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Contents

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VOL. 114 NO. 1
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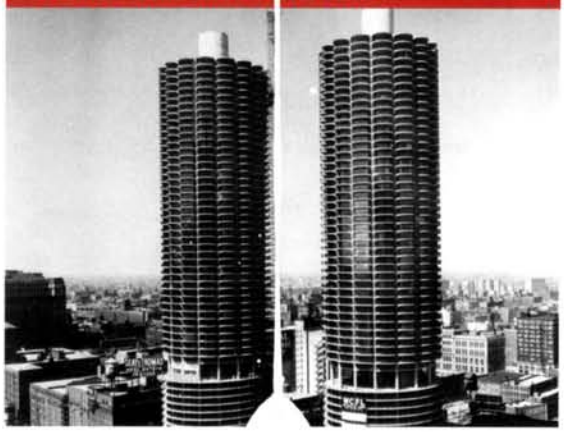
COVER PROJECT, P.48

Oldcastle Precast-Concord (N.C.) engineers a 78-piece roadway crossing and emergency spillway structure serving a new lake at Poston Park in Gaston County, N.C. The Concord plant will host a January 27 tour for 2011 Precast Show (January 25–29, Charlotte) attendees. PHOTO: Oldcastle Precast

ELEVATED-SLAB MILESTONE, P. 18



Stakeholders in Marina
of the Chicago concrete
PHOTO: Portland Cemen

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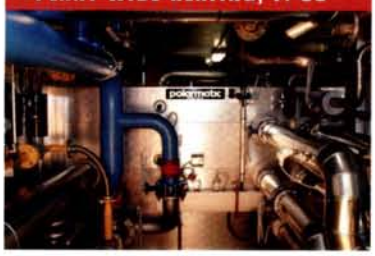
NPCA CHAIRMAN, P. 28

PLANT-WIDE HEATING, P. 35

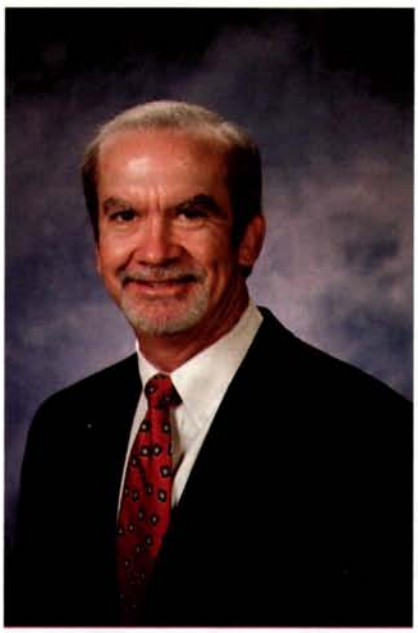


DEPARTMENTS

GET PERVIOUS

BY LAURA DROTLEFF AND DON EBERLY

PERVIOUS CONCRETE WITH AN EXPANDED CLAY LIGHTWEIGHT AGGREGATE BASE ADDRESSES GROWING STORM WATER MANAGEMENT ISSUES AND MANDATES.



Jeff Speck

With rising concern toward reducing the pollutants in water resources, regulators are turning a more critical eye to land development. Runoff from developed real estate pollutes surface and groundwater supplies and leaves the sites in higher rates and volumes, leading to downstream flooding and bank erosion. Pervious concrete pavement minimizes the impact of development by reducing runoff rates and protecting water supplies.

Jeff Speck, vice president of sales and marketing at Big River Industries, Inc., a company based in the Southeastern U.S. that produces rotary kiln-fired expanded clay lightweight aggregate (LWA), provides answers about the basics of using pervious concrete and how developing a pavement drainage system using expanded clay LWA offers substantial results in storm water management.

Q. HOW DOES BIG RIVER INDUSTRIES DEFINE PERVIOUS CONCRETE?

A. The definition of pervious concrete is well-handled in the industry through the American Concrete Industry's (ACI) Committee on Pervious Concrete. Pervious concrete is described as a zero-slump, open-graded material consisting of portland cement, coarse aggregate, little or no fine aggregate, admixtures, and water. The combination of these ingredients produces a hardened material with connected pores, ranging in size from 0.08 to 0.32 in. (2 to 8 mm), that allow water to pass through easily. The void content can range from 18 to 35 percent, with typical compressive strengths of 400 to 4000 psi (2.8 to 28 MPa). The drainage rate of pervious concrete pavement will vary with aggregate size and density of the mixture, but generally falls into the 2 to 18 gallons per minute, per square foot (81 to 730 L/min/m2) range.

In different applications, the compressive strength will vary, depending on the weight the concrete will need to bear. For example, a pedestrian walkway would not need to have the compressive strength necessary for a street or a parking lot. Heavy traffic, like that of streets, would necessitate concrete to be thicker and stronger, with a higher psi and lower void content to support it. Generally, the higher the void content, the lower the compressive strength.

Q. WHY IS PERVIOUS CONCRETE USED?

A. Pervious concrete is an important application for sustainable construction and is one of many low impact development techniques used by builders to protect water quality. The Environmental Protection Agency has adopted a policy that recommends using pervious pavement as part of its Best Management Practice for communities to mitigate the problem of storm water runoff. In areas that frequently encounter heavy storms that cause quick accumulation of large amounts of storm water, the use of pervious concrete reduces runoff volume. Increasingly, engineers are developing projects to retain storm water on site to recharge ground water. Pervious concrete aids in that goal while often being more cost effective than conventional concrete because it allows for elimination or downsizing of storm sewers.

Q. WHAT ARE THE BENEFITS OF SPECIFYING LWA FOR PERVIOUS CONCRETE PROJECTS?

A. Pervious concrete is ideally installed as a storm water drainage system, rather than the typical slab on grade concrete in conventional pavement applications. One of the key requirements for performance of the system is that the water has someplace to go once it infiltratesthe concrete.

ACI recommends using an 8- to 24-inch layer of clean aggregate base below pervious concrete. Expanded clay LWA particles in an open gradation offer a high absorption capacity that essentially doubles the void content of the drainage layer, compared to that of crushed stone or other aggregate, which does not absorb water.

Because of its porosity and ability to filter contaminants from storm water before releasing it to the ground, using LWA allows contractors to reduce the thickness of the drainage layer, sometimes in half, providing

cost and labor savings. When pervious concrete is completely saturated and subjected to freezing, the water has no place to go, which can cause pressure and deterioration. This is another reason why a drainage layer with porous LWA is important, because it channels water away and keeps pervious concrete from cracking.

Q. ARE THERE DIFFERENT FORMS OF PERVIOUS CONCRETE?

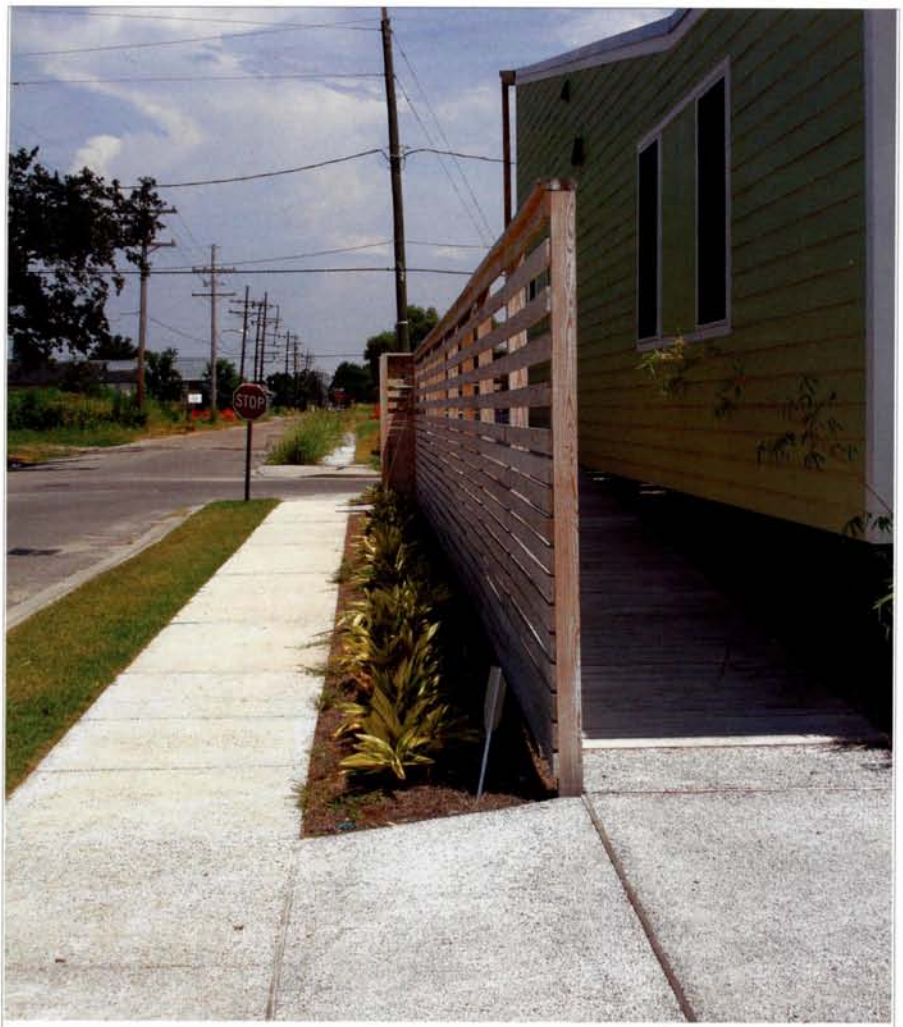
A. Recently, a great deal of focus has been placed on interlocking concrete pavers. The primary form of a pervious concrete interlocking paver creates a space between the units themselves, typically at the corners. For example, instead of each paver retaining a rectangular shape, paver producers miter the edges to create a diamond shape at the corners. Contractors using them can then fill the spaces in the corners with stone to allow water to infiltrate into the pavement system. Where there may be concern about the durability of pervious concrete under certain climatic conditions, interlocking pavers are often made with a focus on durability. While the pavers themselves are very strong with a lower void content, the spacing between pavers allows for storm water infiltration, thus providing a product with a potentially long service life.

Q. HOW DOES BIG RIVER INDUSTRIES WORK WITH CONTRACTORS, ENGINEERS, ETC. IN THE FIELD OF PERVIOUS CONCRETE?

A. Primarily, Big River Industries aims to help contractors and engineers understand the benefits of using LWA in the drainage layer beneath pervious concrete. We want engineers and contractors to recognize that placement of pervious concrete is only part of the equation. They need to account for having the whole pavement system in place to accomplish the ultimate goal: reduced storm water runoff and increased soil absorption. Throughout the United States, we are finding that an increasing number of projects are requiring zero runoff. Engineers and contractors should be prepared for required storm water management on future projects.

A prime example of more common projects aimed at reducing the environmental impact is the new Christopher W. Klaus Advanced Computing Building on the Georgia Institute of Technology (Georgia Tech) campus. The university mandated that 100 percent of the storm water was to be kept on site. Through the use of roof downspouts, cisterns, retaining walls, and a bioretention system that included a self-sustaining, on-site rain garden, the environmental engineer on the job was able to fill that requirement. Big River Industries helped by working with the environmental

A lightweight aggregate base increases a pervious concrete slab's performance by essentially doubling the void content that could be factored in a drainage layer of conventional aggregate. Lightweight aggregate's porosity and contaminant-filtration capacity can reduce by up to 50 percent the thickness of a crushed stone drainage layer.



Pervious concrete has been used in lieu of conventional flatwork for a post-Katrina New Orleans neighborhood.

Lightweight aggregate suits drainage layer specifications for an alternative to pervious concrete slabs: Permeable concrete pavers, typically molded with mitered corners and edge profiles that create joints and voids for runoff capture.

engineer to communicate the benefits of using engineered soil containing LWA, both in the bioretention area and in the lawn at the front of the building.

Q. HOW IS CONSTRUCTION OF PERVIOUS CONCRETE PAVEMENT DIFFERENT FROM CONSTRUCTION OF ORDINARY PAVEMENT?

A. Pervious concrete differs from impervious pavement both in the selection of materials in the mixture and in the techniques used to place and finish the pavement. In the concrete mixture itself, pervious concrete uses very little to no fine aggregate, such as sand or crushed stone, instead using aggregates that create large voids for increased pavement porosity. Pervious concrete finishing techniques are very different as well. Whereas the smooth surface of the conventional concrete is of utmost importance, with pervious concrete, contractors have to make sure not to seal the surface and ultimately close pore spaces that allow water to filter through the pavement.

The goal is to transport it as quickly and as close as possible to where it needs to be, rake it into place, and try not to move or disturb it to avoid packing it down. As a zero slump concrete, contractors take a great deal of care in the placement of the material to avoid filling voids, contaminating the concrete, and standing or driving on top of it to maintain its integrity.

Q. HOW CAN BUILDING PROFESSIONALS ACCESS PERVIOUS CONCRETE GUIDELINES AND SPECIFICATIONS?

A. Engineers and contractors can purchase the ACI 522 Committee on Pervious Concrete documents on the ACI web site, for specification sheets and guidelines. Visit www.concrete.org for more information. To learn more about Big River Industries, Inc. and its expanded clay LWA product applications, visit www.bigriverind.com. On Big River Industries' website, we work diligently to post product documents and application guidelines that our team constantly updates to yield informative support for industry professionals.

Authors note: Don Eberly is president / CEO of Eberly & Collard Public Relations, Laura Drotleff is a writer for the firm. The company (www.eberlycollardpr.com) specializes in public / media relations, market research and writing in the Construction, Design/Build, Landscape, Home, and Agribusiness industries.