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HANOVER ARCHITECTURAL PRODUCTS
TEST REPORT

SCOPE OF WORK
ASTM C936 COMPRESSIVE STRENGTH AND ABSORPTION PROPERTIES EVALUATION OF THREE HANOVER® VENTLOC PAVER PRODUCTS

REPORT NUMBER
H7384.02-106-31 R0

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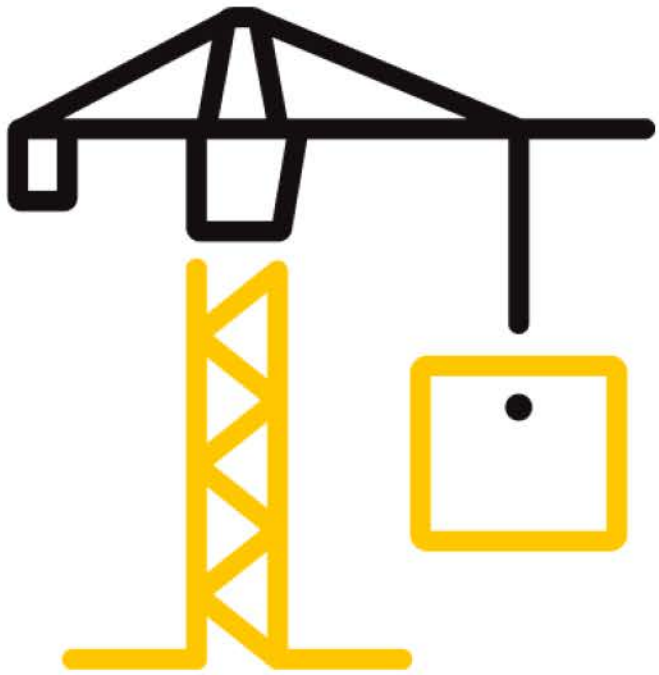

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TEST REPORT FOR HANOVER ARCHITECTURAL PRODUCTS
Report No.: H7384.02-106-31 R0
Date: 12/27/17

REPORT ISSUED TO
HANOVER ARCHITECTURAL PRODUCTS
240 Bender Road
Hanover, Pennsylvania 17331

SECTION 1
SCOPE

Product: Hanover® Ventloc Paver Products

Intertek Building & Construction (B&C) was contracted by Hanover Architectural Products to evaluate Compressive Strength and Absorption of three designs of Hanover® Ventloc Paver products (two standard weight and one heavy weight) in accordance with ASTM C936 and ASTM C140. Results obtained are tested values and were secured by using the designated test methods. Testing was conducted at the Intertek B&C test facility in York, Pennsylvania.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Scott D. Scallorn	**REVIEWED BY:**	Joseph M. Brickner
TITLE:	Project Engineer Materials Laboratory	**TITLE:**	Laboratory Supervisor Materials Laboratory
SIGNATURE:		**SIGNATURE:**	
DATE:	12/27/17	**DATE:**	12/27/17

SDS:jmb/kf

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SECTION 2
SUMMARY OF TEST RESULTS

TEST METHOD	PROPERTY	MEAN RESULT	
ASTM C140, Section 8	Absorption	Standard Weight, White -	1.87 %
		Standard Weight, Natural -	2.16 %
		Heavy Weight, Natural -	1.78 %
ASTM C140, Section 7	Compressive Strength	Standard Weight, White -	6,720 psi
		Standard Weight, Natural -	7,080 psi
		Heavy Weight, Natural -	7,770 psi

SECTION 3
TEST METHODS

The specimens were evaluated in accordance with the following:

ASTM C936/C936M-16, *Standard Specification for Solid Concrete Interlocking Paving Units*

ASTM C140/C140M-17a, *Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units*

SECTION 4
MATERIAL SOURCE

The Hanover® Ventloc (White/Natural Finish/Standard Weight, Natural/Natural Finish/Standard Weight, Natural/Natural Finish/Heavy Weight) test specimens were provided by Hanover Architectural Products. Refer to the product description photos in Section 10. The material was tested as received with the exception of either conditioning as specified by the appropriate test method or, in the case of the compressive evaluation specimens, capping prior to testing. Representative materials/test specimens will be retained by Intertek B&C for a minimum of four years from the test completion date.

SECTION 5
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Scott D. Scallorn	Intertek B&C
Joseph M. Brickner	Intertek B&C

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SECTION 6
TEST PROCEDURES

All conditioning of test specimens and test conditions were at standard laboratory conditions unless otherwise reported. Refer to the test related photos in Section 10.

ASTM C936 - Absorption Evaluation

The absorption evaluation was conducted in accordance with the procedures detailed in ASTM C140, Section 8 (as specified by ASTM C936). A total of three test specimens per test series were evaluated. The test specimens were immersed under six inches of water maintained between 60-80°F for a period of 24 hours. After 24 hours and still submerged in water, the specimens were weighed to determine the immersed weight utilizing a digital balance (ICN: 003449). After each specimen drip dried for 60 seconds and a damp cloth removed any visible surface water, each specimen was re-weighed to determine saturated weight. Subsequent to saturation, the specimens were oven-dried for 24 hours at 110°C in a forced draft oven and re-weighed to determine the oven-dry weight. Results were further evaluated against performance criteria as presented in ASTM C936, Section 5.4.

ASTM C936 - Compressive Strength Evaluation

The compressive strength evaluation was conducted in accordance with the procedures detailed in ASTM C140, Section 7 (as specified by ASTM C936). A total of three test specimens were evaluated for each test series. Individual specimen mass was determined on a digital balance (ICN: 003449) and dimensions were measured with 12.0 in. x 0.001 in. digital calipers (ICN: 65102) prior to evaluation on a Forney Compression Tester (ICN: Y000143). The test specimens were capped as specified in ASTM C140, Section 7.3 and compressive load was applied to each specimen at a rate as specified in ASTM C140M, Section 7.4.3 until failure was observed. Compressive strength was calculated for each specimen in accordance with the equation presented in ASTM C140, Section 9.6 and averaged for each test series with specimen aspect ratio correction factor in accordance with ASTM C140, Section A4.5.2. Results were further evaluated against performance criteria as presented in ASTM C936, Section 5.3.

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TEST PROCEDURE	NUMBER OF SPECIMENS	NOMINAL DIMENSIONS	VISUAL CHARACTERISTICS
ASTM C936, Section 5.3 - Compressive Strength	Standard Weight (White) - 3 Standard Weight (Natural) - 3 Heavy Weight (Natural) - 3	3 in. x 2 in. x 1.5 in.	Pale or Medium Grey Cementitious Paver Sections (Wet-Saw Cut to Test Dimensions)
ASTM C936, Section 5.4 - Absorption	Standard Weight (White) - 3 Standard Weight (Natural) - 3 Heavy Weight (Natural) - 3	3 in. x 3 in. x 1.5 in.	

SECTION 7
TEST RESULTS

ASTM C140, Section 8 - Absorption Evaluation - Standard Weight (White)

SPECIMEN		MASS DETERMINATIONS (g)			ABSORPTION (%)	BULK SPECIFIC GRAVITY
SERIES	NO.	IMMERSED	SATURATED SURFACE-DRY	OVEN-DRY		
Standard Weight (White)	1	202.3	412.4	404.2	2.03	1.92
	2	208.2	422.2	414.6	1.83	1.94
	3	210.7	427.4	420.1	1.73	1.94
Average		**207.1**	**420.7**	**413.0**	**1.87**	**1.93**

ASTM C936, Section 5.3 Performance Criteria	No greater than 5% series mean absorption and no greater than 7% individual specimen absorption
Result	Meets as Stated

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ASTM C140, Section 8 - Absorption Evaluation - Standard Weight (Natural)

SPECIMEN		MASS DETERMINATIONS (g)			ABSORPTION (%)	BULK SPECIFIC GRAVITY
SERIES	NO.	IMMERSED	SATURATED SURFACE-DRY	OVEN-DRY		
Standard Weight (Natural)	1	177.2	388.8	378.7	2.68	1.79
	2	200.2	411.0	403.1	1.97	1.91
	3	201.8	409.8	402.5	1.81	1.94
Average		**193.1**	**403.2**	**394.7**	**2.16**	**1.88**

ASTM C936, Section 5.3 Performance Criteria	No greater than 5% series mean absorption and no greater than 7% individual specimen absorption
Result	Meets as Stated

ASTM C140, Section 8 - Absorption Evaluation - Heavy Weight (Natural)

SPECIMEN		MASS DETERMINATIONS (g)			ABSORPTION (%)	BULK SPECIFIC GRAVITY
SERIES	NO.	IMMERSED	SATURATED SURFACE-DRY	OVEN-DRY		
Heavy Weight (Natural)	1	267.9	480.8	471.6	1.95	2.22
	2	267.2	488.1	479.6	1.78	2.17
	3	280.2	493.2	485.4	1.62	2.28
Average		**271.8**	**487.4**	**478.9**	**1.78**	**2.22**

ASTM C936, Section 5.3 Performance Criteria	No greater than 5% series mean absorption and no greater than 7% individual specimen absorption
Result	Meets as Stated

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ASTM C140, Section 7 - Compressive Strength Evaluation - Standard Weight (White)

SPECIMEN		DIMENSIONS (in)			LOADING AREA (in^2)	MASS (g)
SERIES	NO.	HEIGHT	LENGTH	WIDTH		
Standard Weight (White)	1	1.443	3.009	2.006	6.036	254.8
	2	1.458	2.997	1.977	5.925	271.5
	3	1.447	3.016	1.981	5.975	255.7
Average		**1.449**	**3.007**	**1.988**	**5.979**	**260.7**

SPECIMEN		FAILURE LOAD (lb_f)	ASPECT RATIO		COMPRESSIVE STRENGTH (psi)
SERIES	NO.		T/W	FACTOR [1]	
Standard Weight (White)	1	49,000	0.719	1.091	8,850
	2	36,100	0.737	1.110	6,730
	3	24,600	0.730	1.099	4,530
Average		**36,600**	**0.729**	**1.098**	**6,720**

[1] Aspect Ratio Factor was calculated in accordance with ASTM C140, Section A4.5

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ASTM C140, Section 7 - Compressive Strength Evaluation - Standard Weight (Natural)

SPECIMEN		DIMENSIONS (in)			LOADING AREA (in^2)	MASS (g)
SERIES	NO.	HEIGHT	LENGTH	WIDTH		
Standard Weight (Natural)	1	1.443	3.001	1.986	5.960	259.3
	2	1.420	3.002	1.989	5.971	266.7
	3	1.434	3.000	1.988	5.964	269.1
Average		**1.432**	**3.001**	**1.988**	**5.965**	**265.0**

SPECIMEN		FAILURE LOAD (lb_f)	ASPECT RATIO		COMPRESSIVE STRENGTH (psi)
SERIES	NO.		T/W	FACTOR [1]	
Standard Weight (Natural)	1	43,900	0.727	1.096	8,070
	2	32,800	0.714	1.087	5,970
	3	39,300	0.721	1.093	7,190
Average		**38,600**	**0.721**	**1.092**	**7,080**

[1] ***Aspect Ratio Factor was calculated in accordance with ASTM C140, Section A4.5***

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ASTM C140, Section 7 - Compressive Strength Evaluation - Heavy Weight (Natural)

SPECIMEN		DIMENSIONS (in)			LOADING AREA (in^2)	MASS (g)
SERIES	NO.	HEIGHT	LENGTH	WIDTH		
Heavy Weight (Natural)	1	1.456	3.006	1.985	5.967	311.0
	2	1.466	3.001	1.987	5.963	312.6
	3	1.461	3.006	1.990	5.982	307.0
Average		**1.461**	**3.004**	**1.987**	**5.971**	**310.2**

SPECIMEN		FAILURE LOAD (lb_f)	ASPECT RATIO		COMPRESSIVE STRENGTH (psi)
SERIES	NO.		T/W	FACTOR [1]	
Heavy Weight (Natural)	1	44,200	0.734	1.101	8,160
	2	38,000	0.738	1.104	7,040
	3	44,000	0.734	1.102	8,100
Average		**42,100**	**0.735**	**1.102**	**7,770**

[1] Aspect Ratio Factor was calculated in accordance with ASTM C140, Section A4.5

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SECTION 10
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	12/27/17	N/A	Original Report Issue