
	<b>Bowling Green, Kentucky Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPDs)</b>	<b>SPD-02.4</b>																		
	<b>Activity: Permeable Pavements</b>																			
<b>PLANNING CONSIDERATIONS:</b>  <b>Design Life:</b> Permanent  <b>Acreage Needed:</b> Minimal  <b>Estimated Unit Cost:</b> Low  <b>Annual Maintenance:</b> N/A																				
	<table border="1"> <thead> <tr> <th colspan="3" data-bbox="407 814 1425 856">Target Pollutants</th> </tr> <tr> <th data-bbox="407 856 808 905">Significant ♦</th> <th data-bbox="808 856 1133 905">Partial ♦</th> <th data-bbox="1133 856 1425 905">Low or Unknown ♦</th> </tr> </thead> <tbody> <tr> <td data-bbox="407 909 565 940">Sediment ♦</td> <td data-bbox="565 909 727 940">Heavy Metals ♦</td> <td data-bbox="727 909 889 940">Nutrients ♦</td> </tr> <tr> <td data-bbox="407 940 565 972">Oil &amp; Grease ♦</td> <td data-bbox="565 940 808 972">Bacteria &amp; Viruses ♦</td> <td data-bbox="808 940 1052 972">Floatable Materials ♦</td> </tr> <tr> <td></td> <td data-bbox="889 909 1052 940">Oxygen Demanding Substances ♦</td> <td data-bbox="1052 909 1425 940">Toxic Materials ♦</td> </tr> <tr> <td></td> <td></td> <td data-bbox="1052 940 1425 972">Construction Waste ♦</td> </tr> </tbody> </table>		Target Pollutants			Significant ♦	Partial ♦	Low or Unknown ♦	Sediment ♦	Heavy Metals ♦	Nutrients ♦	Oil & Grease ♦	Bacteria & Viruses ♦	Floatable Materials ♦		Oxygen Demanding Substances ♦	Toxic Materials ♦			Construction Waste ♦
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<b>Description</b>  <b>Suitable Applications</b>  <b>Approach</b>	<p>Infiltration and the reduction of runoff are a result of turf paving. The decrease arises from modular paving blocks or grids, cast-in-place concrete grids and soil enhancement technologies. Healthy grass growth as well as foot and vehicular traffic occur as a result of the site's increased load bearing capacity.</p> <ul style="list-style-type: none"> <li>➤ Areas desiring roadside right-of-ways</li> <li>➤ Emergency access lanes.</li> <li>➤ Delivery access routes.</li> <li>➤ Overflow parking areas.</li> </ul> <ul style="list-style-type: none"> <li>➤ <b>Modular Paving Blocks and Grids</b> Modular paving blocks or grass pavers consist of concrete or plastic interlocking units that provide structural stability while a series of gaps planted with turf grass allow for infiltration. Some blocks may also be filled with gravel and left unplanted. Depending on the use and soil type, a sand setting bed and gravel sub base is often added underneath to help further infiltration and prevent settling.</li> <li>➤ <b>Cast-in-Place Concrete Systems</b> Monolithic concrete pavements incorporate gaps that are filled with topsoil and grass for a free-draining "pavement" with the structural capacity to handle most heavy vehicle loads. The surface is similar to that of modular concrete paving blocks.</li> <li>➤ <b>Soil Enhancements</b> The soil-amendment technology employs synthetic mesh elements blended with a sandy growing medium, resulting in a natural turf surface and an engineered load-bearing root zone. Appropriate for summer overflow parking, golf courses, recreational fields and areas where the aesthetic appeal of uninterrupted grass is important.</li> </ul>																			

**Approach  
(cont'd)**

- **Porous Pavement**  
Porous pavements may be used in lieu of conventional pavement on parking areas and areas with light traffic, provided that the grades, subsoils, drainage characteristics, and groundwater conditions are suitable. Slopes should be flat or very gentle. Soils should have field-verified permeability rates of greater than 0.5 inches per hour, and there should be a 4-foot minimum clearance from the bottom of the system to bedrock or the water table.

**Advantages**

- Turf pavers reduce or eliminate other stormwater management techniques by reducing runoff.
- Applied in combination with other BMPs, pollutant removal and stormwater management can be further improved.
- There may be a construction cost savings due to reduced curb-and-gutter requirements.
- Turf pavers are appropriate for driveways, walkways and overflow parking areas where handicapped access is not required or provided elsewhere.
- Turf helps soften the look of an area and make it more pleasant for pedestrians.
- Soil-enhanced turf systems are advantageous for sports and recreation fields as they resist compaction, thus increasing infiltration, and provide a soft playing surface.
- The mesh elements stabilize soil without reducing its permeability. The elements combat compaction, as they flex under pressure and “cultivate” the surrounding soils.
- Snow melts faster on a porous surface because of rapid drainage below the snow surface.
- Porous pavement can help to reduce the increased runoff temperature commonly associated with impervious cover.

**Limitations**

- For reasons of durability and maintenance, turf pavers are not recommended for high-traffic areas.
- Turf paving systems limit wheelchair access.
- Snow removal can be difficult, as plow blades can remove vegetation and catch the edge of the blocks, damaging the surface.
- Salt and sand in runoff from adjacent impervious pavement can damage turf and clog gaps in the blocks.
- Construction costs for turf paving may be higher than conventional pavements. Maintenance costs are generally higher.
- Clay soils will limit infiltration.
- Since turf paving encourages infiltration, it should not be applied on stormwater hotspots, places where land use or activities generate highly contaminated runoff, due to potential for groundwater contamination.

- Design Criteria**
- Infiltration rates are affected by soil types and should be considered when designing turf areas.
  - Soil type also affects the sub base depth.
  - Fill voids with sand or sandy loam planting base (adhere to manufacturer’s recommendations).
  - Plant with “park grade” turf grasses which are more drought tolerant than “elite grade” grasses.

- Construction Requirements**
- **Modular and Cast-in-Place Concrete Systems**  
Cells may be planted in one of three ways:
    1. Fill with a porous backfill mix (some products require sharp sand), scrape or back rake the entire surface to expose pattern. Broadcast seed or hydroseed and then top dress and fertilize as required.
    2. Fill and scrape or back rake as above, then lay 5/8-inch sod on the assembled pavers. Water the sod, then use a hand water roller or power-driven roller to compress the sod and root system completely into the cells.
    3. Do not fill the cells with any type of soil mixture. Lay 1-inch sod on the assembled pavers. Water the sod and compress as above.

- **Soil Enhancements**  
Sand or a proprietary growing medium is blended with a specific proportion of mesh elements using a mechanical shovel. A 20 kg sample of mixed material will contain 55.4-66.7 g of mesh elements (or approximately 44 lb. mesh for 5 cubic yards of sand mix). Manufacturer will supply precise proportions.  
  
For some proprietary systems, materials are sourced locally and the patent-holder acts as project manager for the installation, using specially designed machines.  
  
Grass cover is established using pre-germinated seed, washed turf or conventional seed.  
Nonessential traffic should be kept off the area until grass is well-established.

- **Porous Pavement**  
Excavate and grade with light equipment with tracks or oversized tires to prevent soil compaction  
  
As needed, divert storm water runoff away from planned pavement area before and during construction.  
  
A typical porous pavement cross-section consists of the following layers:
  1. porous asphalt course, 2-4 inches
  2. filter aggregate course
  3. reservoir course of 1.5-3 inches
  4. filter fabric

- Inspection Checklist**
- Turf method matches soil type.
  - Turf is maintained to accommodate traffic patterns.