



PERMA PIAZZA PERMEABILITY TEST **MAY 13, 2011**

PAVERS · WALLS · MASONRY

23 Quarry Road · Douglassville, PA 19518 · 610-323-6600 · www.rinoxpavers.com

INTRODUCTION

The Perma Piazza is a permeable paver product developed and manufactured by Rinox Pavers. This ecologically friendly paving stone allows precipitation to flow vertically through the system offering alternatives to design engineers dealing with stormwater runoff. The paver system provides an average void size of 5.3% and, when installed on an open graded base with clean stone swept into the paver joints, the system has the potential to pass large rainfall amounts into the underlying open graded base materials.

On May 13, 2011 Rinox Pavers, under the direction of a registered Pennsylvania Professional Engineer, conducted an initial field study to determine the permeability of the Perma Piazza paver system. This initial field study was modeled after a single-ring infiltrometer test to determine the surface permeability of the paver system.

The following sections detail the specifics of the field study.

TEST PLOT

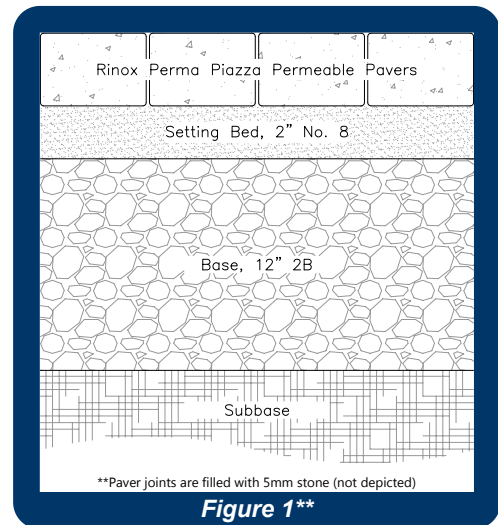
In the weeks preceding the initial field test, Rinox Pavers constructed an approximate 800 square foot pad in accordance with the cross section detailed by Figure 1.

*Paver permeability is dependent upon subsurface conditions, i.e. soil, permeability rates, subbase storage, etc.

†Permeability Rates indicate that the perma piazza paver system is capable of passing up to and including the 100-year storm event, in most regions in Pennsylvania, dependent upon subsurface conditions and maintenance schedule.



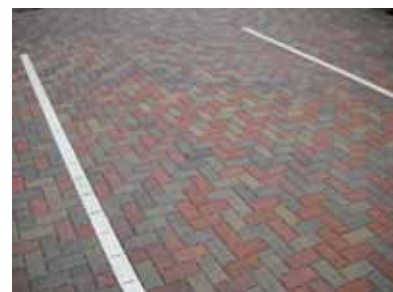
Perma Piazza Average Permeability Rates		
Rate (Inches/Hour)	Capacity (Gallons/Minute)	Capacity (Gallons/Hour)
937.29*	8.28*	496.61*



Laying Perma Piazza pavers on setting bed



Filling joints with AquaStone5 (5mm clean)



Finished test area

Test plot construction in progress



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FIELD TEST

The permeability test involved the use of a steel casing with a 12 ½ inch inner diameter, 13 ⅝ inch outer diameter and ⅝ inch wall thickness sealed to the surface of the pavers using a bentonite seal. The casing extended from the paver surface to a height of 24 inches.

The field test simply involved the introduction of five gallons of water to the casing recording the total time to drain the measured volume of water as well as the time for one inch of water level drop during each test. This test was repeated ten times to collect the data set presented in Table 1.



The permeability field test apparatus - steel casing shown above paver surface.

PERMEABILITY RATES

Based upon the data presented in Table 1, the Perma Piazza paver system, when constructed in accordance with the cross section illustrated in Figure 1, offers the following performance ranges:

Permeability (inches/hour):

787 to 1055***

Permeability (gallons/minute):

6.96 to 9.32***

Permeability (gallons/hour):

417 to 559***

TABLE 1				
Test Number (5 gallons/interval)	Time Lapse (seconds/inch)	Rate (inches/hour)	Capacity (gallons/minute)	Capacity (gallons/hour)
Test 1			7.08	424.93
	4.40	818.18	7.23	433.50
Test 2			6.82	409.09
	4.57	787.75	6.96	417.37
Test 3			7.40	444.01
	3.86	932.64	8.24	494.15
Test 4			7.86	471.33
	3.79	949.87	8.39	503.27
Test 5			8.36	501.67
	3.92	918.37	8.11	486.58
Test 6			8.98	539.08
	3.56	1011.24	8.93	535.79
Test 7			8.70	521.74
	3.41	1055.72	9.32	559.35
Test 8			8.61	516.35
	3.98	904.52	7.99	479.25
Test 9			8.63	517.84
	3.58	1005.59	8.88	532.79
Test 10			8.28	496.55
	3.64	989.01	8.73	524.01
Averages	3.87	937.29	8.28	496.61

***Permeability rates and averages based upon incremental inch measurements due to the variability of time measurements due to the pouring of the five gallons. The total time lapse measurement associated with the five gallons was recorded to provide comparative data with the incremental inch measurements.