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RUSSELL STONE PRODUCTS
TEST REPORT

SCOPE OF WORK
ASTM C1354 KERF ANCHORAGE EVALUATION FOR ONE NATURAL STONE PRODUCT (BLOOM RUN SANDSTONE - PA. WILDS PROJECT)

REPORT NUMBER
L6492.01-106-31 R0

TEST DATES
01/18/21 - 01/20/21

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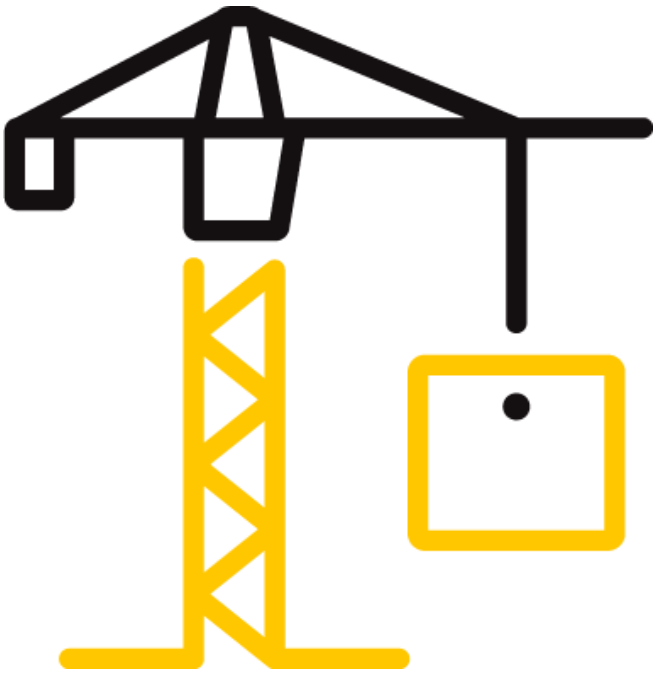

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Report No.: L6492.01-106-31 R0
Date: 02/08/21

REPORT ISSUED TO

RUSSELL STONE PRODUCTS
2640 Greenville Pike
Grampian, Pennsylvania 16838

SECTION 1

SCOPE

Product: Natural Stone Product (Bloom Run Sandstone - PA. Wilds Project)

Intertek Building & Construction (B&C) was contracted by Russell Stone Products to evaluate one natural stone product (Designation: Bloom Run Sandstone - PA. Wilds Project) for ASTM C1354 for kerf anchorage strength. Results obtained are tested values and were secured by using the designated test methods. All 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:	Program Manager Natural Stone Services	**TITLE:**	Laboratory Supervisor Materials Laboratory
SIGNATURE:	Digitally Signed for: Scott Scallorn by Alex Sauls	**SIGNATURE:**	Digitally Signed by: Joseph M. Brickner
DATE:	02/08/21	**DATE:**	02/08/21

SDS:jmb/als

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SECTION 2
SUMMARY OF TEST RESULTS

PERFORMANCE EVALUATION			
TEST METHOD	**PHYSICAL PROPERTY**		**MEAN ANCHORAGE STRENGTH (lb_f)**
ASTM C1354 (Kerf)	Anchorage Strength Dry Condition	Negative Loading	913.3
		Positive Loading	904.4
	Dry Condition Average		**908.8**
	Anchorage Strength Wet Condition	Negative Loading	873.7
		Positive Loading	935.3
	Wet Condition Average		**904.5**

SECTION 3
TEST METHODS

The specimens were evaluated in accordance with the following:

> **ASTM C1354/C1354M-15**, *Standard Test Method for Strength of Individual Stone Anchorages in Dimension Stone*

SECTION 4
MATERIAL SOURCE

The test materials were provided by Russell Stone Products on 01/05/20. Specimens were received in good order for testing and representative of the stone to be employed on the PA. Wilds project. Refer to the product description photos in Section 10. The material was tested as received with the exception of preconditioning and specimen preparation as required for testing. Representative materials/test specimens will be retained by Intertek B&C for a minimum of four years from the test completion date.

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SECTION 5
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Scott D. Scallorn	Intertek B&C
Joseph M. Brickner	Intertek B&C
David M. Curulla	Russell Stone Products

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 C1354 - Kerf Anchorage Evaluation
The kerf anchorage strength evaluation was performed on a SATEC UTM (ICN: Y002011) employing a 5,000 lb_f load cell (ICN: 65607) in accordance with the procedures detailed in ASTM C1354 employing fixturing as detailed in Fig. 1 (a = 13.25 in. and L = 15.0 in.). Specimen dimensions and fixture placement were verified with a 12 in. x 0.001 in. digital caliper (ICN: INT01131) and tape measure. Kerf anchorage mockup stone substrates were evaluated in both oven-dry and 48-hour immersion wet condition against project-specific, nomimal 0.08 in. thickness - 12 in. wide, extruded aluminum kerf anchorages with load applied in both inward and outward negative directions in order to represent both positive and negative wind load conditions. Load was applied through a 1.25 in. diameter loading nose across the width of each specimen at a rate of 200 lb_f/min until failure was observed. Ultimate Failure Load was captured for each specimen mockup and Anchorage System Load was both calculated in accordance with ASTM C1354, Section 10.1 and averaged for each test series.

SECTION 7
TEST SPECIMEN DESCRIPTIONS

TEST PROCEDURE	NUMBER OF SPECIMENS	NOMINAL SPECIMEN DIMENSIONS	VISUAL CHARACTERISTICS
ASTM C1354 (Kerf Anchorage)	20 Total (5 per loading orientation [positive and negative] and test condition [Oven-Dry and 48-Hour Wet])	12.0 in. x 18.0 in. x 1.6 in. thickness (w/precut kerf in opposite 12 in. x 1.6 in. facings)	Cream limestone with saw-cut faces. Provided pre-cut per project specification for associated, 12.0 in. width, kerf anchorage system hardware

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SECTION 8
TEST RESULTS

ASTM C1354 - Kerf Anchorage Evaluation (Negative Windload - Oven-Dry)

SPECIMEN			ULTIMATE FAILURE	
NO.	TEST CONDITION	LOADED KERF LIP THICKNESS (in)	DEFLECTION (in)	LOAD (lb_f)
N-Dry-1	Load Applied Outward (Negative Windload) Oven-Dry	0.640	0.045	1,065.6
N-Dry-2		0.639	0.121	945.4
N-Dry-3		0.634	0.093	1,011.9
N-Dry-4		0.652	0.110	993.3
N-Dry-5		0.651	0.091	1,153.5
Series Mean		**0.643**	**0.092**	**1,033.9**
Standard Deviation		0.008	0.029	79.5
Coefficient of Variation		1.2	31.6	7.7

SPECIMEN		ANCHORAGE SYSTEM LOAD (lb_f) [1]	FAILURE MODE
NO.	TEST CONDITION		
N-Dry-1	Load Applied Outward (Negative Windload) Oven-Dry	941.3	Stone Fracture - Kerf Lip
N-Dry-2		835.1	Stone Fracture - Kerf Lip
N-Dry-3		893.9	Stone Fracture - Kerf Lip
N-Dry-4		877.4	Stone Fracture - Kerf Lip
N-Dry-5		1,018.9	Stone Fracture - Kerf Lip
Series Mean		**913.3**	
Standard Deviation		70.2	
Coefficient of Variation		7.7	

[1] ***Calculated in accordance with ASTM C1354, Section 10.1 ((test machine load*a)/L)***

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ASTM C1354 - Kerf Anchorage Evaluation (Positive Windload - Oven-Dry)

SPECIMEN			ULTIMATE FAILURE	
NO.	TEST CONDITION	LOADED KERF LIP THICKNESS (in)	DEFLECTION (in)	LOAD (lb_f)
P-Dry-1	Load Applied Inward (Positive Windload) Oven-Dry	0.744	0.087	973.4
P-Dry-2		0.715	0.058	818.4
P-Dry-3		0.734	0.072	1,135.7
P-Dry-4		0.719	0.067	955.4
P-Dry-5		0.706	0.076	1,236.0
Series Mean		**0.724**	**0.072**	**1,023.8**
Standard Deviation		0.015	0.011	163.5
Coefficient of Variation		2.1	14.9	16.0

SPECIMEN		ANCHORAGE SYSTEM LOAD (lb_f) [1]	FAILURE MODE
NO.	TEST CONDITION		
P-Dry-1	Load Applied Inward (Positive Windload) Oven-Dry	859.9	Stone Fracture - Kerf Lip
P-Dry-2		722.9	Stone Fracture - Kerf Lip
P-Dry-3		1,003.2	Stone Fracture - Kerf Lip
P-Dry-4		844.0	Stone Fracture - Kerf Lip
P-Dry-5		1,091.8	Stone Fracture - Kerf Lip
Series Mean		**904.4**	
Standard Deviation		144.4	
Coefficient of Variation		16.0	

[1] ***Calculated in accordance with ASTM C1354, Section 10.1 ((test machine load*a)/L)***

Oven-Dry Condition Series Average

TEST CONDITION	SUB-SERIES AVERAGE ANCHORAGE SYSTEM LOAD (lb_f)	DRY CONDITION AVERAGE ANCHORAGE SYSTEM LOAD (lb_f)
Dry, Positive Loading	913.3	**908.8**
Dry, Negative Loading	904.4	

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ASTM C1354 - Kerf Anchorage Evaluation (Negative Windload - 48 hr. Wet)

SPECIMEN			ULTIMATE FAILURE	
NO.	TEST CONDITION	LOADED KERF LIP THICKNESS (in)	DEFLECTION (in)	LOAD (lb_f)
N-Wet-1	Load Applied Outward (Negative Windload) 48-Hour Immersion, Wet	0.654	0.094	1,190.0
N-Wet-2		0.642	0.128	791.1
N-Wet-3		0.740	0.085	1,141.2
N-Wet-4		0.612	0.066	850.9
N-Wet-5		0.624	0.113	972.0
Series Mean		**0.654**	**0.097**	**989.0**
Standard Deviation		0.051	0.024	174.7
Coefficient of Variation		7.7	24.8	17.7

SPECIMEN		ANCHORAGE SYSTEM LOAD (lb_f) [1]	FAILURE MODE
NO.	TEST CONDITION		
N-Wet-1	Load Applied Outward (Negative Windload) 48-Hour Immersion, Wet	1,051.2	Stone Fracture - Kerf Lip
N-Wet-2		698.8	Stone Fracture - Kerf Lip
N-Wet-3		1,008.1	Stone Fracture - Kerf Lip
N-Wet-4		751.6	Stone Fracture - Kerf Lip
N-Wet-5		858.6	Stone Fracture - Kerf Lip
Series Mean		**873.7**	
Standard Deviation		154.4	
Coefficient of Variation		17.7	

[1] ***Calculated in accordance with ASTM C1354, Section 10.1 ((test machine load*a)/L)***

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ASTM C1354 - Kerf Anchorage Evaluation (Negative Windload - 48 hr. Wet)

SPECIMEN			ULTIMATE FAILURE	
NO.	TEST CONDITION	LOADED KERF LIP THICKNESS (in)	DEFLECTION (in)	LOAD (lb_f)
P-Wet-1	Load Applied Inward (Positive Windload) 48-Hour Immersion, Wet	0.721	0.091	987.0
P-Wet-2		0.722	0.077	1,151.4
P-Wet-3		0.700	0.069	783.9
P-Wet-4		0.717	0.104	1,143.6
P-Wet-5		0.742	0.114	1,228.4
Series Mean		**0.720**	**0.091**	**1,058.9**
Standard Deviation		0.015	0.019	177.0
Coefficient of Variation		2.1	20.4	16.7

SPECIMEN		ANCHORAGE SYSTEM LOAD (lb_f) [1]	FAILURE MODE
NO.	TEST CONDITION		
P-Wet-1	Load Applied Inward (Positive Windload) 48-Hour Immersion, Wet	871.9	Stone Fracture - Kerf Lip
P-Wet-2		1,017.0	Stone Fracture - Kerf Lip
P-Wet-3		692.4	Stone Fracture - Kerf Lip
P-Wet-4		1,010.2	Stone Fracture - Kerf Lip
P-Wet-5		1,085.0	Stone Fracture - Kerf Lip
Series Mean		**935.3**	
Standard Deviation		156.3	
Coefficient of Variation		16.7	

[1] ***Calculated in accordance with ASTM C1354, Section 10.1 ((test machine load*a)/L)***

Oven-Dry Condition Series Average

TEST CONDITION	SUB-SERIES AVERAGE ANCHORAGE SYSTEM LOAD (lb_f)	DRY CONDITION AVERAGE ANCHORAGE SYSTEM LOAD (lb_f)
Wet, Positive Loading	873.7	**904.5**
Wet, Negative Loading	935.3	

SECTION 9
CONCLUSION

No performance criteria were specified for this test program so results are reported as obtained.

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SECTION 10
PHOTOGRAPHS

Photo No. 1
Representative Test Specimens, As Received

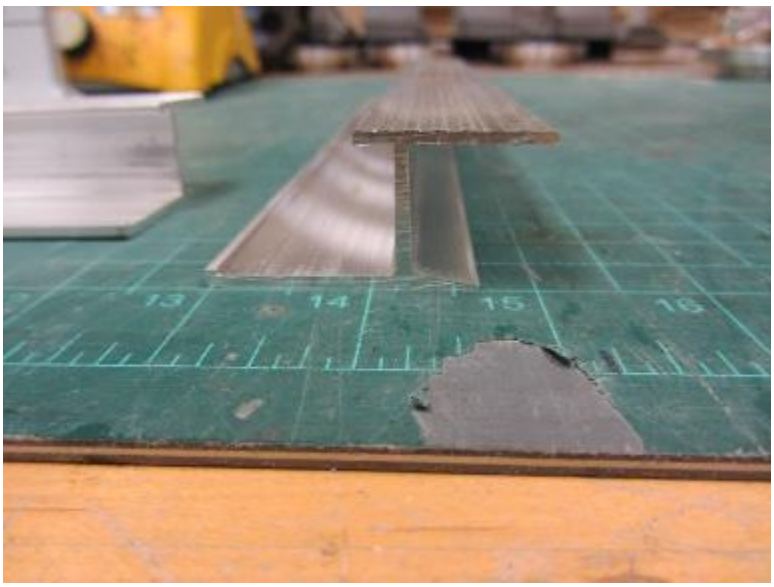

Photo No. 2
Kerf Anchor Detail

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Photo No. 3
ASTM C1354 - Kerf Anchorage Evaluation Test Setup - Front

Photo No. 4
ASTM C1354 - Kerf Anchorage Evaluation Test Setup - Rear

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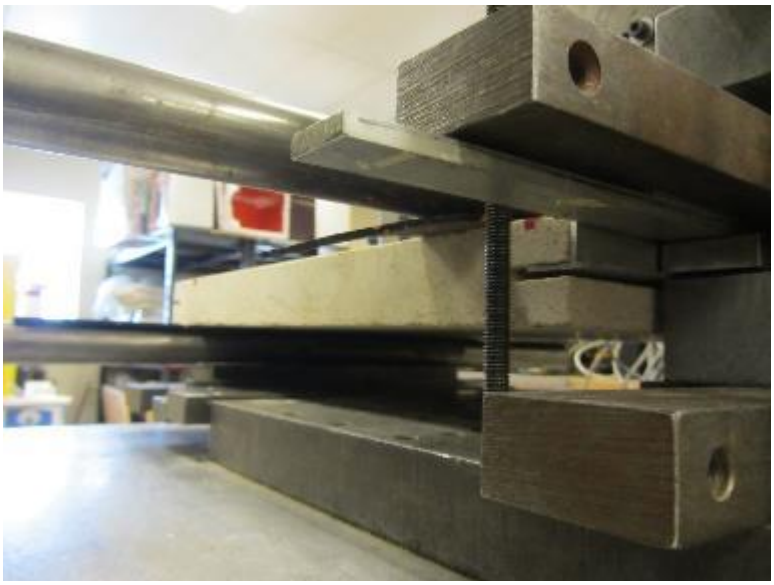

Photo No. 5
ASTM C1354 - Kerf Lip Loading Detail

Photo No. 6
ASTM C1354 - Representative Kerf Mockup Failure Mode - Stone Fracture (Kerf Lip)

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SECTION 11
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	02/08/21	N/A	Original Report Issue