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Permeable Pavement

What is permeable pavement?

When rainwater falls on conventional pavement, such as concrete, it accumulates and then flows across and off of this impervious surface as stormwater runoff. Permeable pavement allows stormwater to slowly seep through (infiltrate), reaching the soil and groundwater below the surface.

A variety of permeable pavement materials are available, such as interlocking pavers, porous asphalt, pervious concrete, and manufactured grass pavers. Interlocking pavers consist of precast blocks (primarily brick or concrete) that are aligned in such a way that water is able to pass between the blocks into the soil below. Grass pavers are a type of open-cell paver made of concrete or plastic, in which the cells are filled with soil and planted with turf.

While the specific designs vary, all permeable pavements have a similar structure, consisting of a surface pavement layer, an underlying crushed stone reservoir layer, and a filter or fabric layer installed on the bottom. The size and extent of the crushed stone layer depends on a variety of factors, such as the amount of precipitation and the capacity of the soil to soak up rainwater.

The installation of permeable pavement is a robust approach to stormwater management and environmental stewardship with a wide range of residential and commercial applications. Permeable pavements can be installed on walkways, patios, plazas, driveways, and parking areas. Because it does not require additional land, permeable paving is an excellent technique for urban areas.



What are the benefits to property owners and communities?

Throughout a typical community, paved surfaces—such as driveways, sidewalks, patios, parking lots, and roadways—are primarily composed of asphalt and concrete. The stormwater that flows across these surfaces is directed toward storm drains, inlets, streams, and ponds. In many locations, the quantity of runoff generated from the impervious surfaces is so large that it can exceed the capacity of storm drains, resulting in localized flooding. In addition, stormwater runoff contributes to sewer overflows, poor water quality and stream erosion. The replacement of conventional concrete or asphalt with porous pavements or permeable pavers helps to reduce these impacts by allowing precipitation to infiltrate into the soil below. This results in a direct reduction to peak stream flows during storms, which can help reduce erosion as well as the frequency and severity of flooding in downstream locations. Water that infiltrates into the soil replenishes groundwater, ensuring productive aquifers within the community.

An added benefit to permeable surfaces is that pollutants slowly permeate through the crushed stone and soil layers, allowing natural filtration processes to improve water quality by retaining some pollutants that would otherwise enter streams and rivers with runoff. With proper maintenance, the longevity of permeable pavements typically exceeds that of conventional systems. Grass pavers can improve site appearance by providing vegetation where there would otherwise be only pavement.

To be eligible for a rebate under the Rain Check Rebates Program, an individual residence must install a minimum of 100 square feet of permeable pavement while multi-family residences, commercial properties, and projects completed by nonprofit or not-for-profit organizations must install a minimum of 350 square feet of permeable pavement.



How can your permeable pavement project qualify for a rebate?

To be eligible for a rebate through the Rain Check Rebate Program, the area on which you install permeable pavement must be at least 100 square feet in residential applications and 350 square feet for multi-family, commercial, nonprofit, or not-for-profit uses.

How can you determine if your property is suitable for permeable pavement?

Permeable paving is well suited for many residential and commercial applications. However, because its load-bearing capacity is lower than that of conventional pavement, permeable paving should not be used in areas subject to excessive loads or high-speed traffic. Permeable paving is most appropriate for pedestrian-only areas and for very low-volume, low-speed vehicle areas such as overflow parking areas, residential driveways, alleyways, and parking stalls. It should not be used in areas with high pollutant loads because the stormwater is not pre-treated before infiltration.

To determine the suitability of areas on your property, first identify your existing impervious surfaces or areas that you intend to pave. Most properties have driveways, sidewalks, or patios—these are prime locations that can often be replaced with permeable pavement to improve rainwater infiltration and visual appeal. Or, if you want to pave an area that is not currently paved, you may want to choose permeable pavement. Exclude any surfaces that accumulate a lot of sediment and debris as this can clog the surface and reduce the effectiveness of the system. Only include areas that have a gradient, or slope, that will direct water away from the foundation of your home or other nearby structures, and include only those areas with a slope of less than 5%. Think about the project size that will best fit within your budget; smaller projects are more affordable and can offer a wide degree of flexibility, particularly at the residential level. Consider the landscaping requirements of the project; some types of permeable pavement, such as interlocking pavement, can be decorative as well as functional. Once you have identified the locations on which you would like to replace impervious surfaces with permeable pavement, measure the total area to be sure it is at least 100 square feet (for residential properties) or 350 square feet (for other types of properties).

The type of soil found on your property is an important consideration. Soil conditions do not constrain the use of permeable pavement, although they do determine whether an underdrain is needed. Soils such as sand and loam are permeable and allow water to infiltrate fairly rapidly. In contrast, clay soils can be impermeable and will probably require an underdrain system to prevent ponding. Professional designers and contractors will be able to help determine the infiltration capacity of the soils on your property.

How can you determine what kind of permeable pavement to use and where?

Once you have selected the location, decide what type of system will be the most effective and visually pleasing. A wide variety of permeable pavements are available. For residential properties, permeable interlocking pavers are commonly used because property owners can customize their shape, size, color, and layout to meet their individual needs. Permeable interlocking pavers are not restricted to residential applications; they have also been successfully implemented in walkways, plazas, and parking areas for larger-scale projects. Pervious concrete and porous asphalt are versatile and can be used in a wide variety of applications, including the resurfacing of sidewalks, driveways, and parking areas. For aesthetic reasons, asphalt is not typically used for patios or sidewalks. Manufactured grass pavers are a good option for driveways or overflow parking. Grass pavers are not suitable for everyday, all-day parking because the grass will not receive sufficient sunlight.

Which other techniques work well with permeable pavement?

Permeable pavement can replace a conventional asphalt driveway and therefore works well with pavement removal. In some permeable paving applications, you may be able to incorporate the overflow from a rain barrel or cistern.

What are the costs?

On most sites, permeable paving costs more than conventional asphalt or concrete paving. In the case of pervious concrete or porous asphalt, construction costs may be 50% more than their conventional counterparts, and are typically in the \$7 to \$15 per square foot range. For a typical 10 foot by 20 foot single car driveway this would amount to between \$1,400 and \$3,000. For a 5,000 square foot parking lot, costs can be expected to range between \$3,500 and \$7,500. Construction costs of paving stones and manufactured grass pavers vary considerably but generally cost about 20% more than traditional concrete pavers. Annual maintenance generally costs about 1% to 2% of the construction cost. The use of permeable pavement reduces the amount of land needed for stormwater management and may satisfy requirements for green space, allowing more development on a site.

To alleviate costs, the Rain Check Rebate Program provides a rebate of \$1,200 (100-square-foot minimum) for residential properties and \$5,000 (350-square-foot minimum) for commercial properties, multi-family dwellings, and projects undertaken by nonprofit and not-for-profit organizations.

Can you do this project yourself?

No. The installation of any type permeable pavement should be completed by a qualified contractor. Specialized equipment, such as excavators and pavement machinery, are required. Various landscaping, soil type, and drainage issues must be considered as they can affect the stability of the surface and rainwater infiltration. Your certified contractor can help you select a system that works best for your needs.

How should you choose a contractor?

You will need to hire a qualified contractor who is licensed and bonded to install porous asphalt, pervious concrete, and other types of permeable pavement. Find out what type of system will work (and look) best in your situation. Ask potential contractors what their experience is in soil testing, amending soils, and soil reinforcement or stabilization techniques and be sure that they are experienced with the specific type of permeable pavement you are considering. Ask whether they hold certifications from nationally recognized organizations, such as the National Ready Mix Concrete Association, the Interlocking Concrete Pavement Institute, or the National Asphalt Pavement Association. Find out if they can supply references and past project experience in the area. Ask potential contractors how much the project will cost, what is included in their services, and whether any additional fees are associated with the disposal of removed materials. Ask what type of equipment will be needed, whether any subcontractors will be used, how long the project should take, and whether the work will be guaranteed.

What kinds of permits are required?

A permit is not required for most permeable pavement projects. However, if installing your permeable pavement (on its own or in combination with a concurrent project on your property) exceeds 5,000 square feet and/or 100 cubic yards of earth-moving disturbance (such as grading, cutting, and filling), or a change in grade of +/- 12" a permit is required. Contact the County's Department of Permits, Inspection and Enforcement (DPIE) for more information: (301) 636-2000 or www.princegeorgescountymd.gov/sites/dpie.

What maintenance will be required?

As with any structural feature, permeable pavement requires maintenance to ensure that the system continues to function properly. The most common problem impacting permeable pavement is clogging, which occurs when sediment and other material obstructs pores, reducing infiltration. To help prevent these problems, keep landscaped areas well maintained and prevent soil from being transported onto the pavement. The most effective preventive maintenance for permeable pavement is yearly dry weather vacuum sweeping. Brooms, hoses, and pressure washers can compromise the system's integrity and should not be used for cleaning and clearing. For paving stones, periodically add joint materials (sand) to

replace material that has been transported away. Inspect your permeable pavement each year to check for and repair cracking, splitting, or other damage to the pavement surface. Do not reseal or repave with impermeable materials. Grass pavers may require periodic reseeding to fill in bare spots. In winter, salt can be used in moderation to melt ice, but never use sand unless you have paving stones. Pervious concrete works well in cold climates as the rapid drainage of the surface reduces the occurrence of freezing puddles and black ice. Melting snow and ice infiltrates directly into the pavement, facilitating faster melting. Snow plows can catch the edge of grass pavers and some paving stones. Rollers should be attached to the bottom edge of a snowplow to prevent this problem.

		MAINTENANCE SCHEDULE FOR PERMEABLE PAVEMENT											
		Spring			Summer			Fall			Winter		
Interlocking Pavers	Inspection	Required	Required	Required	Required	Required	Required	Required	Required	Required	Required	Required	Required
	Cleaning and sweeping		Required at Low Frequency										
	Replacement of filler material	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary	Required As Necessary
Grass Pavers	Inspection	Required	Required	Required	Required	Required	Required	Required	Required	Required	Required	Required	Required
	Reseeding of bare spots		Required As Necessary										

Required
 Required at Low Frequency
 Required As Necessary

For more information

While Prince George's County does not endorse any one method or vendor for permeable pavement projects, the following information is provided for your consideration.

General Information

Metropolitan Area Planning Council, Massachusetts Low Impact Development Toolkit
www.mapc.org/sites/default/files/LID_Fact_Sheet_-_Permeable_Paving.pdf

Paver Search (a comprehensive list of national paver products and contractors)
www.paversearch.com/index.htm

Interlocking Concrete Pavement Institute, Low Impact Development Center, and North Carolina State University, Permeable Interlocking Concrete Pavements
www.ncsu.edu/picp/

Interlocking Concrete Pavement Institute, Carving a new path in town?
www.icpi.org/

Low Impact Development Center, Permeable Interlocking Concrete Pavement Specification
www.lowimpactdevelopment.org/epa03/pavespec.htm

New Jersey Stormwater Best Management Practices Manual, Standard for Pervious Paving Systems
www.njstormwater.org/tier_A/pdf/NJ_SWBMP_9.7.pdf

Chesapeake Stormwater Network, Permeable Pavement Design Specification
<http://chesapeakestormwater.net/2009/11/permeable-pavement-design-specification/>

Maryland Ready Mix Concrete Association Inc. (pervious concrete information and pervious pavement contractor certification)
www.marylandconcrete.com/

Low Impact Development Center, Permeable Pavers: Watershed Benefits
www.lid-stormwater.net/permpavers_benefits.htm

National Asphalt Pavement Association, Porous Asphalt Pavements for Stormwater Management
<http://store.asphaltpavement.org/index.php?productID=179>