POROUS CONCRETE PAVEMENT

By W. R. Cauthan, P.E.

Porous concrete pavement has been around the construction industry for a quite a number of years. Essentially, porous or pervious concrete is a structural concrete pavement with a large volume (15 to 35 percent) of interconnected voids containing a mixture of cement, coarse aggregates and water. Porous concrete has always been a tantalizingly interesting paving material but, due to the lack of proven durability as a construction material and its ability to maintain porosity and permeability, engineers have been hesitant to use this material. There is still relatively limited practical experience with porous concrete pavement for most engineers as compared to traditional pavements and, at some sites where it has been used, there have been either structural or functional failures. These failures have been primarily attributed to poor design, inadequate construction techniques, its use on soils with insufficient permeability, and poor maintenance. In the past, there has been neither a clear and easy method of taking advantage of the lower curve number (CN), nor the ability to take advantage of the storage capacity of porous concrete in the State and local Stormwater permitting process. Therefore, there has been no advantage to designing with this material.

This might be changing, however, as cities like Green Cove Springs, Stuart, Titusville and Winter Park, along with the counties of Brevard, Charlotte, Hernando and Pasco, have developed ordinances to address porous pavements. For example, the Code of Land Development Regulations for the City of Titusville reads, *"When pervious concrete pavement is used in development of the site, twenty-five (25) percent of the area covered by the pervious pavement shall be regarded as impervious and shall be constructed per City of Titusville Specifications on file with the Water Resources Department."*

Due to the porosity of porous concrete and the reduced rate of runoff from the first inch of rainfall, one of the advantages of porous concrete, as it relates to water quality, is the removal of stormwater pollutants. Removal of total nitrogen and total phosphorous is accomplished as these pollutants become trapped or absorbed and broken down in the underlying soil layers. Pollutant removal can be improved through routine vacuuming and high pressure washing of the porous concrete.

Additionally, when combined with certain drainage modifications, porous concrete pavements can also provide limited runoff quantity control, particularly for smaller storm events. For some smaller sites, trenches can be designed to capture and infiltrate stormwater. Porous concrete pavement will definitely need to be used in conjunction with other structural controls to provide protection for greater storm events.

Examples of such modifications to the standard porous pavement design that have been used include: placing perforated pipe near the top of a crushed stone reservoir to pass flows to a conventional surface detention pond after the reservoir is filled, connecting the stone reservoir to a stone filled trench, or placing an underground vault system beneath the porous pavement and stone reservoir.

Porous concrete pavement systems are typically used in low-traffic areas such as the following types of applications:

- Parking pads in parking lots
- Overflow parking areas
- Recreations trails
- Golf cart and pedestrian paths
- Emergency vehicle and fire lanes

The primary drawback has always been the cost and the complexity of porous concrete pavement systems as compared to conventional pavements. Porous concrete systems require a very high level of construction workmanship to ensure that they function as designed, and they experience a high failure rate if they are not designed, constructed, and maintained properly.

Slopes should be flat or gentle to facilitate infiltration versus runoff, and the seasonal high water table should be low. Steeper slopes should also be avoided to prevent erosion of the base beneath the pavement as water passes

through it. Also, due to the potential for clogging, porous concrete pavement should not be used for removal of sediment.

With greater emphasis on green building and sustainable growth, porous concrete pavement could be an increasingly important design material and an idea whose time has arrived. By capturing stormwater and allowing it to seep into the ground, porous concrete could become a key component in the treatment train and instrumental in reducing stormwater runoff. Porous concrete pavement could play a significant role in designs to accomplish the requirements of the new State of Florida Unified Stormwater Rule and could be prominent as a Best Management Practice (BMP).

While porous concrete pavement is not expected to eliminate use of conventional paving systems, for those of us with limited experience with this building material, it might be time to take another look.

Ron Cauthan is a Principal/Senior Project Manager for Chastain-Skillman's Civil Engineering Department in Sebring. His work focuses on private and municipal roadway and drainage projects. Ron received a Bachelor of Civil Engineering Degree from The Citadel in 1975. He can be reached at (863) 382-4160 or rcauthan@chastainskillman.com.