



GENERAL MAINTENANCE GUIDANCE

As with all types of permeable and pervious pavements, permeable interlocking concrete pavements (PICP) are subject to sediment, fines and other debris accumulating on the surface, which can slow infiltration over time. As a result, it is recommended that the pavement be inspected and periodically cleaned to help ensure that the desired infiltration rates are maintained. Some municipalities may stipulate sweeping frequency.

The rate of sedimentation will vary depending on the amount of traffic and whether sediment is deposited onto the pavement from adjacent areas. Some PICPs may not require cleaning for several years as they remain capable of adequate infiltration. Research conducted by James and Gerrits 2003, Borgwardt 2006, Bean, et al. 2007, and Shackel 2009, demonstrated that PICP up



Clean aggregate is found just below the sediment trapped at the surface of the Eco-Stone openings

to 20 years old were capable of infiltrating most typical design storms despite little to no maintenance. The research also found that the small aggregate used in the openings and joints trapped sediment at the top 1 inch (25mm) or so and prevented it from entering the base and subgrade.

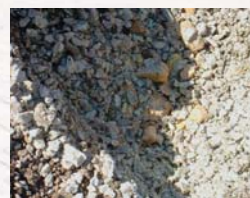
This trapping of the sediment in the joints and openings allows for easy removal by street sweeping/vacuuming equipment. Street sweeping can provide preventative and restorative maintenance depending on the equipment used. Conventional broom sweepers can be used to remove the sediment crust in the openings and joints. However, regenerative air vacuum sweepers are more effective for maintenance of permeable pavements. The vacuum settings on sweeping equipment may require adjustment to prevent the uptake of aggregate in the pavement openings and joints during routine cleaning of fine sediments. For more severely clogged pavements, vacuum sweepers have demonstrated the ability to remove up to 3 inches or more of aggregate from the openings and restore the PICP to its original infiltration rates.

The pavement should be dry when cleaning. Pressure washing permeable pavements is not recommended, as this can drive residue into the setting bed and base below. Properly constructed and maintained PICP should provide a service life of 25+ years. If at the end of its design life the pavement no longer infiltrates the required amount of stormwater, PICP is the only type of permeable pavement that can be taken up and the same pavers reinstalled with new aggregate materials, as the pavers themselves have a design life of up to 50 years. In addition, PICP allows access to underground utilities for repairs, and unlike other types of pervious pavements, leaves no unsightly patch.

TESTING AT MORTON ARBORETUM

Cleaning tests were conducted on a UNI-Ecoloc® permeable pavement at Morton Arboretum in suburban Chicago in 2009, which had been subjected to heavy car and bus traffic. Despite no cleaning in the seven years the pavement had been in place, the 500-car parking lot had been infiltrating the local design storms.

Pavers and jointing material were removed in a heavily-trafficked section to observe the penetration depth of sediments into the void and joint aggregate. As with previous research findings, the sediment was trapped in the first 1/2 to 1 inch (12 to 25mm) of the drainage voids.



Once the selected Ecoloc pavers were removed, there was no visible sediment on the bedding aggregate or the No. 57 stone base material. This clearly demonstrates the ability of the joint and drainage void aggregate to trap sediment at the surface.

A vacuum sweeper was provided to test the ability to restore infiltration rates. The machine was adjusted to remove only the top 1 inch (25mm) of aggregate and sediment. This substantially increased the surface infiltration rate, which was demonstrated by comparing water poured on the newly cleaned surface to an



uncleaned area. After cleaning, fresh aggregate material was swept into the joints and drainage voids and the pavement surface was restored to its original condition. This demonstration

shows a major maintenance advantage of PICP over monolithic pervious and porous pavements with the ability to restore heavily-clogged joints. By comparison, researchers at the University of Minnesota found sediment that penetrated over 1/4 inch (6mm) in pervious concrete could not be removed with vacuum equipment.



Before cleaning and after cleaning at Morton Arboretum

WINTER MAINTENANCE

Over twenty years of experience in areas such as Toronto, Chicago, Calgary, and New England have demonstrated that PICP can be used successfully in cold climates. The pavement base and soil subgrade drain prior to freezing and the air in the aggregate voids offer some insulating effect, while the moisture and the earth provide some heat to delay freezing of the soil subgrade and base/subbase so that they can drain prior to freezing. However, should water freeze in the base/subbase, the pavement does not heave due to sufficient space in the aggregate voids for expansion.



UNI permeable pavements can be snow plowed just as with any other pavement. Tests have shown a benefit of all permeable pavements is that any snow remaining after plowing can melt and drain through the surface as temperatures rise, thus reducing or eliminating refreezing of water at night and reducing slip and skid hazards. In addition, research at the Toronto and Region Conservation Authority and the University of New Hampshire has shown that the use of deicing salts can be reduced with permeable pavements. This provides added environmental benefits. Winter sanding of PICP is not recommended as it will speed up clogging. Instead, if needed, use No. 8, 89 or 9 stone for traction as these materials are typical of jointing and drainage opening fill.

INSPECTION AND MAINTENANCE TASKS

It is recommended that PICP be inspected at least once a year to ensure the pavement surface is infiltrating. An easy way to do this is simply to observe if there is standing water after storms. Also, surface infiltration tests may be conducted using C1781 Standard Test Method for Surface Infiltration Rate of Permeable Unit Pavement Systems. Stormwater maintenance agreements are sometimes used to determine inspection and cleaning frequency, however, often a property changes hands or the information is not enforced. Therefore, a simple visual inspection is most often the best indicator of when a pavement needs to be cleaned. During a site visit, other inspections can be performed to ensure the pavement is being properly maintained:

- Replenish aggregate in joints if more than 1/2 inch (13 mm) from chamfer bottoms on paver surfaces
- Maintain groundcover and plants around PICP perimeter to ensure stability and minimize sediment running onto the pavement surface
- Remove weeds that grow in the paver joints/openings with a bio-degradable herbicide
- Inspect and repair all paver surface deformations exceeding 1/2 inch (13 mm)
- Replace any cracked paver units that compromise the surface structural integrity
- Keep any overflow curb cut-outs free from debris
- If an observation well is installed, check outflow

As with traditional interlocking concrete pavers, oil, grease, rust, and other stains can be removed from permeable pavers if desired. Specialty cleaners are available for this purpose.

Proper planning, design and construction of PICP can help minimize or avoid maintenance issues by stabilizing surrounding soils with groundcover and plants and instructing contractors to avoid tracking sediment onto the surface. Landscape maintenance activities such as mulching and lawn mowing also contribute to sediment accumulation, so instruction on keeping these materials off pavement surfaces should be provided.

Infiltration paving construction and maintenance inspection reports are available in our UNI Eco-Stone Design Guide and Research Summary print and online versions. For more information and to find the local UNI manufacturer nearest you, please visit www.uni-groupusa.org.

REFERENCES & RESOURCES

- *The UNI Eco-Stone® Family of Permeable Interlocking Concrete Pavers Design Guide and Research Summary*
- *Permeable Interlocking Concrete Pavements* - Interlocking Concrete Pavement Institute
- *Experience in the Application of Permeable Interlocking Concrete Paving in Australia* Beecham, Pezzaniti, Shackel, Pearson 2009, 9th International Conference on Concrete Block Paving
- *Long-Term In-Situ Infiltration Performance of Permeable Concrete Block Pavement* Soenke Borgwardt, 2006
- *Study on the Surface Infiltration Rate of Permeable Pavements* Bean, Hunt, Bidelspach, 2003
- *Maintenance of Infiltration in Modular Interlocking Concrete Pavers with External Drainage Cells*, James and Gerrits, 2003, *Practical Modeling of Urban Water Systems*
- *Urban Waterways - Maintaining Permeable Pavements* NC State University, A&T State University Cooperative Extension William F. Hunt, Ph.D., PE, Associate Professor and Extension Specialist Biological and Agricultural Engineering Dept., 2011

Thank you to the Interlocking Concrete Pavement Institute for use of some project photos.

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