
851 North Harvard Ave  
Lindsay, CA 93247  
(800) 726-1994  
[www.ndspro.com](http://www.ndspro.com)

**Presto Products Company**  
(Geoweb, Geoblock)  
Appleton, WI  
(800) 548-3424  
[www.prestogeo.com](http://www.prestogeo.com)

**Soil Stabilization Products Company, Inc.**  
(Geoweb, Geoblock distributor)  
P.O. Box 2779  
Merced, CA 95344  
(800) 523-9992  
[www.sspco.com](http://www.sspco.com)

**Wm. A. Matzke Co.**  
(Grasspave2, Gravelpave2 distributor)  
(209) 595-2203  
[www.matzkecompany.com](http://www.matzkecompany.com)

## Permeable Pavers

**Ackerstone Industries, Inc.**  
(Eco-Stone, Turf Block)  
13296 Temescal Canyon Rd.  
Corona, CA 92883  
(800) 258-2353  
[www.ackerstone.com](http://www.ackerstone.com)

**Basalite Concrete Products**  
(SF Rima, Turfstone)  
Tracy, CA  
(800) 266-3670  
[www.basalitepavers.com](http://www.basalitepavers.com)

**Bauman Landscape Inc**  
(Installer)  
San Rafael, CA  
(415) 492-8555

**Paver Depot**  
(Eco-Stone dealer)  
2662 Monterey Road  
San Jose, CA 95111  
(800) 660-5230

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