Types of permeable pavement

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Green Infrastructure: Permeable pavement can be an important tool for retention and detention of stormwater runoff. Permeable pavement may provide additional benefits, including reducing the need for de-icing chemicals, and providing a durable and aesthetically pleasing surface.

Photo illustrating pervious concrete. Pervious concrete is a special type of concrete with a high porosity that allows water from precipitation and other sources to pass directly through.

The most commonly used **permeable pavement (https://stormwater.pca.state.mn.us/index.php?title=Permeable_pavement)** surfaces are pervious concrete, porous asphalt, and permeable interlocking concrete pavers. Other options include plastic and concrete grids, as well as amended soils (artificial media added to soil to maintain **soil structure** and prevent compaction). This document focuses on pervious concrete, porous asphalt and permeable interlocking concrete pavements. A general comparison of their properties is provided in the table. Additional requirements specific to each system should be obtained by designers from suppliers and from the local review authority.

This page provides general information

For each of the above pavement surfaces, there are many variants depending on the design goals. For instance, permeable pavement can be installed with a deep underlying reservoir consisting of open-graded, crushed rock. This design provides water quality and quantity control by storing runoff and infiltrating it into the subgrade soils over an extended period of time. A second design variation includes a deep underlying reservoir consisting of open-graded, crushed rock above an impermeable layer of soil or a liner and an **underdrain**. The underdrain typically discharges to a **wet pond** (https://stormwater.pca.state.mn.us/index.php?title=Stormwater_ponds) or storm sewer system. This design provides some runoff flow attenuation, filtering, but no volume reduction. These two options provide different levels of treatment.

To assist with selection of a permeable pavement type, a general comparison of the properties of the three major permeable pavement types is provided in the table. Designers should check with product vendors and the local review authority to determine specific requirements and capabilities of each system. Schematic cross sections of each system are illustrated in the design section for permeable pavement.

Summary of properties of permeable pavements.
Link to this table

Photo illustrating porous asphalt. Porous asphalt is standard hot-mix asphalt that allows water to drain through it.

Photo illustrating permeable interlocking concrete pavement. Permeable interlocking pavers consist of concrete or stone units with open, permeable spaces between the units.

Properties	Pervious concrete	Porous asphalt	PICP
Typical pavement surface thickness[a]	5 to 8 inches	3 to 4 inches (thicker for high wheel load applications)	3 inches[a]

Properties	Pervious concrete	Porous asphalt	PICP
Bedding layer[a,f]	None	1 in. AASHTO No. 57 stone (https://unionquarries.com/products/aggregate-types/aashto-57/)	2 inches of AASHTO No. 8 stone (https://unionquarries.com/products/aggregate-types/aashto-8/) (MnDOT 3127 FA-3)
Reservoir layer[b,f]	AASHTO No. 57 stone or per hydraulic design	AASHTO No. 2, 3, or 5 stone (https://www.nesl.com/wp-content/uploads/2019/06/Product-Description-and-Uses_PA-stone.pdf)	4 inches of AASHTO No. 57 stone over No. 2, 3 or 4 stone (https://www.nesl.com/wp-content/uploads/2019/06/Product-Description-and-Uses_PA-stone.pdf)
Construction properties	▪ Cast in place ▪ Seven day cure ▪ Must be continuously covered	▪ Cast in place ▪ 24 hour cure	▪ No cure period ▪ Manual or mechanical installation of pre-manufactured units
Installed surfacing cost[c]	3 to $4/square foot	$2/square foot	3 to $4/square foot
Minimum batch size	None		
Longevity[d]	20 to 30 years		
Overflow	Catch basin, overflow edge, elevated underdrain		
Runoff temperature reduction	Cooling at the reservoir layer		
Surface colors/texture	Range of light colors and textures	Black or dark grey colors	Wide range of colors, textures and patterns
Load bearing capacity[e]	Handles all vehicle loads with appropriate surface and base/subbase layer material and thickness design		
Surface cleaning[g]	Periodic vacuuming; replace if completely clogged and uncleanable		Periodic vacuuming; replace jointing stones if completely clogged and uncleanable
Other issues	▪ Avoid concentrated deicers ▪ Avoid winter sanding	▪ Avoid seal coating ▪ Avoid winter sanding	Avoid winter sanding
Design references	[1] (https://core.ac.uk/download/pdf/215464202.pdf)	[2] (https://www.unh.edu/unhsc/sites/unh.edu.unhsc/files/pubs_specs_info/unhsc_pa_spec_10_09.pdf)	[3] (https://www.fhwa.dot.gov/pavement/concrete/pubs/hif19021.pdf)

[a]Thickness may vary depending on site and traffic conditions

[b]Reservoir storage may be augmented by corrugated metal pipes, plastic arch pipe or plastic lattice crates

[c]Supply and install minimum surface thickness only; minimum 30,000 sf with Minnesota 2012 prevailing labor wages. Does not include base reservoir, drainage appurtenances, engineering, or inspection

[d]Based on pavement being properly maintained. Resurfacing or rehabilitation may be needed after the indicated period

[e]Depends primarily on on-site geotechnical considerations and structural design computations

[f] ASTM D448 Standard Classification for Sizes of Aggregate for Road and Bridge Construction or ASASHTO M-43

[g]Periodic vacuuming frequency determined from inspection, intensity of use, and other potential sediment sources

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