Infiltration Testing of the SWM PAVE System in the Ashland Municipal Parking Lot

April 5, 2016

Don Rissmeyer, PE, CFM[1]

[1] Associate, A. Morton Thomas & Associates, 100 Gateway Centre Parkway, Suite 200
Richmond, VA 23235, Tel: 804-276-6231 drissmeyer@amtengineering.com

Abstract

Since their advent in the 1990s, municipalities have constructed millions of square meters of permeable pavement in parking lots, alleys and streets. These typically consist of porous asphalt, pervious concrete and permeable interlocking concrete pavements. The Ashland Municipal Parking Lot was retrofit with Permeable Interlocking Concrete Pavement recently using the SWM PAVE permeable pavement system. This report is the first in a series of annual infiltration tests to help measure long-term performance.

Test Locations

Testing was performed in four (4) locations to establish an average infiltration rate for the current conditions in the parking lot. Locations were distributed throughout the parking lot, based on available parking spaces at the time of testing in each quadrant. Resulting locations for this testing are noted on the enclosed site plan.

Infiltration Testing Procedures

The four (4) locations were tested using the methods in C1781 *Standard Test Method for Surface Infiltration Rate of Permeable Unit Pavement Systems*. Water was supplied by a local business through an outside hose bib, and the testing was performed on a dry, sunny day with temperatures in the low 40's (degrees Fahrenheit). The test procedure began with a "pre-wetting". This is done by applying approximately 8 lbs. (roughly equivalent to 1 gal) of water into a 12 inch diameter ring sealed to the pavement with plumber's putty, and while maintaining an approximate head of 3/8 inch, which is marked on the ring. This is illustrated in Figure 1.

Figure 1. Initial Pre-wetting Test

A. MORTON THOMAS AND ASSOCIATES, INC.

100 Gateway Centre Parkway - Suite 200 ▪ Richmond, VA 23235
Phone: (804) 276-6231 ▪ Fax: (804) 276-6233 ▪ www.amtengineering.com

If the pre-wetting water applied into the ring requires more than 30 seconds to completely infiltrate, then the same amount of water (1 gallon) is applied 2 minutes later. If the pre-wetting takes less than 30 seconds, the entire 40 pounds (5 gallons) is applied during testing. The infiltration test was then run twice for each sample site. In conclusion, the average infiltration rate for all four (4) test sites was 449.3 inches per hour, as shown in the enclosed calculations per ASTM C1781.

Observations

The test sites were chosen based on a visual inspection of each parking space utilized, and included areas with tree seeds, leaves, cigarette butts, and oil stains. None of the locations chosen appeared to be entirely clogged with sediment or to have vegetation growing in the joints.

At the time of infiltration testing, the Town of Ashland had not done a vacuuming of the entire parking lot, since the new wearing surface was installed in July 2015. After nine (9) months since the wearing surface was replaced, the conditions were very good from the standpoint of the average infiltration rate of 449.3 inches per hour which was tested. This can be attributed somewhat to the smaller contributing drainage area (approximately 2:1 ratio of the total drainage area to the permeable pavement wearing surface) and the highly impervious nature of the site (approximately 98% impervious consisting mostly of permeable pavement, building roofs, and landscaping with river stone).

Surface Infiltration Testing in Accordance with ASTM C 1781

Project Name & Location: **Municipal Parking Lot (Ashland, VA)**   **Date:** 4/5/2016

Prewet is done using 8 pounds of water (see map for infiltration testing locations chosen)

Test #1 - Prewet			Test #2 - Prewet			Test #3 - Prewet			Test #4 - Prewet	
M(lb)	t(sec)		M(lb)	t(sec)		M(lb)	t(sec)		M(lb)	t(sec)
8.0	32.0		8.0	15.0		8.0	23.0		8.0	23.0

If prewet time is **less than 30 seconds**, perform subsequent tests at that location using 40 lb of water otherwise use 8 lb of water, Note - Make sure that M (lb) is the correct weight of water used below.

Test # 1-A

M (lb)	t (sec)	D (in)	K (in-lb)	I (in/hr)
8.0	25	11.875	126870	287.9

Test # 2-A

M (lb)	t (sec)	D (in)	K (in-lb)	I (in/hr)
40.0	72	11.875	126870	499.8

Test # 1-B

M (lb)	t (sec)	D (in)	K (in-lb)	I (in/hr)
8.0	17	11.875	126870	423.4

Test # 2-B

M (lb)	t (sec)	D (in)	K (in-lb)	I (in/hr)
40.0	83	11.875	126870	433.6

Test Site #1 Average I:	355.6	in/hr

Test Site #2 Average I:	466.7	in/hr

Test # 3-A

M (lb)	t (sec)	D (in)	K (in-lb)	I (in/hr)
40.0	118	11.875	126870	305.0

Test # 4-A

M (lb)	t (sec)	D (in)	K (in-lb)	I (in/hr)
40.0	51	11.875	126870	705.6

Test # 3-B

M (lb)	t (sec)	D (in)	K (in-lb)	I (in/hr)
40.0	132.0	11.875	126870	272.6

Test # 4-B

M (lb)	t (sec)	D (in)	K (in-lb)	I (in/hr)
40.0	54.0	11.875	126870	666.4

Test Site #3 Average I:	288.8	in/hr

Test Site #4 Average I:	686.0	in/hr

Ring D: 11.875 in.   Governing Equation: **Site Average Surface I (in/hr):** **449.3**

Ring D²: 141.0 in.² $I=(K*M)/(D^2*t)$ INPUT ALL YELLOW FIELDS

PERMEABLE PAVEMENT

BIORETENTION
BASIN

HANOVER AVE

THOMPSON ST
(S.R. 54)

SITE #4

SITE #2

108
McKINNEY & CO.

SITE #1

SITE #3

210
OFFICE ON
THE TRACKS

TO TOWN HALL

114
HENRY CLAY INN

108   THE CABOOSE

106   BELL BOOK & CANDLE
      PUFFERBELLY PROP.
      THE CHIFFAROBE

104   TRAIN TOWN
      HOBBY

102   CHANGING REINS

100
IRON HORSE
RESTAURANT

100
ASHLAND COFFEE
& TEA

102
HOMEMADES
BY
SUZANNE

104
HANOVER BANK
BUILDING

TRAIN STATION/
VISITOR'S CENTER

ONE WAY

S. RAILROAD AVE

N. RAILROAD AVE

THE
PLAZA

PUBLIC
LIBRARY

TO RANDOLPH
MACON COLLEGE
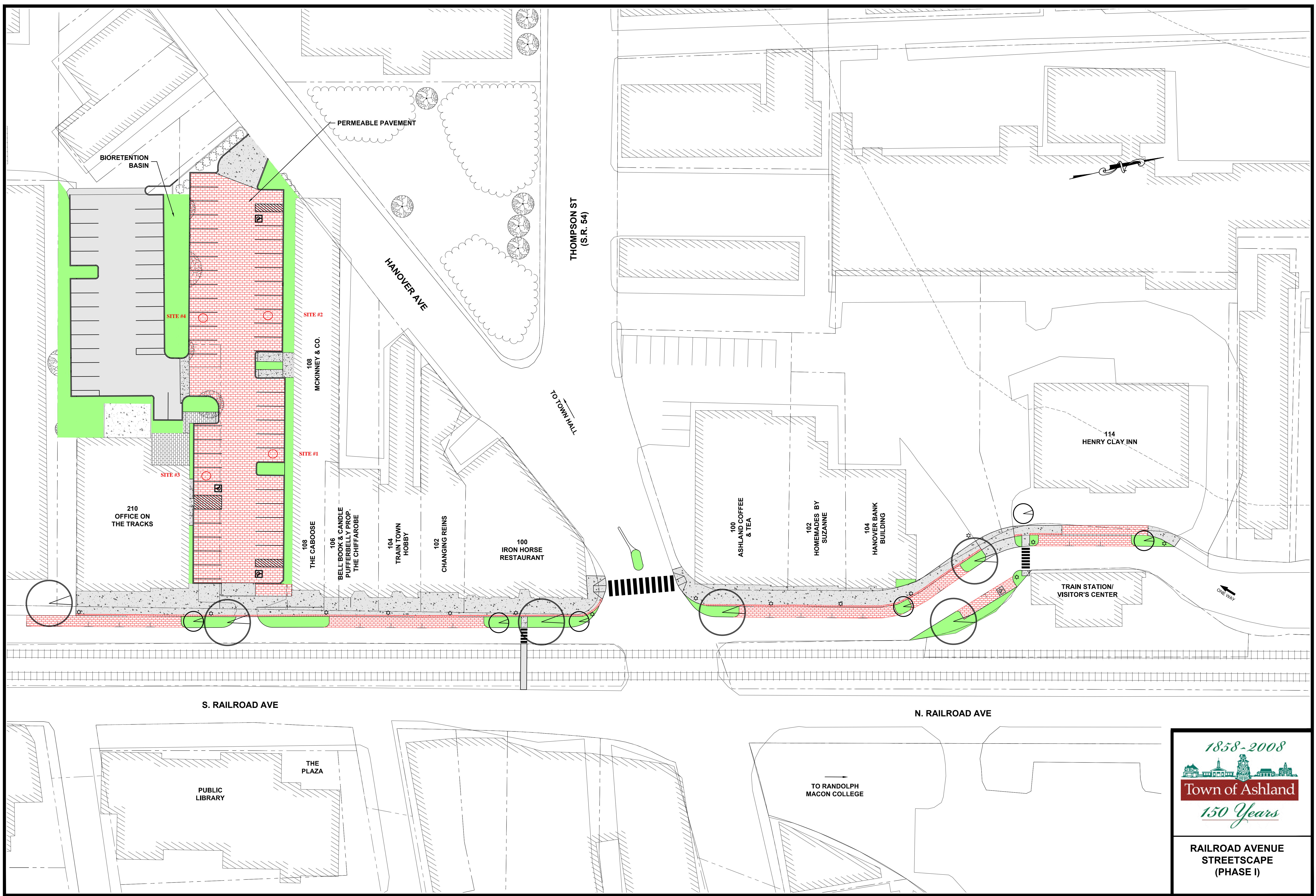
1858-2008

Town of Ashland

150 Years

RAILROAD AVENUE
STREETSCAPE
(PHASE I)