Porous Pavement

Porous pavement systems consist of a pervious surface with an underlying rock reservoir to temporarily store surface runoff before it infiltrates into the surrounding subsoil. This porous surface replaces traditional pavement, allowing parking lot storm water to infiltrate directly and receive water quality treatment. Porous pavement options include porous asphalt, pervious concrete and various pavers. Porous asphalt and pervious concrete appear to be the same as traditional pavement from the surface, but are manufactured without "fine" materials, and incorporate void spaces to allow infiltration. The ideal application for porous pavement is for low-traffic or overflow parking areas. The base of the stone reservoir should be below the frost line to reduce the risk of frost heave. Porous pavement cannot be used where sand is applied because sand will clog the surface of the material. Care must also be taken when applying road salt to a porous pavement surface as chlorides from road salt may migrate into the groundwater.

Limitations

- Areas where soil infiltration capacity is less than .3" per hour.
- Areas of steep slopes (>15%)
- Certain land use areas; such as drinking water aquifer recharge areas, or where petroleum products, greases, or other chemicals will be used, stored, or transferred, areas that receive significant amounts of sediment or areas that require sand and salt application for winter deicing.
- The use of porous pavement must be carefully considered in areas where the pavement may be seal coated or paved over due to lack of awareness, such as individual home driveways.

Supporting Practices Consideration

- Pretreatment
- Subsurface drain

Recommended V_Q Credit

1) Storage capacity of stone reservoir if underlying soils are permeable enough to facilitate infiltration of storm water.

2) Reduction of time of concentration if underlying soils do not support infiltration of stormwater runoff.

Sizing Guidelines

1. Compute the Water Quality Treatment Volume (V_Q) for the given pavement:

V_Q = Drainage Area in Square Feet x 0.083 (1 inch rain)

Infiltration Volume Equation	24,000 SF Parking Lot Example
1 inch x SF / 12 = CF CF 0.4* * to account for 40% void ratio in aggregate used to fill rock reservoir	1 x 24,000 SF = 24,000 SF / 12 = 2,000 CF 2,000 / .40 = 5,000 cubic feet storage needed Depth = 3.5 feet; Length = 100 feet 5,000 cu ft = 3.5 deep x 100 long x 15 wide

Recommended Guidelines

1. Design Considerations

1.1. Soil investigation and infiltration testing required.

1.2. The overall site shall be evaluated for potential porous pavement / infiltration areas early in the design process, as effective porous pavement design requires consideration of grading.

1.3. Porous pavement should not be placed on areas of recent fill or compacted fill. Any grade adjustment requiring fill shall be done using the stone sub-base material. Areas of historical fill (>5 years) may be considered for porous pavement.

1.4. The sub-base should not be compacted; however the rock reservoir is placed in 8" lifts and lightly rolled according to the specifications.

1.5. The bottom of the rock reservoir must be level. Sloping bed bottoms will lead to areas of ponding and reduced distribution.

1.6. Infiltration areas should be located within the immediate project area in order to control runoff at its source. Expected use and traffic demands shall also be considered in porous pavement placement.

1.7. Control of sediment is critical. Installation and maintenance of erosion and sediment control measures is required to prevent sediment deposition on the pavement surface or within the rock reservoir. Non-woven geotextile may be folded over the edge of the pavement until the site is stabilized. The designer should consider the placement of porous pavement to reduce the likelihood of sediment deposition. Surface

sediment shall be removed by a vacuum sweeper and shall not be power-washed into the rock reservoir.

1.8. Porous pavement installations must have a backup method for water to enter the rock reservoir in the event that the pavement fails or is altered. In uncurbed lots, backup drainage may consist of an unpaved 2 ft wide stone edge drain connected directly to the bed between the wheel stop. In curbed lots, inlets with sediment traps may be required at low spots. Backup drainage elements will ensure the functionality of the infiltration system if the porous pavement is compromised.

1.9. The rock reservoir and overflow may be designed and evaluated in the same manner as a detention basin to demonstrate the mitigation of peak flow rates. In this manner, the detention basin may be eliminated or significantly reduced in size.

1.10. Roof leaders and area inlets may be connected to convey runoff water to the rock reservoir. A filtering device / screen should be used to prevent the conveyance of sediment and debris into the rock reservoir.

1.11. While most porous pavement installations are underlain by a rock reservoir, alternative subsurface storage products may also be used, such as interlocking plastic units that contain greater storage capacity than rock, at an increased cost.

2. Slopes

2.1. Rock reservoirs may be placed on a slope by benching or terracing parking bays.

2.2. Orienting parking bays along existing contours will reduce site disturbance and cut/fill requirements.

3. Design flow

3.1. Not applicable

4. Groundwater

4.1. Four (4) feet clearance is recommended from the seasonal high water table with a minimum of 1 foot.

5. Drawdown time

5.1. Water stored in the rock reservoir should infiltrate within 72 hours.

6. Observation well

6.1. Not applicable

7. Construction Considerations

7.1. Post-construction soil

7.1.1. In areas with poorly-draining soils, rock reservoirs below porous pavement may be designed to slowly discharge to adjacent bio-retention areas. Only in extreme cases (i.e. industrial sites with contaminated soils) may the rock reservoir be lined to prevent infiltration.

7.2. Aggregate material

7.2.1. The rock reservoir is typically 12-36 inches deep and comprised of clean, uniformly-graded aggregate with approximately 40% void space. AASHTO No.3, which ranges 1.5-2.5 inches in gradation, is often used. The reservoir depth is a function of stormwater storage requirements, frost depth considerations, and site grading.

7.3. Filter fabric

7.3.1. A layer of non-woven geotextile filter fabric separates the aggregate from the underlying soil, preventing the migration of fines into the rock reservoir.

7.4. Inlet Control

7.4.1. Not applicable

7.5. Outlet control

7.5.1. The underlying rock reservoir is typically sized to manage the runoff generated from the 1” in 24 hour storm. Control in the underlying rock reservoir is typically provided in the form of an outlet control structure. A modified inlet box with an internal concrete weir and low-flow orifice is a common type of control structure. The specific design of these structures may vary, depending on factors such as rate and storage requirements, but it always must include positive overflow from the system.

7.6. Overflow

7.6.1. All systems shall be designed with an overflow system. Water within the rock reservoir should never rise to the level of the pavement surface. Inlet boxes can be used for cost-effective overflow structures.

7.7. Final stabilization

7.7.1. Not applicable

8. Maintenance Considerations

8.1. Immediately clean any soil deposited on pavement to prevent clogging.

8.2. Vacuum pavement twice per year.

8.3. Clean inlets draining to the stone reservoir twice per year.

8.4. Do not apply abrasives, i.e. sand or cinders, on or adjacent to pavement.

8.5. Snow plowing should be done as not to damage pavement surface.

8.6. Salt application is acceptable, although more benign deicers are preferable.

8.7. Repairs

8.7.1. Patch small areas (> 50 SF) with porous or standard asphalt; larger areas (< 50 SF) with an approved porous asphalt.

Porous Pavement Resource:

- Pennsylvania Stormwater Best Management Practices Manual; DRAFT - JANUARY 2005 Section 6, Comprehensive Stormwater Management: Structural BMPs