Porous (or Pervious Pavement) Information Sheet (from http://www.perviouspavement.org/)

Pervious concrete pavement is a unique and effective means to address important environmental issues and support sustainable growth. By capturing stormwater and allowing it to seep into the ground, porous concrete is instrumental in recharging groundwater, reducing stormwater runoff, and meeting U.S. Environmental Protection Agency (EPA) stormwater regulations. In fact, the use of pervious concrete is among the Best Management Practices (BMPs) recommended by the EPA-- and by other agencies and geotechnical engineers across the country-- for the management of stormwater runoff on a regional and local basis. This pavement technology creates more efficient land use by eliminating the need for retention ponds, swales, and other stormwater management devices. In doing so, pervious concrete has the ability to lower overall project costs on a first-cost basis.

In pervious concrete, carefully controlled amounts of water and cementitious materials are used to create a paste that forms a thick coating around aggregate particles. A pervious concrete mixture contains little or no sand, creating a substantial void content. Using sufficient paste to coat and bind the aggregate particles together creates a system of highly permeable, interconnected voids that drains quickly. Typically, between 15% and 25% voids are achieved in the hardened concrete, and flow rates for water through pervious concrete are typically around 480 in./hr (0.34 cm/s, which is 5 gal/ft²/ min or 200 L/m²/min), although they can be much higher. Both the low mortar content and high porosity also reduce strength compared to conventional concrete mixtures, but sufficient strength for many applications is readily achieved.

While pervious concrete can be used for a surprising number of applications, its primary use is in pavement. This site focuses on the pavement applications of the material, which also has been referred to as porous concrete, permeable concrete, no-fines concrete, gap-graded concrete, and enhanced-porosity concrete.

Environmental Benefits

Pervious concrete pavement systems provide a valuable stormwater management tool under the requirements of the EPA Storm Water Phase II Final Rule. Phase II regulations provide programs and practices to help control the amount of contaminants in our waterways. Impervious pavements-- particularly parking lots-- collect oil, anti-freeze, and other automobile fluids that can be washed into streams, lakes, and oceans when it rains.

EPA Storm Water regulations set limits on the levels of pollution in our streams and lakes. To meet these regulations, local officials have considered two basic approaches: 1) reduce the overall runoff from an area, and 2) reduce the level of pollution contained in runoff. Efforts to reduce runoff include zoning ordinances and regulations that reduce the amount of impervious surfaces in new developments (including parking and roof areas), increased green space requirements, and implementation of “stormwater utility districts” that levy an impact fee on a property owner based on the amount of impervious area. Efforts to reduce the level of pollution from stormwater include requirements for developers to provide systems that collect the “first flush” of rainfall, usually about 1 inch (25 mm), and “treat” the pollution prior to release. Pervious concrete pavement reduces or eliminates runoff and permits “treatment” of pollution: two studies conducted on the long-term pollutant removal in porous pavements suggest high pollutant removal rates.

Economic Benefits

Parking areas paved with pervious concrete reduce the need for large detention ponds, because the pavement itself acts as a detention area. Parking lot owners that use pervious will spend fewer dollars on the labor, construction, and maintenance of detention ponds, skimmers, pumps, drainage pipes, and other stormwater management systems. Expensive irrigation systems can also be downsized or eliminated. In reducing runoff from paved areas, pervious concrete reduces the need for separate stormwater retention

ponds and allows the use of smaller-capacity storm sewers. This allows property owners to develop a larger area of available property at a lower cost.

Structural Benefits

► *Textured Surface*

Pervious concrete, lacking the fine aggregates of conventional concrete, has a unique surface texture. Made up primarily of rounded and angular aggregates such as gravel and crushed stone, it has an appearance similar to that of a Rice-Krispie treat. The exposed course aggregates of pervious concrete provide enhanced traction for vehicles and prevent driving hazards such as hydroplaning. The textured surface is especially beneficial during the most difficult and dangerous of driving conditions, such as in rain and snow.

► *Void Structure*

The permeability of pervious concrete provides increased safety for drivers. When used instead of impervious asphalt as a parking area pavement, pervious concrete substantially improves driving safety during wet weather conditions. Rain seeps down through the concrete rather than remaining on the surface, which eliminates the spraying and pooling of water. This subsequently reduces nighttime glare for the driver and lessens the risk of hydroplaning. Anecdotal evidence also suggests that snow-covered pervious concrete clears more quickly than other pavements, as its voids allow for more rapid thawing.

After a rainfall, there is a significant visible difference between pervious concrete and asphalt pavements. While asphalt stays slick with rainwater, pervious surfaces are more likely to remain unaltered by the weather. Click here to view pervious and asphalt comparison photos and see for yourself!

► *Strength and Durability*

Pervious concrete is a strong and highly durable material. Parking areas properly designed and constructed will last 20-40 years with little or no maintenance. Unlike asphalt, surface raveling (the loosening of surface aggregates) is common only in the first few weeks after the concrete is laid, and it can be reduced with proper compaction and curing techniques.

Pervious concrete mixes contain minimal amounts of water and therefore have very low slump (i.e. a stiff consistency). A much smaller amount of drying shrinkage occurs in the placement of pervious concrete than dense, and it develops sooner, as well. This allows many pervious pavements to be constructed without crack-preventing control joints. Random cracks that do form are not abundant, and they have no significant impact on the structural integrity of the pavement. They also generally do not detract aesthetically from the concrete's appearance.

Pervious pavements can achieve strengths in excess of 3000 psi (strong enough to support a fire truck), and even more with special mix designs, structural designs, and placement techniques. The key to high-performance concrete is the use of supplementary cementitious materials such as silica fume, fly ash, and blast furnace slag, all which increase durability by decreasing permeability and cracking. Concrete strength can also be maximized by installing subgrade and subbase levels of course and/or fine aggregates beneath the pavement.