

## **Modular Pavement**

### **Description**

Modular pavement comes in pre-formed modular pavers of brick and concrete. When the brick or concrete is laid on a permeable base, water will be allowed to infiltrate. Grass can be planted between the pavers, allowing structural support in infrequently used parking areas.

### **Other Terms Used to Describe**

Lattice concrete blocks  
Monoslab concrete blocks  
Modular brick or concrete pavers  
Pre-cast concrete  
Perforated pavers laid over pre-cast concrete

### **Pollutants Controlled and Impacts**

Some of the possible benefits of this practice include: removal of fine particulates and soluble pollutants through soil infiltration; attenuation of peak flows; reduction in the volume of runoff leaving the site and entering storm sewers; reduction in soil erosion; and groundwater recharge. The degree of pollutant removal is related to the amount of runoff which exfiltrates the subsoils. It may also help reduce land consumption by reducing the need for traditional stormwater management structures.

There is a potential risk to groundwater due to oils, greases, and other substances that may leak onto the pavement and leach into the ground. Pre-treatment of stormwater is recommended where oil and grease or other potential groundwater contaminants are expected.

### **Application**

#### **Land Use**

Urban, urbanizing, rural

#### **Soil/Topography/Climate**

This practice should only be used on sites with soils which are well or moderately well drained. Since subgrade soils will differ in their capacity to infiltrate and percolate water, the design of modular pavement will vary slightly based on soil type. See the "Specifications" section of this BMP.

Weather conditions will also affect frost penetration depth. This practice is not recommended for barren areas with expected wind erosion.

#### **When to Apply**

Apply when the soil, topography and climatic conditions listed above can be met.

### Where to Apply

Apply in low-volume parking lots and roads, and in high activity recreational areas like basketball and tennis courts or playground lots. The area is generally limited to 0.25 to 10.0 acres and generally serves only a small section of the watershed. This BMP can also accept rooftop and adjacent parking lot runoff.

### **Relationship With Other BMPs**

Subsurface Drains may collect water infiltrating the subbase of the modular pavement and route it to an Extended Detention Basin or Infiltration Basin. This may be necessary for soils having marginal infiltration capabilities. The use of subsurface drains may diminish the pollutant removal efficiency of this BMP by not allowing the water to fully exfiltrate the soil. Subsurface drains may also be installed but allowed to remain capped, acting as a backup system if the modular pavement becomes clogged.

### **Specifications**

#### **Planning Considerations:**

Soil tests should be conducted to determine permeability, load bearing capacity, resistance to frost heaving, swell and shrink. Soils with a permeability rating of A or B (higher permeability) are more suitable than soils with a permeability rating of C (lower permeability). Evaluate the soils and drainage area to estimate the amount of water that may enter the modular pavement, and how fast this water will percolate through the soil. Underlying soils should have a minimum infiltration rate of 0.27 in/hr, or 0.52 in/hr for full exfiltration systems.

Diversions should be placed around the perimeter of the modular pavement to keep runoff and sediment completely away from the site both before and during construction. Plan to design Diversions in conjunction with the modular pavement.

#### **Design Considerations for Various Types of Modular Paving:**

As discussed below, modular pavement comes in a variety of materials, from lattice concrete blocks to modular brick or concrete pavers. This information was derived from "Water Resources Protection Technology: A Handbook of Measures to Protect Water Resources in Land Development," the Urban Land Institute (Tourbier and Westmacott).

**Lattice concrete blocks** are used for infrequent parking use, for lining grass swales, and for grass ramps. In parking areas, blocks should be laid on a bed of gravel or crushed aggregate (to give a sufficient capacity), and a 2-inch layer of fines and gravel. Interstices of blocks should be filled by screening with coarse sand. Spaces between blocks should be filled with coarse sand. Where the only purpose is for erosion control, blocks may be laid directly on soil and screened with topsoil. On driveways under lawns, blocks may be covered with 1-2 inches of topsoil

**Monoslab concrete blocks** result in a surface which is 25% concrete and 75% permeable soil. Blocks are of high-strength freeze/thaw resistant concrete, with both a rough and a smooth side. Lay the smooth side down for driveways, parking lawns, construction roads, erosion control, slopes banks, and waterways. Lay the rough side down for footpaths, sidewalks, bike trails, patios, malls

and tree grilles.

**Modular brick or concrete pavers** are perforated bricks, or bricks with lugs to control spacing. The brick or concrete pavers are made to a variety of specifications depending on the intended use, usually with a compressive strength of between 7,500-10,000 psi for use in areas where more wear is expected than for lattice blocks. Uses include paving around trees and dividing strips between impermeable paved surfaces. It is generally not conducive for walking. Interstices and perforations are usually kept free of vegetation.

Lay on a bed of gravel topped with 2 inches of coarse sand. The depth of the gravel will depend on the required stormwater storage capacity.

**Pre-Cast Concrete Perforated Pavers Laid over Pre-cast Concrete Lattice Blocks** can be made to a variety of specifications. A "web" opening may be in the order of 5" x 5" and 4.5" deep. The entire slab may be only 2.5 inches thick, with 0.75 inch diameter holes. These are laid on a base course of gravel of the necessary depth to provide storage capacity and 2 inches of coarse sand. This type of system is used in formal areas, especially where "warping" of large impermeable surfaces would be unsightly; also as a strip cover for French drains between areas of impermeable surface. Concrete blocks may be lifted and the web and sand filter cleaned out if the percolation rate falls.

#### **Construction Considerations:**

Where necessary, install a temporary Diversion to prevent runoff from entering the site during construction.

Install all modular pavement following manufacturer's specifications. The requirement for skilled labor for laying modular pavement may be reduced if mechanical vibrators are used for levelling uneven surfaces.

#### **After Construction:**

1. Stabilize the surrounding area and any established outlet following specifications in the Seeding and Mulching or Sodding BMPs. This will prevent sediment from entering the modular pavement.
2. Where applicable, remove temporary Diversions after vegetation is established.
3. Although snow and ice tends to melt more quickly on modular pavement, it may still be necessary to apply de-icing compounds to melt snow and ice. Do not use sand or ash because they may cause clogging of the pavement.

#### **Maintenance**

All modular pavement should be inspected several times in the first few months after construction, and at least annually thereafter. Inspections should be conducted after large storms to check for surface ponding that might indicate local or widespread clogging. If severe clogging occurs, the entire structure may have to be removed and old (clogged) filtering material replaced with new material.

Additional maintenance requirements will differ depending on the type of modular pavement selected. Follow the manufacturer's recommendations.

### **Exhibits**

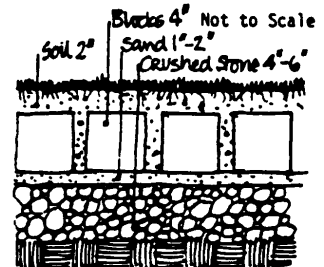
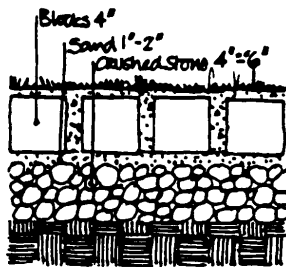
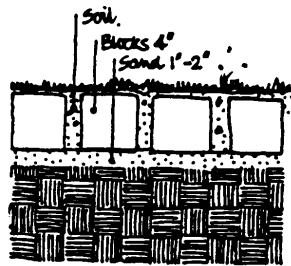
Exhibit 1: Examples of Modular Pavement. Source: "Water Resources Protection Technology: A Handbook of Measures to Protect Water Resources in Land Development," the Urban Land Institute.

Exhibit 1

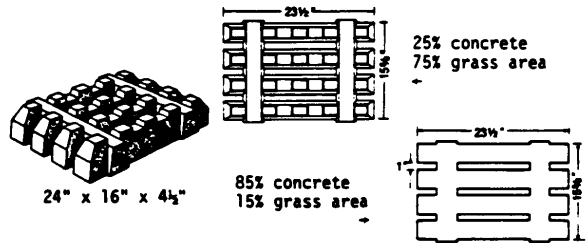
Examples of Modular Pavement



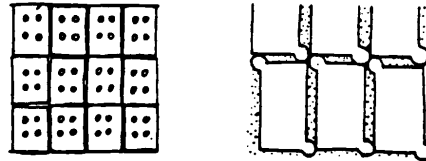
Concrete Blocks



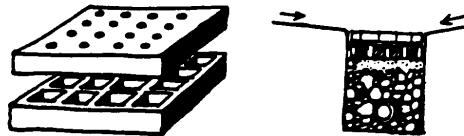
Monoslab Concrete



Modular Brick or Concrete Pavers



Pre-cast Concrete Perforated Paver Laid Over Pre-Cast Concrete Lattice Block



Source: "Water Resources Protection Technology: A Handbook of Measures to Protect Water Resources in Land Development," the Urban Land Institute.