PERMEABLE PAVING SYSTEMS

Permeable paving (also known as pervious or porous pavement) are surfaces that allow water to pass through voids in the paving material or between pavers while providing a stable, load-bearing surface. This allows stormwater to filter through the soil below the paved surface, reducing the numerous environmental issues associated with water runoff. Just as drinking water can be filtered to remove impurities, the soil particles filter rainwater percolating through soil on its way to surface waters and to groundwater aquifers. This important step in the natural process of water purification is bypassed when rainwater falls on impermeable pavement surfaces or roofs and is carried directly through storm drainage systems into waterways. Pollution carried in rainwater runoff is another concern, especially in urban areas. Stormwater flowing across streets, parking lots and sidewalks pick up contaminants associated with air pollution particles, spilled oil, detergents, solvents, dead leaves, pesticides, fertilizer, and bacteria from pet waste. Natural filtration of water through soil is the simplest way to control these pollutants, and is a direct advantage of permeable pavement.

CONSIDERATIONS

APPLICABILITY
Permeable paving systems are appropriate for parking areas, parking lots, drive aisles, private alleys, sidewalks, courtyards and plazas.

INSTALLATION
Permeable paving systems must be designed and installed in accordance with the manufacturer's specifications. These specifications and details must be included with the site plan submittal to the Development Services Center.

GRADING
In order to optimize water infiltration through the permeable paving system, the slope of the surface area should range from 0.5 percent to 2 percent.

SPACING
When designing a permeable paving system utilizing Open Jointed and Open Cell Paving Blocks (pavers) as described below for parking spaces above the minimum number required, the permeable area shall have a minimum perviousness of 10 percent. If a permeable paving system is being designed for stormwater management purposes, additional criteria will need to be met in accordance with applicable City and State regulations.

MAINTENANCE
The overall maintenance goal for a permeable paving system is to prevent clogging of the void spaces within the surface material. The surface must not be sealed or repaved with non-porous materials if it is to continue to function and to be counted towards meeting the maximum allowed parking requirement. Sand and salt must not be applied to areas with porous pavements. Depending on the system, occasional sweeping or vacuuming of debris will be required to ensure the void spaces do not clog. Educational signage should be used wherever porous pavement is installed as a teaching tool for the public and as a reminder of maintenance obligations.

LANDSCAPING
The most important landscaping objective for porous pavements is to ensure that its drainage area is fully stabilized, thereby preventing sediment loads from clogging the pavement.

ACCEPTABLE MATERIALS

There are many options for permeable paving materials: porous concrete, pervious asphalt, open joined and open cell paving blocks. Examples provided herein are meant as a representation of products available, not an endorsement of a specific product or manufacturer.

POROUS CONCRETE: There are a number of alternate names for porous concrete including permeable concrete, porous pavement, and pervious concrete. All of the names basically mean the same thing; porous concrete is a form of concrete which is permeable, rather than solid. Porous concrete is designed to trap water and allow it to percolate through the concrete to the ground below. Pervious concrete uses the same materials as conventional concrete, with the exceptions that the fine aggregate (sand) typically is eliminated entirely, creating a substantial void content.

- **Advantages:** Used in place of conventional concrete decreases the total amount of runoff leaving a site, promotes infiltration of runoff into the ground, reduces the amount of pollutants carried to a storm drain or waterway, and aids with reducing peak runoff velocity and volume. Porous concrete is applicable to many light-duty uses, including overflow parking areas, residential street parking lanes, parking pads in parking lots, sidewalks, golf cart and bike paths, and emergency access lanes. With proper maintenance, including regular vacuuming of the surface to prevent clogging by sediment, porous concrete can have a minimum service life of 20 years. It also comes in a range of colors, and it can be made with recycled materials including recycled concrete rubble. This flexibility and potential for recycling makes it an ecologically friendly and aesthetically pleasing building material.

- **Disadvantages:** Permeable paving is not ideal for high traffic/high speed areas because it has lower load-bearing capacity than conventional pavement. Nor should it be used on stormwater "hotspots" with high pollutant loads because stormwater cannot be pretreated prior to infiltration.

PERVIOUS ASPHALT: A typical porous pavement has an open-graded surface over an underlying stone bed. The water drains through the porous asphalt and into the stone bed, then, slowly, infiltrates into the soil. If contaminants were on the surface at the time of the storm, they are swept along with the rainfall through the stone bed. From there they infiltrate into the sub-base so that they are subjected to the natural processes that cleanse water.

- **Advantages:** Porous asphalt used in place of traditional impervious paving materials decreases the total amount of runoff leaving a site, promotes infiltration of runoff into the ground, reduces the amount of pollutants carried to a storm drain or waterway, and aids with reducing peak runoff velocity and volume. It is appropriate for pedestrian-only areas and for very low-volume, low-speed areas such as overflow parking areas, residential driveways, alleys, and parking stalls.

- **Disadvantages:** Permeable paving is not ideal for high traffic/high speed areas because it has lower load-bearing capacity than conventional pavement. Nor should it be used on stormwater "hotspots" with high pollutant loads because stormwater cannot be pretreated prior to infiltration.

OPEN JOINTED AND OPEN CELL PAVING BLOCKS: These pavers are solid units of concrete, brick, plastic or stone laid side by side. They can bear traffic loads and are shaped to produce openings that are filled with porous aggregate or turf that allows for infiltration of stormwater.

BLOCK PAVERS: This material can be used to create a porous surface with the aesthetic appeal of brick, stone, or other interlocking paving materials. They are most often used for driveways, entryways, walkways, or terraces.

PLASTIC GRID SYSTEMS: High strength plastic grids (often made from recycled materials) are placed in roadway areas. Some are designed to be filled with gravel on top of an engineered aggregate material, while others are filled with a sand/soil mixture on top of an aggregate/topsoil mix that allow grass to be planted on the surface.

- **Advantages:** Paving blocks have a long useable life, are relatively easy to install and provide good infiltration. Most plastic paver material is flexible so it can adapt well to shrink/swell and freeze/thaw conditions. Most commercially available plastic paver material is made from recycled material, an added environmental plus. The grids provide a support structure for heavy vehicles, and prevent erosion. After heavy rains, the grids act as mini holding-ponds, and allow water to gradually absorb into the soil below.
- **Disadvantages:** Some pavers are sensitive to deformation in the base or sub-grade and do require a thick base to prevent "heaving." In cold climates where areas need to be plowed for ice or snow removal, blocks may catch and cause damage to the blocks and/or plow.