Pervious Evolution

The main item on the table was salt and the alarming aspect of pervious carnage that has appeared in localized areas where deicing salts are used. Pervious has another unique and peculiar aspect of vulnerability to brine exposure. The surface area of the internal lining of the void structure is exposed to storm water that includes brine from deicing products applied to the surface of the pervious concrete pavement slab.

It is my intention to sound the alarm, regarding this problem, mainly to those who promote this pavement and those who would consider owning pervious concrete pavement. The Bunyan Pervious Roast is a gathering of talented industry professionals who share ideas about making better pervious. We are diligently working on answers for those who already own pervious concrete pavement, to make it more functional and serviceable.

The work done by our Roasters group, including Phil, Colin, and crew from NRMCA and others came together in an excellent Operation and Maintenance Guide for pervious. In that Guide, we were able to emphasize the importance of continued infiltration maintenance and an enhanced section on deicing salts. We highly recommend this document for all who own this pavement and especially for those who build it.

Roast Report

A summary of the ongoing pursuit of excellence in pervious concrete pavement. The 2014 proceedings of the fifth, annual Bunyan Pervious Roast in Las Vegas and the continued work of the Roasters in the advancement of pervious concrete construction practices.

Bunyan Industries

We have made great progress during recent years. It is useful to review the steps of evolution that pervious has made, starting with the most important one.

More Water

The industry recognized and adopted the use of flowable pervious mixtures in 2009 and we began Roasting immediately thereafter.

We have found that many of the ways used to make better pervious concrete are also ways to make it more manageable and reliable to work with. Certainly, an elevated water to cement ratio does both. The zero slump material, sometimes called a “meatball mix” made reference to observing the mixture while forming a cohesive ball. These mixtures ranged from .26 to .28 in water/cement ratio and they would rarely maintain a “wet metallic sheen” long enough to complete the placement process. Modern pervious is wet enough to slump freely and is proportioned with a water/cement ratio at .32.

Elevated water content allows us to build this pavement that is bonded with paste that is more uniformly shaped, well consolidated, free from surficial defects. Our early experience showed that paste with these properties had better performance.

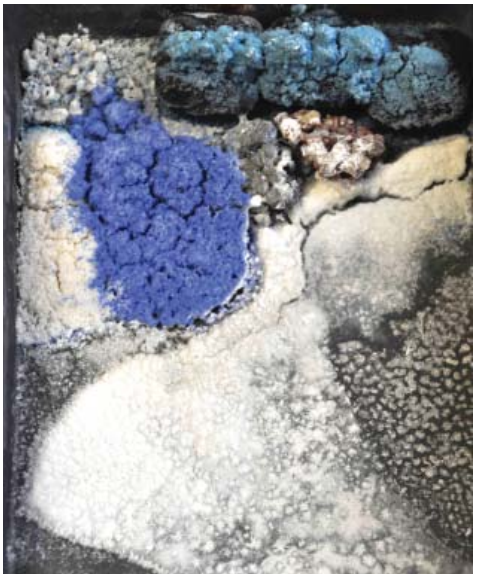
In 2011 we adopted the use of “wet voids” to evaluate the void content of a given aggregate sample. We explored examples of aggregate that showed broad variation between the conventional ASTM C-29, gravimetric calculation of the solids. Another step is added to the normal procedure to top of the measure with water and note the added weight. A calculation is made to determine the space available in the aggregate, and it is done with the aggregate sample in SSD condition rather than having been baked out to dry condition. This variation of the conventional aggregate voids calculation has proven to be a useful verification of the aggregate voids, our critical target for proportioning a certain aggregate source.

Our keen attention to moderating the proportion of total powder content in a pervious mixture is to allow space for sufficient moisture, without choking the voids with excessive paste.

Surface Compaction

The evolution of pervious made a giant step forward with slumpable mixtures and another big step came when we began using the motorized pan float. Wetter mixtures will consolidate more readily and are more responsive to compaction forces. This means that a motorized roller screed will be sufficient to compact the body of the slab with this type of mixture, with suitable density and infiltration. However, the cross rolled finishes lacked a certain durability that is needed. We found that a motorized pan float could apply more intense compaction with great benefit to the surface durability, uniformity, flatness and appearance, without choking the infiltration. This type of surface finish proved to be more maintenance friendly as the tighter surface prevents larger particles of debris from entering the void passage openings.

We were anxious to demonstrate the durability of this type of pervious construction and began staging hotrod burnout demonstrations on slabs that were just four days old. One of our team, Mr. Wang, introduced the motorized pan at the 2011 Bunyan Pervious Roast. Since then, everything else looks like stretch marks. We demonstrated the technique of panned finishes at the 2012 World of Concrete and the pervious industry is slowly adopting it as a replacement of the standard cross rolled finish. At the 2015 World of Concrete, we introduced our new “Man Pan”, a dual 36 inch hydraulic pan that features precise maneuverability while reaching 26 feet from the slab edge. A whole new range of options become available when this platform is deployed immediately behind the strike-off process.



Pervious Concrete, an emerging and formative new industry.

Many people believe that the pervious concrete industry contains an opportunity to sell some product, especially products that are consumed in the process. The evolution of available products for pervious has attracted the resources of us who sell screeds and other equipment. However, the race is intense among those who sell consumables, especially the integral components of the pervious concrete mixture. The pervious concrete industry has been plagued by scams that claim to assure success in your pervious construction and ownership experience but the best answers are more simple and far less mysterious.

Consumable Products for Pervious

I am quick to point out the wonderful features of our Bunyan products. However, I claim a certain unbiased evaluation of those products we call “consumable”. I think it is valuable to understand the features that a person would expect from these various products, in plain language. Once these features are known, each builder can decide what is money well spent for pervious mixtures with added value. Our baseline is called generic pervious, just the basics with a little sedative to keep it from going off.

Top Three

Our first choice for a value added component for pervious concrete is an admixture, called Mix Water Conditioner. This product is added to pre-water during the batch sequence and helps the mix water to connect more effectively. The pervious mixture that is treated with this admixture will require less hydration stabilizing admixture (HSA) to delay set during construction. This admixture was first introduced by Robert Bickers at the 2010 Roast. It is also available now from Solomon, called CA 2000/P.

We find various benefits with silica fume in the pervious mixture. One of these benefits is an aid to the panning compaction process. Fume causes a shift of rheology in the paste and added lubricity, which aids the panning compaction process. Another valuable function of silica fume is found in particle packing, an essential component of salt resistant mixtures.

Macro fibers are made manageable in high volume with a marvelous product from Forta, called Ferro-Green. We made some beams with an extra high dose at 7.5 pounds per yard, to demonstrate the amazing performance of macro fibers. Our standard dose of Ferro-Green is 5 pounds per yard, another one of our top three value added components for pervious concrete.

Fish Condos

We missed Brian at the Roast and when I found him, he was making catfish condos. Nesting shelters, actually, to be embedded in the banks of the Chicago river. Young channel cats are vulnerable to some invading species in the river and canals of this complex, urban watershed. These pervious concrete catfish condos will provide shelter for young catfish until they are big enough to escape predators on their own.

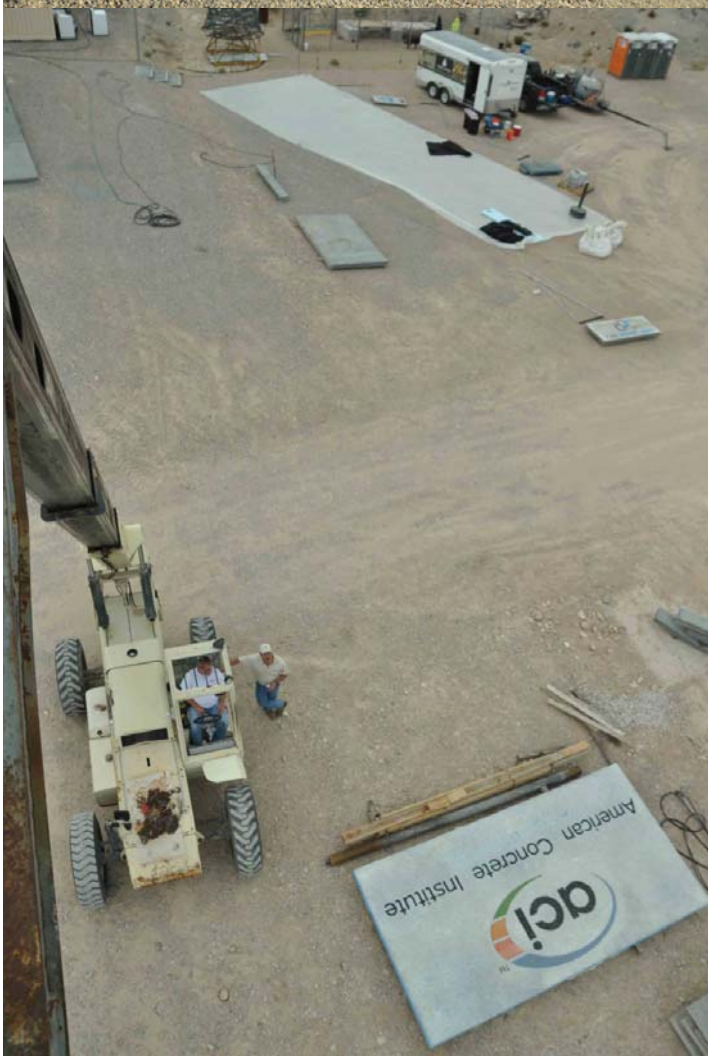
We also found Michael Repkin in Chicago, tending the entire census of the bug zoo at his main facility in the public school system. Along with bugs, plants and soils, a new feature is being added to their “soil building” process, bio char. This charcoal is produced and added to composted soil. Our interest in the bug zoo and bio soils is to culture this medium in rain gardens and other landscape that surrounds pervious pavement systems. As organic contamination collects in the pavement section, these microbes will populate those spills and mitigate them. I found William Flood there, too. He had his mom and dad with him as we explored the habitat. Wow!

Repair Strategies

Three types of repairs were presented at the 2014 Roast. Pervious concrete pavement that was built with sufficient voids and has raveled, may be milled, cleaned and overlaid with permeable concrete in a thin overlay. Slabs were prepared for this overlay process as well as a repair that uses interlocking pavers. The pavers were supplied by Cal Star, who markets this product for installation on pervious concrete or on compacted base materials. These pavers are extra tough and have good resistance to deicing salts. The Cal Star pavers offer a quick and sure way to repair a raveled surface.

Other repair methods include a thin overlay that is not always resulting in full permeability. These are also more expensive materials and are used for localized repairs between .5 inches and 1 inch thick. These offer superb durability as well as certain aspects of decorative options. Epoxy products tend to suffer under exposure to ultraviolet sunlight, so exterior repairs are done best with poly aspartic, a popular decorative product for the well funded.

Poly aspartic is also used as an excellent binder for rubber aggregate mixtures, a popular playground surface again, for the well funded. This product is transparent and brings out the colors of glass and decorative aggregate. That's why we chose it for the logo slab for ACI.



We express our thanks to our partners and sponsors of this important work. Pervious concrete pavement will find its place among the choices of pavement products, thanks to the participation of these generous people.

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