VINCENT TECHNOLOGY MANAGEMENT

Specialists in Applied Concrete Technology

January 26, 2010

Mr. Paul Mitchell
Executive Vice President
STEPSTONE, INC.
13238 South Figueroa Street
Los Angeles, CA 90061

Re: Test Program to Determine the Permeability
of Precast Pervious Concrete Pavers

Dear Mr. Mitchell:

The attached report summarizes the procedures and performance of a full-scale test to determine the permeability of the pavers to simulated full-scale rainfall storm water events.

The test procedures were controlled and effective and successfully verified the satisfactory performance of the pervious pavers.

Very truly yours,

Lionel W. Vincent, PE, FACI
President and Senior Consultant

LWV:eda/jc

REGISTERED PROFESSIONAL ENGINEER
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TITLE:

A TEST PROGRAM DESIGNED TO DETERMINE THE PERMEABILITY OF PRECAST PERVIOUS CONCRETE PAVERS UNDER SIMULATED STORM DESIGN PARAMETERS

PROGRAM:

The parameters of this test program are s to measure the penetration of a specified amount of simulated rain water through a given area of a porous surface in a measured length of time. The recommendations provided in the ICPI Guideline, titled *Permeable Interlocking Concrete Pavements* by David R. Smith, 3rd edition, 2006, were beneficial in establishing reasonable parameters for this study.

Of the three types of permeable paving products made with concrete, the pervious concrete units were selected because the utilization of pervious concrete allows rainfall to directly enter and pass through the pavers, as the concrete has no fines, resulting in an interconnected void system. This use is best for pedestrian areas, bicycle paths and residential applications.

Available performance data suggests that a conservative design rate of three (3) inches/hour can be used as the basis for the design infiltration rate for a twenty (20) year life. NOTE: In most localities, Best Management Practices (BMP) are designed to a specific storm recurrence (or return period) duration and intensity equivalent to a two (2) year, twenty-four (24) hour storm of 1.5 inches/hour.

DESCRIPTION OF TEST PIT:

The test pit (see photo A) was designed and fabricated by STEPSTONE INC. in response to the necessity of assuring compliance with a U.S. Federal Law, mandating a BMP effort to capture rainfall runoff that relies on gravitational settling and/or infiltration through a porous medium for pollution control criteria.

The unit as fabricated is 4 foot-1 inch square area, so as to provide a base that encompasses three 16 × 16 inch pavers in each direction with ¼ inch joints between the abutting pavers and the end units along the walls. The pit depth is 24 inches with one clear siding to view and accommodate the measurements of the thickness of various layers of subbase materials.

The base of the test pit is composed of a sheet of open-faced expanded metal to provide support and flow-ability of the measured water through and out of the test chamber. A filtration fabric is placed over the expanded metal so as to provide subbase stability.

A uniform water spray mechanism with adjustable nozzles is located at an appropriate position over the test pit (see photo B) to disperse the exact amount

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of water (16.9 gallons) as required for the initial portion of the two-part test program.

TEST CRITERIA AND CALCULATIONS:

As indicated, the surface area of the test unit is approximately 16 square feet. The calculated total amount of water required for a 3 inches/hour inundation of this area is 15.6 pounds/square foot—for a total area of 16 square feet. This equates to 249.6 pounds of water or 33.28 gallons of water.

Due to the volume and weight of this quality of water, it was decided to conduct the test in two increments. The first increment used one half the total water required (16.64 gallons or 124.8 pounds of water), which was applied through a uniform water spray mechanism with adjustable nozzles located at selected positions over the test pit (see photos 8A and 8B). The time for total penetration of this initial immersion through the pervious pavers was approximately 27 minutes.

Accordingly, a decision was made to immerse the test pit with the second application of 124.8 pounds of water, discharged from four containers placed at one container per side (see photos 10A and 10B). This second application constituted a doubling of water volume, which resulted in a ponding depth at the surface of ½ inch, which was dissipated into the pervious units in approximately 23.5 minutes (i.e., double the quantity of water passing through the pervious units well within the allocated time period of one hour)! The test was successful!

PROGRAM INFORMATION:

OBJECTIVE: To verity the penetration of 3 inches of simulated rainfall through a 2½ inch thick precast pervious concrete pavers within a one-hour time period.

CALCULATIONS:

1. A cubic foot of water weight 62.4 pounds.
2. A cubic foot of water equals 7.5 gallons.
3. 3 inches of water is ¼ of a cubic foot.
4. Therefore, 3 inches of water is (¼)(62.4)=15.6 pounds/square foot.
5. A test unit with 16 square feet equals 249.6 pounds of water.
6. At 7.5 pounds/gallon, the total amount of water required for this test is 33.28 gallons.
7. Therefore, each of the two immersion procedures utilized, required 16.6 gallons of water.

RESULTS OF PENETRATION TESTS:

A. Overhead water spray:
   16.6 gallons Time: 27 minutes

B. Direct water bucket discharge:
   16.6 gallons Time: 23.5 minutes

CONCLUSION: Total penetration time – 50.5 minutes! Therefore, the test objectives have been attained.