

## **STORM: Soaking Up Solutions**

By Jim Force (page 28)

Permeable pavement surfaces begin living up to their promise as cost-effective tools to reduce runoff and cut stormwater pollution.



Sometimes, the best solution to a problem is to turn the problem into the solution.

That may be the case with stormwater runoff from hard surfaces like parking lots, streets, sidewalks and alleys.

Permeable “hardscapes” allow rainwater to soak into the ground instead of running off into sewer systems and polluting receiving streams. They actually serve as a stormwater management system.

Introduced in Europe, permeable surfaces are gaining ground in North America, propelled by stormwater regulations and public concerns that continued paving with impervious materials is not sound environmental policy. The approach also

dovetails with other municipal low-impact development strategies and practices.

### **Reaching all levels**

“We’ve been working with permeable projects for several years,” says Donna DeNinno, marketing director for Uni-Group U.S.A, maker of the Eco-Stone family of interlocking concrete pavers, head-quartered in Palm Beach Gardens, Fla. “Now we’re seeing interest all the way to the residential level. People are actually coming to us.”



Bob Lisi of LHB Inc. in Duluth, Minn., observes, “The trend is borderline revolutionary in the construction industry. Current pavement design relies on preventing moisture from penetrating the pavement. Porous pavements flip this design practice and readily accommodate moisture in the base materials. My guess is that porous pavements will become mainstream technology across the United States in the next 10 years.”

And Bruce Chattin, executive director of the Washington Aggregates and Concrete Association (WACA), says the trend line is “almost exploding” in the Northwest. “It started slowly — trails and sidewalks, but now we are seeing residential streets, parking lots, and residential driveways,” he says.

“Permeable concrete provides the ability to maximize the use of the site, provides a two-stage infiltration filter over the whole site, and filters pollutants and recharges the groundwater supply. It is almost a structural soil.”

But while earth-friendly, how difficult are permeable (also called pervious or porous) surfaces to install and maintain? Do they hold up? Are they a feasible retrofit? And how much do they cost compared to traditional surfaces? Answers are still forming, since permeable surfaces are still not widespread. But a growing number of installations are providing new and useful information.



### Some differences

Generally, installers can use standard construction techniques and equipment to put down permeable surfaces, but contractors need to make unique modifications to prepare the site, install the base materials, and place the actual surface. According to LHB's Lisi, "The main challenge is getting contractors up to speed on proper construction techniques to avoid problems due to improper installation methods.

"Porous pavement needs to be understood as a system, not just as a new type of pavement surface. The system is unique in that it temporarily accommodates storm-water in the base materials — quite the reverse from traditional pavement design."

Likewise, traditional maintenance procedures apply to the new surfaces. Sweeping, blowing, and pressure washing work fine. Proper landscaping and curbing can control runoff of silts and fines. "Any site should have a Best Management Practice program on how to monitor and maintain any pervious surface," says Chattin of WACA.

In Vancouver, B.C., Carl Matricardi, engineering project coordinator for the city's Street Design Branch, notes that replacing a leaking water connection or main beneath the city's green Country Lanes would cost more than on a conventional alley or lane.

"In Country Lanes, the cost for a cut would be significantly more because the cross section of the surface treatment is so much more diverse than regular pavement," he says. "Over time, costs for maintenance will decline as everyone becomes more familiar with construction methods and procedures. Keep in mind that these types of projects are different than what we are use to, so there is a learning curve for everyone involved."

And what about winter? Owners remove snow the same way as on traditional pavements, although applying sand for traction tends to plug the surface pores. Icing on porous pavements is less likely, since the water seeps into the base layer before it freezes. Porous pavements may be less prone to freeze-thaw cracking because the base layers are stronger. In fact, current research shows that freeze-thaw conditions do not negatively affect long-term pervious concrete pavements.

Actually, minor pavement cracking does not compromise the function of a porous pavement. "Cracks are another conduit for drainage into the base layers that are designed to accommodate the water," says Lisi.

### Loadings and retrofits

Permeable surfaces may not be suitable for all applications, and heavy industrial loadings may warrant stronger materials. "Some-times, as in heavy truck-use areas, traditional concrete can be a better long-term choice and will make more sense for the owner," says Chattin. A mix of pervious concrete with traditional parking lot surfaces still allows a site to store stormwater in the base layer.

In the Country Lanes project, designers used interlocking paver blocks for support where driveways entered alleys, or in areas with heavy utility truck traffic.

So far, little information on retrofitting exists. Lisi suggests that porous asphalt can be pulled up and new porous material installed over the original base, if the system still functions and the bituminous is all that needs replacing. Paver stones and permeable concrete can also be replaced as necessary.

For replacing an impervious surface with pervious, the best approach might be to strategically place porous pavement where it will best capture storm runoff before discharging water from the site. This would be more cost effective than removing the entire existing surface.



### The cost question

In general, permeable surfaces cost more, mainly because of the larger quantity of base materials. But that may change as the technology becomes more prevalent and if owners take total project costs into account. Compared to a traditional pavement with storm-water infrastructure (catch basins, piping, and land dedicated to treatment ponds and rain gardens), porous pavement can be very cost effective.

“Pervious concrete is better evaluated based on the value it brings to a development or project,” says Chattin. “It almost will save a developer substantially over expensive and expansive detention vaults, plus it puts land otherwise used for retention ponds back into development, yielding more taxable parcels

for a city.”

Lisi believes stormwater fees charged to landowners should figure in the equation. “The fees are typically based on the amount of impervious surfacing contributing runoff,” he says. “If a landowner can receive a reduced utility fee for utilizing a porous pavement system, the annual savings will eventually pay for the porous system.”

Lisi also expects unit prices to decrease as demand for permeable surfaces meets reasonable bulk production levels for suppliers. That could well happen, as the pavement industries have developed nationwide design and installation guidelines, which are being modified by state agencies and industry representatives to adapt to regional climates and material resources.

As applications expand, and as specifiers and contractors become more educated and certified in the technology and grow comfortable with it, the application of permeable surfaces should increase. “Contractors need to understand the type and differences between pervious and impervious surfaces, and specifications should require trained or certified contractors,” Chattin says.

However, porous pavement should not be a license to pave with abandon. “Vegetation has ecological value beyond what any pavement can provide,” says Lisi. “First, reduce paving to that which is necessary. Then look for ways to integrate paving and vegetation into the site.”

More information about permeable pavements is available from:

- Washington Aggregates and Concrete Association ([www.washingtonconcrete.org](http://www.washingtonconcrete.org)).
- Interlocking Concrete Pavement Institute ([www.icpi.org](http://www.icpi.org)).
- Uni-Group, Eco-Stone pavers ([www.uni-groupusa.org](http://www.uni-groupusa.org)).
- Vancouver Country Lanes ([www.city.vancouver.bc.ca/engsvcs/streets](http://www.city.vancouver.bc.ca/engsvcs/streets)).
- Portland Cement Association: ([www.concrete thinker.com](http://www.concrete thinker.com)).