

PERVIOUS CONCRETE: A Case Study

By JJ McCarthy

The impending revised Virginia Storm Water regulations will likely have owners, designers, and contractors exploring new strategies for storm water systems.

In that regard, a viable alternative to traditional storm water management is a pervious concrete paving system. Pervious concrete mix has no sand and a low water content when combined it creates about a 20 percent void ratio that enables the concrete to handle approximately 450 inches of rain water per hour. The storm water is ultimately drained through the paving section that consists of six inches of pervious concrete, six to 18 inches of open-graded gravel without fines (typically #57 stones), a compacted sub-grade with filter fabric and an under-drain system of perforated pipe that facilitates storm water flow below the sub grade.



Associated Builders and Contractors-Virginia Chapter (ABC-VA) Training Facility

In its quest for LEED Gold certification, ABC-VA's new training facility located in Dulles, Virginia utilizes a pervious concrete paving system. The system made sense for the project for a number of reasons in addition to it meeting the LEED credit for storm water quality control. Because the building site has rock underneath that negates storm water from penetrating the ground, it currently gets discharged to a flood plain; however, in the future, by increasing the gravel depth, pervious concrete paving sections may be designed as water quantity retention structures, freeing up the Storm Water Management pond for future development. Other positive reinforcements are that the site is entirely void of storm drain inlets, as well as underground storm water piping (nor is it littered with curb and gutter for storm water conveyance). Lastly, if the site is flat, the fact that a pervious concrete system does not need a slope to drain can not only be a welcomed relief, but a cost-saver.

Design Phase

During the design phase it was decided not to extend the gravel down to the frost line. Pervious concrete has positive freeze/thaw characteristics that allow water to flow through the voids of both it and the gravel without the freeze and expand elements that could damage the system.

Another issue that was addressed in the design was a problem some heavy truck tires have with "raveling" on pervious concrete. To combat this all truck travel lanes were designed with a traditional concrete paving system with the parking stalls remaining entirely pervious; the travel lanes slope to drain the storm water to the pervious parking stalls. In addition, the storm water from the roof is conveyed to gravel under the pervious paving and is drained to the flood plain.

Dollars and Cents

The general perception is that a pervious system always costs more than the traditional; this was not the case for the ABC-VA Training Facility. Based on historical information and an allowance of \$250,000 for a water quality structure, the pervious system at the very least broke even. Down the line there is potential for greater savings on other projects if the site is flat and has a natural slope to the flood plain.

LEED Accreditation Points

A pervious concrete system contributes several points in both the *Sustainable Site* category and the *Material and Resource* category of the LEED® rating system.

The following credits may apply for *Sustainable Sites* credits:

- **SSc6.1:** Storm Water Design, Quantity Control - if using the system for water quantity retention
- **SSc6.2:** Storm Water Design, Quality Control - if using the system for water quality
- **SS7.1:** Heat Island Effect, Non-Roof - by providing a high reflectance and a low absorption of heat

The following credits may apply for the *Materials and Resource* credits:

- **MRC2:** Construction Waste Management – by recycling concrete waste



The pervious concrete being leveled with a vibratory screed



The pervious concrete being rolled and cut in a construction joint

- **MRc4:** Recycled Content – by using cement replacements such as fly ash
- **MRc5:** Regional Materials – by obtaining materials within 500 mile radius of the project

Installation

As you would imagine, the installation of pervious concrete is different than traditional concrete.

- Installation takes place towards the end of construction so silt does not get trapped in the material
- Because of its low water content, pervious mix is very stiff and cannot be pumped; the ABC-VA project utilized a telescoping conveyor belt to place the concrete
- Too much compacting decreases the void ration of the concrete mix and defeats the purpose of the pervious concrete. (The formwork is a two-piece system; a 3/8 inch furring strip is nailed on top of a 2 x 6 and after the pervious is placed, a screed is run along the top of the furring strip to level the concrete. After the screed is run, the furring strip is removed and a steel pipe roller is run along the top of the 2 x 6 to gently compact the concrete. Plastic is rolled out on top of the concrete and weighed down with rebar; it has to remain there for at least a week to allow proper curing)
- The installation process takes minutes versus hours
- Traditional testing does not apply to pervious concrete, only an air density test of the mix

- Because of its unique nature, suppliers are only allowed to deliver pervious concrete mix to companies employing certified installers

Maintenance

Maintaining a pervious system requires several unfamiliar strategies such as not using traditional salt and sands as well as raising the plow blade a half inch to avoid scraping up its surface. The big positive is that studies show pervious concrete melts snow faster than its traditional counterpart thanks to its voids which conduct heat energy straight from the earth, melting the snow from beneath. In terms of cleaning, pervious concrete may be power washed and/or commercially swept several times a year by a commercial vacuum. The great news is that even if it is clogged up to 90 percent, it can still handle the worst of rain storms.



The pervious concrete being placed

For further information on Pervious Concrete, go to the following web-site: www.perviouspavement.org

Certified Installers Needed!

There are very few certified installers so ABC-VA used the opportunity to certify several companies during the pervious concrete installation on its site. A certified installer conducted a training course and administered an exam just prior to the installation for the six participating companies. Certification is acquired after a prerequisite quantity of pervious concrete installations is completed.

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