POROUS PAVEMENTS IN GEORGIA

Bruce K. Ferguson

AUTHOR: Franklin Professor of Landscape Architecture, School of Environmental Design, 609 Caldwell Hall, University of Georgia, Athens, Georgia 30602
REFERENCE: *Proceedings of the 2007 Georgia Water Resources Conference*, held March 27–29, 2007, at the University of Georgia.

Abstract. Porous pavements can contribute to the solution of urban stormwater management problems at the source. Georgia has been acquiring experience in porous pavement installations which elucidate the care that is necessary in making future installations successful.

INTRODUCTION

Today's porous pavements admit air and water to the pavement base and the underlying soil, while bearing intense urban traffic. They have the potential to restore rain water's natural path in the soil, limit urban flash flooding, biodegrade oils, replenish ground water, and give urban trees the rooting space they need to grow to full size. The cost of porous pavement, with its built-in stormwater management, can be less that that of an impervious pavement with a separate stormwater management facility downstream.

Porous pavements of various kinds have been installed in Georgia for years — successfully and unsuccessfully in various installations. Examples are listed in Tables 1 through 5. The number of installations is increasing rapidly.

Recently completed research (Ferguson, 2005) has defined and organized the porous pavement field as a whole for the first time. The research consumed eight years, and included interviews with 170 experts in the field, reading of 800 technical articles and reports, and a firsthand survey of 270 installations of all kinds of porous pavements in all parts of North America.

Different porous paving materials present distinctive construction requirements and experiences. For example:

POROUS AGGREGATE

Single-sized aggregate without any binder is at once the most permeable and the least expensive of all paving materials. The particles must be angular in order to produce stability, and open-graded (single-sized) to give porosity and permeability. Georgia is blessed with abundant supplies of highly durable crushed-stone aggregate. Traffic can displace unbound aggregate, so it can be used only in very low-traffic settings such as seldom-used parking stalls. Failures have consisted of displacement where the material was used under inappropriately heavy traffic.

POROUS TURF

Living turf absorbs CO_2, emits oxygen, cools by evapotranspiration, absorbs noise and glare, and gives a "green" appearance. Excessive traffic can wear and compact a turf surface, so turf's vehicular applications are limited to settings with only occasional parking such as churches and stadiums. Failures have consisted of rutting in plastic clay. A common feature in successful applications is a thick, well drained, sand-based rooting zone.

OPEN-JOINTED BLOCKS

Pavements of open-jointed blocks such as Eco-Stone, SF-Rima, and Ecoloc obtain their porosity and permeability from open-graded aggregate in the blocks' open joints. This industry has admirably uniform standards in ASTM C936, and guidelines from the Interlocking Concrete Pavement Institute. Pavements following these standards give a geometric, architectural look, and can bear notably heavy traffic. Experiences in Georgia have paralleled those in many other states and Canada. Failures have consisted of slow infiltration rates in early installations that used inappropriately dense-graded aggregate. More recent installations have used correctly open-graded aggregate, and show excellent infiltration rates (Wright, 2004).

POROUS CONCRETE

Georgia's porous concrete installations have built upon previous experience in Florida, where the material originated. The first installation outside Florida may have been in 1992 at Georgia's Jones Ecological Research Center, on sandy Coastal Plain soil like that in Florida. The first installation outside the Coastal Plain, on the clay soil of northern Georgia, was a small driveway at the Southface Institute in Atlanta in 1996. A critical feature of porous concrete is that it must be installed by a qualified installer, and Georgia now has some of the country's most experienced and best-regarded installers. Failures have consisted of raveling where water content was not correctly controlled during installation. Successes have evidenced both excellent durability and excellent infiltration rates.

POROUS ASPHALT

Georgia's porous asphalt installations have built on prior experience largely in the mid-Atlantic states. Failures have consisted of uncontrolled "draindown" of asphalt binder through the material's pores, leading to surface raveling and reduced infiltration rate. Georgia DOT has installed porous asphalt overlays on impervious bases on Interstate highways statewide. DOT has benefited from highway research in Europe, and has contributed further to technology that controls draindown and prolongs overlay life (Georgia DOT, no date; Huber, 2000; Watson, Johnson and Jared, 1998).

CONCLUSIONS

To date, porous pavements constitute only a minute fraction of the paving done each year in Georgia and the rest of the United States. But their rate of increase, on a percentage basis, is very high.

Georgia's experience with porous pavements shows that in Georgia, as in other states, a full range of porous paving materials is available, and the ability to install successful installations exists. It shows that care is required in selection, design, and installation. Construction on Piedmont clay has been successful as has that on Coastal Plain sand, although not all the hydrologic results are the same.

Among the experiences with porous pavements in Georgia and around the country, some provide models to be emulated; others point out problems to practitioners so that the mistakes of the past need not be repeated. Experience gives responsible professionals the information they need to evaluate one kind of pavement material against another, participate in responsible professional debates, and correctly adapt porous pavements to unique site-specific conditions. Installation of porous pavements is not more difficult than that of dense pavements, but it is different, and its different specifications and procedures must be strictly adhered to.

LITERATURE CITED

Ferguson, Bruce K., 2005. *Porous Pavements*. Boca Raton: CRC Press.

Georgia Department of Transportation, Office of Materials and Research, [no date]. *Georgia's Modified Open-Graded Friction Course*. Accessed from web page for "Office of Materials and Research" at www.dot.state.ga.us.

Huber, Gerald, 2000. *Performance Survey on Open-Graded Friction Course Mixes*. National Cooperative Highway Research Program Synthesis of Practice 284, Washington: Transportation Research Board.

Watson, Donald, Andrew Johnson, and David Jared, 1998. Georgia DOT's Progress in Open-Graded Friction Course Development. Prepared for presentation at *1998 Annual Meeting of the Transportation Research Board*, on file at Georgia Department of Transportation Office of Materials and Research, Forest Park.

Wright, Mark, 2004. Robson Center Uses Permeable Pavements. *Interlocking Concrete Pavement Magazine* vol. 11, no. 4, p. 20-21.

Table 1. Examples of porous aggregate installations in Georgia.

Location	Name	Installation Date	Reinforcement	Application
Athens	Southeast Clark Park	2004	Gravelpave	Parking
Athens	Athens Welcome Center	2002	Gravelpave	Parking
Athens	1510 Prince Avenue	2002	Gravelpave	Parking
Athens (UGA)	Herty Mall	2001	None	Pedestrian
Athens (Westpark Drive)	Creekside	2002	RKM Grassy Paver	Parking
Savannah	Good Eats Restaurant	2003	Gravelpave	Parking
Stone Mountain	Stone Mountain Paark	2000	Geoweb	Access road

Table 2. Examples of porous turf installations in Georgia.

Location	Name	Installation Date	Reinforcement	Application
Athens	Southeast Clarke Park	2002	RKM Grassy Paver	Parking
Athens	Tailgate Station	2001	Grasstrac	Parking
Buford	Mall of Georgia	1999	None	Parking
Duluth	Town Green	2004	Sand rooting zone	Pedestrian
Savannah	Good Eats Restaurant	2003	Gravelpave	Parking

Table 3. Examples of open-jointed block installations in Georgia.

Location	Name	Installation Date	Block Model	Application
Athens (UGA)	Denmark Hall	1996	Eco-Stone	Parking
Atlanta	English Park	1998	Drainstone	Parking
Atlanta	Alpha Delta Pi Sorority	2003	Eco-Stone	Parking
Buford	Gwinnett Environ-mental & Heritage Center	2006	SF-Rima	Parking
Conyers	Rockdale County Water Dept.	2002	Eco-Stone	Parking
Gainesville	Robson Center	2003	SF-Rima	Parking

Table 4. Examples of porous concrete installations in Georgia.

Location	Name	Installation Date	Application
Athens	198 Waddell Street	2003	Parking
Athens	Athens Transit Center	2003	Bus parking
Atlanta	East Atlanta Library	2005	Parking
Atlanta	Southface institute	1996	Parking
Buford	Sam's Club	2000	Parking
Fitzgerald	WalMart	2003	Parking
Guyton	Efffingham County Dry Waste Collection Site	1999	Industrial
Juliette	Jarrell Plantation State Park	2002	Pedestrian
Newton	Jones Ecological Research Center	1992	Road & parking
Rincon	Video Warehouse	1995	Parking
Savannah	WalMart	2000	Parking
Savannah	Bull Street Library	1995	Parking

Table 5. Examples of porous asphalt installations in Georgia.

Location	Name	Installation Date	Application
Alpharetta	Webb Bridge Park	1998	Parking
Atlanta and elsewhere	Interstate highways	1990+	Highway overlays
Covington	Oxford Campus of Emory Univ.	1996	Parking
Roswell	Sweet Apple Park	1997	Parking