Pervious Concrete Pavement Maintenance and Operations Guide

NRMCA Pervious Concrete Pavement Maintenance and Operations Guide

Pervious concrete pavement is a Portland cement-based, rigid permeable pavement that serves not only as the surface layer of a stormwater management system, but also as a vital part of a water filtration system. Beneath the pervious concrete is the second layer of the stormwater system, the base rock, which is an open-graded, stone layer that is used for temporary stormwater detention. When rain falls, the pervious concrete allows on-site infiltration of stormwater. It also filters sediments and pollution from stormwater deposited on the pavement surface.

Because this permeable surface is a filter, like any filter it must be cleaned periodically. Cleaning is performed by vacuuming to remove sediments that have accumulated. The frequency of the vacuuming is directly related to the amount of sediment that the surface receives over time.

The following chart can serve as a *minimal recommendation* for scheduled maintenance:

ACTIVITY	SCHEDULE
Avoid sealing or repaving with impervious materials. In particular, never use asphalt or other tar-type sealers on pervious concrete.	N/A
Visually inspect pervious pavement area to ensure that it: • is clean of debris • de-waters between storms • is clean of sediments	Monthly
• Maintain upland and adjacent grassy areas. • Seed upland and adjacent bare areas. • Keep the pervious pavement surface free of sediment by blowing, sweeping or vacuuming. • Excessive water flow carrying debris toward the pavement should be diverted.	As needed
Inspect the pervious pavement surface for deterioration or spalling.	Annually

Pervious Concrete Maintenance: Plan and Practice

Maintenance of the pervious concrete pavement is the responsibility of the property owner/manager. The Maintenance Plan should be developed to assure proper maintenance procedures are followed. After the first year of operation, the plan should be reviewed and, if necessary, revised to reflect the actual results of that first period of service. When ownership of the property is transferred, the maintenance plan must be transferred as well.

In general, maintenance of pervious concrete pavement consists of monitoring the surface for sediment buildup, and removing that buildup as needed, to maintain the pavement's permeability. Owners/property managers should follow good housekeeping practices to prevent accumulation of trash, sediment or other debris on the pervious surface. Drainage of all unpaved areas should be directed away from the pervious concrete pavement. If areas are allowed to drain onto the pavement, suspended materials may wash into the void structure of the pervious pavement and reduce the porosity and compromise its service life. Adjacent areas that do drain to the pavement should be kept seeded and maintained to minimize sediment deposition which may increase the frequency of cleaning of the pervious surface. Landscape contractors should be advised of the special precautions required to avoid debris buildup on the pavement surface. Additionally, it is recommended that informational signage be posted to identify the pervious pavement as being part of a stormwater management system and that particular care should be taken to maintain its peak performance.

The first step in creating a maintenance plan is to develop a baseline infiltration rate for your pervious concrete system. ASTM C1701: Standard Test Method for Infiltration Rate of In-Place Pervious Concrete, is the procedure used to determine the infiltration rate of pervious concrete. Performing an initial ASTM C1701 test for a baseline is best done the day that the plastic curing is removed. The pavement has not been in service yet, so this initial baseline measurement will document the optimal performance of the pavement, as constructed, for stormwater management. ASTM C1701 requires three test procedures to be performed for every 25,000 square feet and an average taken of the three tests. This will be the baseline for comparison of all future tests. The original testing locations should be marked or noted in the maintenance log so that future tests can be run at the same locations. A change in the infiltration rate with service will determine the appropriate frequency of maintenance.

There are three levels of pervious concrete pavement maintenance:

1. **Routine Maintenance:** Should include visual inspection of the pervious pavement to ensure that it is clean of debris and sediments, and that it will dewater between storms. Routine maintenance cleaning procedures would include blowing (with leaf blower or similar equipment), truck-sweeping and/or dry vacuuming. Routine maintenance may help prevent more stubborn clogging by keeping sediment from becoming ground deep into the pavement's void structure. This routine maintenance should be performed as needed (at least monthly) to keep the entire pervious concrete area clean. Visually inspect the pavement periodically during or immediately following a rain event. Ponding or puddles are signs that it is time to clean the pavement. In some areas, moss growth can be an issue. Moss can be controlled by sprinkling baking soda on the surface, followed by a dry vacuuming within a few weeks. Additionally, moss growth can be retarded/eliminated with lime water applications. Since this pavement is designed to infiltrate water, any surface treatment must be evaluated for environmental impacts to ground water.
2. **Periodic Maintenance:** In areas that see freezing temperatures, it is a good practice to perform periodic maintenance just before winter to insure that the pervious concrete voids are clean and free of non-compressible materials that may inhibit draining and, therefore, could contribute to freeze-thaw damage. Additionally, periodic maintenance may be required following winter to remove any anti-skid materials that may have been used. Proper cleaning procedures would include pressure washing and/or vacuuming the area with either a dry vacuum or a regenerative vacuum sweeper. Care should be taken to avoid extremely high pressures with a pressure washer, as this can degrade the bonding cement paste and increase raveling. Cleaning equipment should allow for the debris to be bagged and removed from the unit so it can be weighed.

A maintenance log should be completed that records the following:

- Date of service
- Name of individual/company performing service
- Type of maintenance performed
- Amount (lbs.) and type(s) of sediment/debris/other material removed as result of cleaning
- General observations and record of pavement condition
- Name/signature of individual completing the inspection
- Additionally, if ASTM C1701 is performed, the test results and locations should be included in the report. (A sample Maintenance Log is included on page 7 of this guide).

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Routine and periodic maintenance is essential with the goal of avoiding renovation/rehabilitation.

3. **Deep Cleaning/Unclogging:** Over time, deep cleaning/unclogging of pervious concrete pavement may become necessary, particularly if routine and periodic maintenance is not performed. If a pervious concrete pavement system is not periodically cleaned, the void structure system will become clogged with debris over time. Typically, an average infiltration rate decrease of 25% from the initial value, or an infiltration rate less than 100 inches per hour, triggers the need for deep cleaning/unclogging. Neglected projects that had never been cleaned and are completely clogged should be restored to a drainage rate of 100-200 inches per hour, per ASTM C1701, by using specialized cleaning equipment.

ASTM C1701: Standard Test Method for Infiltration Rate of In-Place Pervious Concrete

Cleaning pervious concrete can maintain and/or restore its original permeability

Deep cleaning/unclogging is best accomplished by simultaneous pressure washing and vacuuming. Several equipment manufacturers have developed pressure washing/vacuum systems that have proven to rehabilitate the pore structure of pervious pavement. For best results, follow the equipment manufacturer's recommendations. As with the periodic maintenance procedures, when cleaning/unclogging is performed, a maintenance log should be completed and filed with the owner/property manager.

Use of Chemicals to clean pervious concrete should be done with extreme caution to prevent damage to the aquifer, the biological organisms within the pervious system, or the pervious concrete pavement itself.

Winter Maintenance

This is a critical aspect of owning a Pervious Concrete Pavement. Improper winter maintenance has been responsible for many failures of Pervious Concrete Pavement Surfaces.

Freeze-thaw resistance of pervious concrete depends on its saturation level at the time of freezing. When the large voids are saturated, complete freezing can cause severe damage to the pervious concrete pavement. Field observations have shown that, due to its rapid draining characteristics, a properly maintained pervious concrete pavement will rarely be fully saturated.

Winter maintenance issues affect pervious concrete the same as standard concrete. Deicing chemicals should not be used on any type of concrete in the first year. Concrete that is not properly cured is more susceptible to damage from deicing chemicals. Because concrete takes longer to cure in lower temperatures, when it is placed late in the year, such as late fall or early winter, it may be more susceptible to damage due to the use of deicing chemicals. As with conventional concrete, applying a penetrating sealer to the pervious concrete can improve its performance in freezing weather. Use a penetrating sealer manufactured specifically for concrete. **Concrete penetrating sealer should not be confused with impermeable sealers such as asphalt seal coats.**

The following recommendations should be followed:

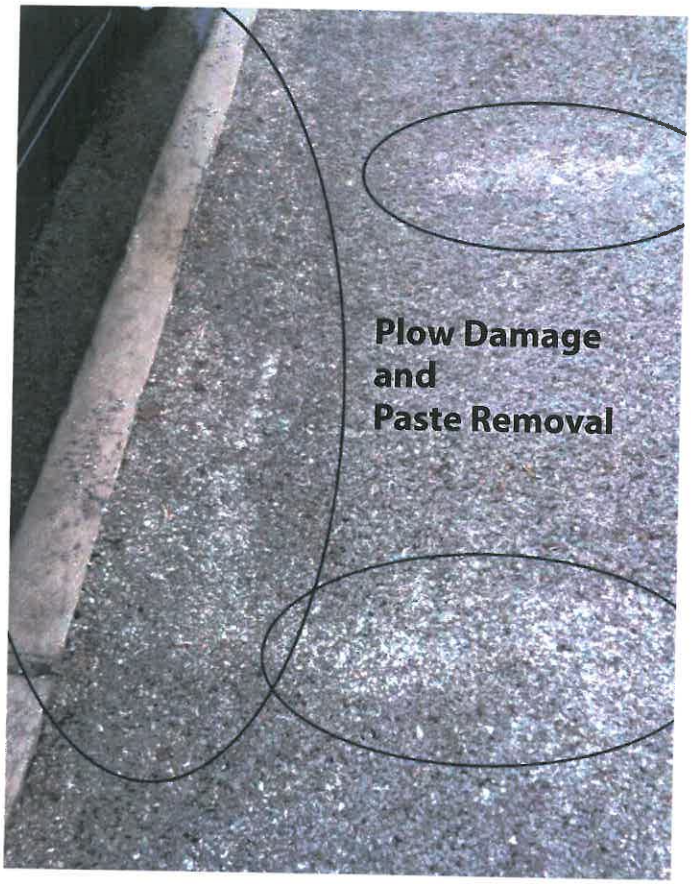
- Anti-icing pre-treatments should never be used on pervious concrete pavements. If these products are used on adjacent pavements, care should be taken to prevent the adjacent runoff from infiltrating the pervious concrete.
- Deicers containing magnesium chloride, calcium magnesium acetate or potassium acetate should ***never*** be used on pervious concrete pavement.
- Deicing agents that contain fertilizer ingredients such as Ammonium Sulfate and Ammonium Nitrate cause chemical deterioration to any Portland cement-based concrete pavement and should ***never*** be used.
- Calcium Chloride impregnated sand can be used for deicing pavements ***after*** the first year.
- Coarse sand (minimum 1/8"), or small crushed aggregate (1/4 – 10, or similar gradation) can be used as an anti-skid material with the understanding that vacuum cleaning will be performed after the winter season. **Fine sands such as masonry sand or play sand should NOT be used on pervious concrete pavements!**
- Snow plowing can be performed with trucks mounted with plows, but the plow should be fitted with a polyurethane cutting edge. Use of snow blowers may be a better alternative to plowing, if available. Snow removal should not be performed using front end loaders or skid loaders by either scooping or back dragging. Note that snow plowing may result in striations on the concrete surface. These striations are merely aesthetic and will often disappear over time.

The number one concern of property facilities managers is liability. Facilities managers instruct their maintenance personnel to salt and plow when snow begins to lay on the surface. In many cases, that minimal amount of snow will melt when the sun comes out or when temperatures even slightly rise. Once the snow melts, it infiltrates into the pervious concrete and does not refreeze on the surface, as it would on an impervious surface. Additionally, studies show that the ground beneath the pervious concrete system is less susceptible to freezing due to the insulating properties of the air space in the aggregate base. This is very beneficial to the facilities managers who are concerned about safety factors and liability.

Pervious concrete should ***never*** be used as a storage area to pile snow from other areas unless it has been specifically designed as a snowshelf, with special consideration for resistance to deicing chemicals, water quality issues and additional maintenance as requisite. The snow that has been plowed from other surfaces may be full of debris that will clog the pervious concrete voids. Additionally, the plowed snow will most likely have a very high salt or anti-skid content.

An Ounce of Prevention...

The best maintenance practice is prevention. Keeping the pavement clean, and within design specifications, is the owner's responsibility. When proper maintenance techniques are followed, pervious concrete will provide a durable pavement and long-term stormwater management.



For more information, go to www.perviouspavement.org

References:

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National Ready Mixed Concrete Association (NRMCA), ***Text Reference for Pervious Concrete Contractor Certification,*** NRMCA Publication #2PPCRT. Silver Spring, MD.

Tennis, P. D., Leming, M. L. and Akers, D. J. 2004. ***Pervious Concrete Pavements.*** Portland Cement Association (PCA), Skokie, IL

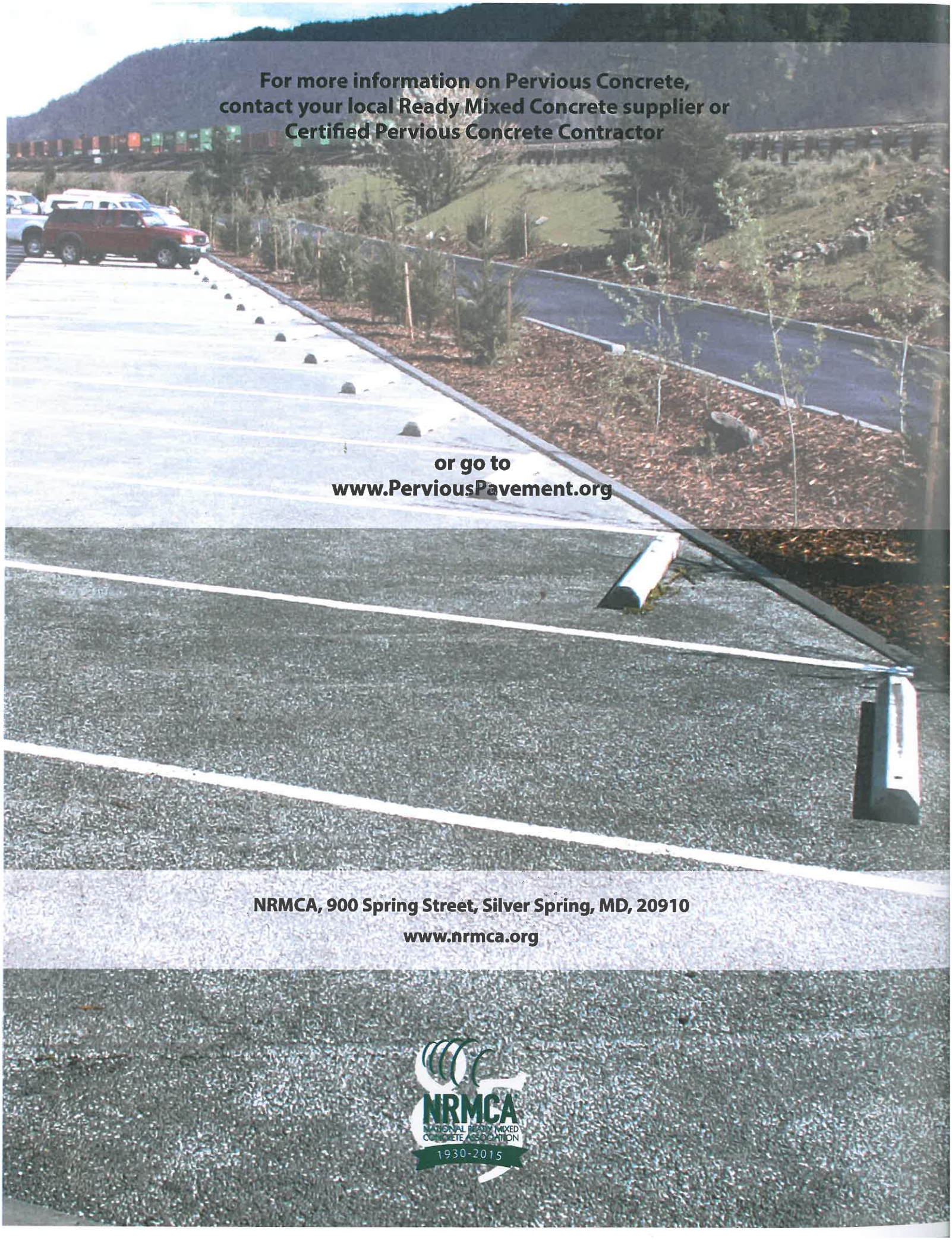
Watershed Management Institute (WMI). 1997. ***Operation, Maintenance, and Management of Stormwater Management Systems.*** Prepared for US Environmental Protection Agency, Office of Water, Washington, DC.

Pervious Concrete Maintenance Log

Site Name and Location: _____

Initial ASTM C1701 Test Results: _____ **Inches / Hour**

Date of Inspection	Observations/ Pavement Condition	ASTM C1701 Performed?	ASTM C1701 Results	Type of Maintenance Performed	Type and Amount of Debris/Sediment Removed	Maintenance Performed By:	Name/Signature of Inspector
		Yes ☐ No ☐	Before Maintenance ____ IN/HR After Maintenance ____ IN/HR				
		Yes ☐ No ☐	Before Maintenance ____ IN/HR After Maintenance ____ IN/HR				
		Yes ☐ No ☐	Before Maintenance ____ IN/HR After Maintenance ____ IN/HR				
		Yes ☐ No ☐	Before Maintenance ____ IN/HR After Maintenance ____ IN/HR				


For more information on Pervious Concrete,
contact your local Ready Mixed Concrete supplier or
Certified Pervious Concrete Contractor
or go to
www.PerviousPavement.org
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