

COMPREHENSIVE ONSITE STORMWATER MANAGEMENT PROGRAM FOR SMALL PARCEL SITE DEVELOPMENT



Rawson Commons Retail Center
7320 W. Rawson Rd. Franklin, WI

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With years of urban sprawl with vast areas of rural land developed into business parks, shopping centers and subdivisions, the impact of stormwater run-off from pervious surfaces such as parking lots, side walks and roads, has challenged our environmental balance; this ever increasing pervious area has created an imbalance in the natural ecosystem leading to flash floods, pollution of our rivers, streams and lakes, and the depletion of our water aquifers.

According to the U.S. Environmental Protection Agency, stormwater runoff is a leading source of the pollutants entering our waterways. Approximately 90 percent of surface pollutants pour into our rivers, lakes and streams via impervious surfaces, normally during the first 1 ½ inches of rainfall. The EPA, State and Municipal governing bodies have tightened environmental regulations and are requiring more stringent stormwater management practices, and pervious concrete has become one of the most promising solutions. The use of pervious concrete is among the Best Management Practices (BMPs) that is recommended by the EPA to effectively control and manage stormwater run-off.

In an effort to fulfill EPA stormwater regulations of containing runoff from impervious parking areas, the use of containment methods such as retention ponds and swales have been extensively used. Though functional in their reduction of erosion and flooding, these solutions are costly to implement and require the purchase of additional land for its containment. However, due to the high concentration levels of the pollutants in these small contained areas, the natural infiltration system of a detention pond is unable to biologically process and treat the pollutants.



The use of pervious concrete parking areas eliminates the need for retention ponds and other runoff containment methods, providing for more efficient land use. Rather than directing and containing stormwater on-site, pervious concrete with its high porosity, naturally captures the stormwater and allows it to infiltrate back to the ground water. With its network of voids in the pervious concrete and underlying detention area, the pollutants are absorbed and biologically processed to “treat” the toxins naturally and effectively to improve the water quality. This benefits not only the building owner economically, but the entire community environmentally and aesthetically.



Pervious concrete has been in use for decades. EcoCreto Enhanced Pervious Concrete™ was formulated in the early 1900's in Mexico City to assist in the replenishment of the aquifers. Mexico city was running out of water.

Of all pervious concrete admixtures available, EcoCreto Enhanced Pervious Concrete™¹ distinguishes itself from others by providing much higher compressive and flexural strengths; 3000 psi, 7days, 5000 psi, 28 days comprehensive and 665 psi, 7 days and 670 psi, 28 days flexural. Degussa², now B-

¹ David W. Fowler, University of Texas, 2001

ASF, the world’s largest chemical admixture company, promotes flexural strengths at 1340 psi, 7 days and 2200 psi, 28 days and flexural strengths of 300 psi to 500 psi. 3000 psi strengths should be the minimum for vehicular traffic, strengths far exceeded by EcoCreto Enhanced Pervious Concrete™.

Specific to this site, the test cores were:

Core Strength Test Data³

Core ID	Age (days)	Area (sq.in.)	Total Load	Compressive Strength (psi)
1	7	3.142	9415	2893
2	28	3.142	12320	3907
3	7	3.142	8385	2669
4	28	3.142	11530	3661
5	7	3.142	13090	4010
6	28	3.142	7685	2446
7	7	3.142	13085	4165
8	28	3.142	15255	4833
9	7	3.142	12095	3744
10	28	3.142	12695	4041

Average 7 day strength: 3496 psi Average 28 day strengths: 3778 psi

The project consisted of construction of two retail buildings with associated parking, drives and infrastructure on a 1.6 acre parcel. The development was required to meet City of Franklin, Milwaukee Metropolitan Sewerage District, and Wisconsin Department of natural Resources storm water management regulations. The traditional approach to meet the storm water regulations would be to utilize a surface storm water detention basin. However, because the property was surrounded by adjacent development, the opportunity to purchase additional land for an on-site surface detention basin did not exist. Furthermore, a surface detention basin would have taken up valuable developable land and made development of the property economically unfeasible. By utilizing EcoCreto Enhanced Pervious Concrete™ pavement system with an underground stone storm water detention bed to provide storm water management, the Developer was able to effectively develop the property. In addition to the economic benefits, the EcoCreto Enhanced Pervious Concrete™ pavement system provides environmentally sustainable features including: zero discharge storm water management, groundwater recharge, and reduction of heat island effect.



The pavement system consists of four inches of EcoCreto Enhanced Pervious Concrete™ pavement placed over a stone detention bed. The detention bed consists of 6 inches of 1-1 ½

² M. Bury, C. Mawby, D. Fisher, *Making Pervious Concrete placement Easy*

³ Charles S. Gresser, Giles Engineering, 2006

inch diameter washed stone over 18 inches of 2-2 ½ inch diameter washed stone. The EcoCreto Enhanced Pervious Concrete™ has a permeability rate of up to 4 inches of rainfall per minute which is approximately 26 times the peak rainfall intensity for a 100-year, 5-minute storm event. The high permeability of the pavement allows storm water to infiltrate through the pavement without ponding or runoff under even the most extreme rainfall events. The detention bed beneath the pavement was sized to store the volume of the 100-year, 24-hour rainfall event over the entire site. The subgrade, silty clay soils, for the stone detention bed were graded flat to promote infiltration into the subsoils.

The system is operated as a zero discharge system. Monitoring of the system conducted to date, has demonstrated that there has been no storm water discharge from the site. Operation of the system as a zero discharge system reduces surcharging of public storm sewer systems and downstream flooding. Storm water that infiltrates through the pavement system into the detention bed infiltrates into the subsoils resulting in recharge of the groundwater aquifer – an effect that is not achieved with traditional pavement systems. Because the



pavement system is lighter in color than traditional asphalt pavements, heat island effect is minimized. Also, because of the permeability of the pavement system, the pavement “breathes” also reducing heat island effect.

In summary, use of the porous pavement system provides an economical pavement/storm water management system with added sustainable features that are not provided with traditional systems.

For more information regarding EcoCreto Enhanced Pervious Concrete™ please contact Steve Nikolas with Zabest Environmental Concrete at (262) 827-4866 or via e-mail at steven@zabest1.com

References:

- Bury, M.A., Mawby, C., and Fisher, D. *Making Pervious Concrete Placement Easy Using a Novel Admixture System*. Degussa Admixtures, Inc.
- Fowler, David W. University of Texas at Austin *Investigation of Portland Cement Pervious Concrete (EcoCreto)*. May 17, 2001.
- Leedom, James B. *2006 SE² Leadership Award*. Sigma Development. 2006.

