

Section 7.7

Manmade Pervious Surfaces

7.7.1 Description

A porous surface consists of the use of a permeable surface material and mineral base and subbase materials which allow penetration of runoff and into the underlying soils.

The efficiency of pavement alternative systems will depend on whether the surface is designed to store and infiltrate most runoff with the remainder discharged to a storm drainage system or over-land flow. The effectiveness of pervious alternatives will also depend on their long term maintenance and serviceability.

7.7.2 General Design Criteria

A typical permeable pavement alternative consists of a top porous structure that is providing structural strength and will allow the infiltration of runoff, a filter course, a reservoir course (with drainage if needed), a geotextile fabric and existing soil or subbase material. The following surface alternatives are example of pervious surfaces:

Porous Asphalt and Concrete: Porous asphalt is similar to conventional asphalt except that it contains very few particles smaller than coarse sand (less than # 30 sieve). Without these finer particles, water is able to infiltrate and into the subsurface.

Block pavers: Block paves are interlocking concrete blocks that leave void spaces between which water can infiltrate. The void spaces can be filled with gravel or soil and grass.

Plastic grid Pavers: These are often constructed from recycled material and come in a honeycomb pattern. The voids are filled with gravel or may be grassed.

Artificial ball fields (turf ballfields): These are also considered pervious surfaces that require similar design considerations. The

synthetic nature of the turf may be a concern for the infiltration of chemical into the subsurface; however, no restriction will be applied until more data is available on this subject.

Any manmade pervious surface shall be subject to the General Standards of Chapter 500, Stormwater Management Rules and the DEP licensing staff must be consulted for permitting requirements. However, the use of this technology will provide needed level of treatment to meet the General Standards if designed as below.

7.7.3 Specific Design Criteria

Traffic Volumes: Pavement alternatives are limited to areas with light to moderate traffic. They are not recommended for most roadways, and cannot withstand heavy vehicles.

Grading: The site should slope with less than 5% and preferably closer to 1%.

Sediment loading: Pavement should not be used in areas expected to receive high levels of sediments as they are highly susceptible to clogging. Also alternative measures such as salt should be implemented over these areas in the winter.

Reservoir Course: The reservoir course should consist of clean washed 1 1/2-inch to 3-inch aggregate that is free of debris. The depth of the reservoir course shall be based on the desired storage volume and frost penetration.

7.7.3 Design Criteria for Infiltration

- All specifications from SW rules, Appendix D, Section 2 apply.

- At a minimum, one foot separation is needed below the road subbase and above the groundwater table. The depth of the water table elevation needs to be considered in designing the road for sufficient frost protection depth.
- A filter layer providing pretreatment before infiltration to groundwater needs to be included in the road design and can be part of the subbase and base. The media must be a mineral soil with between 4 and 7% fines (passing #200 sieve) and should be a minimum of 8 inches thick.
- To meet the General Standards requirements (1 inch infiltration), a minimum storage capacity within the filter layer or subbase and base is needed to allow the direct entry of one inch or more.
- To meet the Flooding Standards requirements, the road design needs to provide a minimum storage capacity for the direct entry of the rain precipitation from a 24-hour, 25-year storm (5 + inches).
- Infiltration rate should be confirmed with a double ring infiltrometer test to determine the soils ability to accept water. The test needs to be on native subgrade even if there is fill above it, and not on the fill itself. Recommended infiltration should be less than 2.41 inches per hour but great enough that the inch of stored precipitation infiltrates in 24 hours (i.e. >0.04 inches per hour).
- The stored volume needs to fully infiltrate within 24-48 hours
- Provide appropriate drainage and discharge of flows from larger storms where is needed.

7.7.4 Design Criteria for Storage and Filtration

- Appropriate specifications from SW rules, Appendix E and BMP design standards for an underdrained filter bed apply
- To meet the General Standards requirements (treatment of 1 inch of runoff), a minimum storage capacity within the filter layer or subbase and base is needed to allow the treatment of one inch or more.

- To meet the Flooding Standards requirements, the road design needs to provide a minimum storage capacity for the direct entry of the rain precipitation from a 24-hour, 25-year storm (5 + inches).
- The filter bed may be part of the road base and subbase horizon. The filter media must be a mineral soil with between 4 and 7% fines (passing #200 sieve) and must be a minimum of 4 inches thick. .
- An underdrained bed consisting of a minimum of 12 inches of underdrain gravel meeting the MDOT Specification 703.22, Type B should be a minimum of 12 inches to provide sufficient coverage for the underdrain piping.
- An underdrain pipe network is needed to drain adequately the underdrain bed. Pipes should be placed perpendicular to the slope and should be spaced no further apart than 20 feet. An orifice may be needed to control the outflow.
- Stored volume needs to fully drain within 24-48 hours.
- Provide appropriate drainage and discharge of flows from larger storms where is needed.

7.7.5 Maintenance Criteria

Pervious surfaces and pavement, whether asphalt, concrete or paving stones, have the potential to become impervious if not properly maintained. The following need to be planned for and be met:

- Design pervious pavement structures to prevent erosion from surrounding areas from reaching the pavement and sediment deposition.
- Restrain vehicles with muddy wheels from accessing pervious pavement areas.
- Limit salt use for deicing and do not use sand.
- Remove leaves and organic debris in the fall.
- Sweep, vacuum and/or pressure wash pavement **twice** annually at a minimum.