SCAN

Intertek | Architectural Testing

17-251284 REV 01 FA

PERFORMANCE TEST REPORT

Rendered to:

DOW SILICONES CORPORATION

PRODUCT: DOWSIL™ 795 Silicone Building Sealant

Report No.:	**F9469.01-106-31**
Report Date:	**02/10/17**
Test Record Retention Date:	**01/27/21**
Revision 2:	**01/11/18**

130 Derry Court
York, PA 17406

www.archtest.com . www.intertek.com/building

p. 717.764.7700
f. 717.764.4129

Intertek | Architectural Testing

PERFORMANCE TEST REPORT

Rendered to:
DOW SILICONES CORPORATION
2200 West Salzburg Road PO Box 994
Auburn, Michigan 48611

Report No.:	F9649.01-106-31
Test Start Date:	06/02/16
Test Completion Date:	01/27/17
Report Date:	02/10/17
Test Record Retention Date:	01/27/21
Revision 2:	01/11/18

Product: DOWSIL™ 795 Silicone Building Sealant

Project Summary: Architectural Testing, Inc., an Intertek company ("Intertek-ATI"), was contracted by Dow Silicones Corporation to evaluate the DOWSIL™ 795 Silicone Building Sealant in accordance with ASTM C1184. The product description, test procedures, and test results are reported herein. Average test results are reported in the table below.

Test	Requirement	Result
ASTM C639 - Rheological Flow	≤3/16 in.	0 in.
ASTM C603 - Extrudibility	≤10 seconds	3.33 seconds
ASTM C661 - Hardness	20-60	40
ASTM C792 - Heat Aging	≤10% weight loss	1.897%
ASTM C679 - Tack Free Time	≤3 hours (180 minutes)	140 minutes
ASTM C1135 - Tensile Adhesion - Standard Conditions	50 psi	83 psi
ASTM C1135 - Tensile Adhesion - 88ºC (190ºF)	50 psi	70 psi
ASTM C1135 - Tensile Adhesion - -29ºC (-20ºF)	50 psi	117 psi
ASTM C1135 - Tensile Adhesion - Water Immersion	50 psi	87 psi
ASTM C1135 - Tensile Adhesion - 5,000 hours QUV Weathering	50 psi	78 psi

Test Methods: The test specimens were evaluated in accordance with the following methods.

ASTM C1184-14, *Standard Specification for Structural Silicone Sealants*

ASTM C639-15, *Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants*

ASTM C603-14, *Standard Test Method for Extrusion Rate and Application Life of Elastomeric Sealants*

ASTM C661-15, *Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer*

ASTM C792-15, *Standard Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants*

ASTM C679-15, *Standard Test Method for Tack-Free Time of Elastomeric Sealants*

ASTM C1135-15, *Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants*

Product Description: The DOWSIL™ 795 Silicone Building Sealant was purchased by Intertek-ATI and consisted of twelve tubes of sealant. The material was tested as-received.

Test Procedures and Test Results: The testing procedures and results obtained from testing are reported as follows. All conditioning of test specimens and test conditions were at standard laboratory conditions unless otherwise reported.

ASTM C639 - Rheological Flow

The sealant was determined to be Type II based on the guidelines of ASTM C639. Two stainless steel channels for were filled for a vertical slump test. One channel was placed vertically in a forced draft oven (ICN: Y002568) maintained at 50 ±2ºC (122 ±3.6ºF) while the other channel was placed into a refrigerator (ICN: Y002766) maintained at 4.4 ±2ºC (40 ±3.6ºF) for a period of 16 hours. Specimens were removed from their conditioning chambers and observed for any flow on the lower edge.

Specimen	Flow (in)
4.4 ±2ºC (40 ±3.6ºF)	0
50 ±2ºC (122 ±3.6ºF)	0

Test Procedures and Test Results: (Continued)

ASTM C603 - Extrudibility

The sealed tubes of the sealant were conditioned for at least 16 hours before testing began. One tube was selected at random and was used to fill a 177mL (6 fl oz) cartridge which was used for testing. The cartridge was placed into an air powered sealant gun which expelled the sealant with 50 psi of pressure out of the end of the cartridge with no nozzle.

Extrudibility Time
3.33 seconds

ASTM C661 - Hardness

Two specimens were prepared by filling a brass frame of internal dimensions measuring 5 in. X 1-1/2 in. X 1/4 in. The frame was removed and the sealant was allowed to cure under standard laboratory conditions of 73 ±4°F and 50% ±10% relative humidity for a period of seven days, followed by seven days at 100ºF and 95% relative humidity, and then seven days at standard laboratory conditions. A Shore "A" durometer (ICN: Y000092) was applied to the surface of each sealant pad with a force of three pounds. The instantaneous hardness reading was measured and recorded. Two additional readings were taken of each sealant pad for a total of six readings.

Reading	Specimen 1	Specimen 2
1	39	39
2	43	40
3	42	39
Average	**40**	

Test Procedures and Test Results: (Continued)

ASTM C792 - Heat Aging

Three specimens were prepared by filling a brass frame of internal dimensions measuring 5 in. X 1-1/2 in. X 1/4 in. on top of nominally 2 in. wide by 6 in. long aluminum plates. Before preparing specimens, the aluminum plate was weighed on a Mettler Toledo Balance (ICN: 65215). The plate and the fresh sealant were weighed using the same balance immediately after removing the brass frame. Specimens were allowed to cure for 7 days at standard laboratory conditions. Following the cure period Specimens 1 and 2 were placed into a forced-draft oven (ICN: Y002567) maintained at 70 ±2ºC (158 ±3.6ºF) for 21 days while the Specimen 3 was maintained at laboratory conditions. Specimens were allowed to cool to standard conditions and the re-weighed again to determine a percentage of mass loss.

Specimen No.	Weight of Aluminum Plate (g)	Weight of Aluminum Plate with Fresh Sealant (g)	Weight of Aluminum Plate with Aged Sealant (g)	Weight Loss (%)
1	21.543	62.764	61.980	1.902
2	21.805	63.117	62.317	1.936
3	21.825	60.500	59.784	1.851
Average	**21.724**	**62.127**	**61.360**	**1.897**

ASTM C679 - Tack Free Time

One tube of sealant was conditioned at standard laboratory conditions for at least 24 hours. Pads of sealant were made by filling a copper frame of internal dimensions measuring 5 in. X 1-1/2 in. X 1/8 in. Upon completion of the first sealant pad a timer was started and a reading was taken using polyethylene sheeting and a 30g weight with dimensions 1-5/8 in. X 3/4 in. every minute for the first 10 minutes followed by every 2 minutes for the next ten minutes and every 5 minutes for the next 160 minutes. The polyethylene strip was then peeled away from the sealant at a 90º angle. If sealant adhered to the strip the test was continued.

Tack-Free Time
140 minutes

Test Procedures and Test Results: (Continued)

ASTM C1135 - Tensile Adhesion

Twenty-five specimens were made for testing. A 3/8 in. wide spacer was used between two pieces of cleaned glass and clamped in place before sealant was used to fill the gap. After filling all molds the specimens were allowed to cure for 21 days at standard laboratory conditions before groups of five specimens were then subjected to one of the following conditions immediately prior to testing:

- Ambient
- 1 hour at -29°C
- 1 hour at 88°C
- 7 days of immersion in deionized water
- 5,000 hours of UV light exposure

After each exposure condition the samples were mounted to an Instron Universal Test Machine (ICN: 005740) and pulled in tension with a crosshead movement speed of 0.5 in/min until failure occurred.

Ambient Condition

Specimen No.	Area (in^2)	Load at 10% Elongation (lb_f)	Load at 25% Elongation (lb_f)	Load at 50% Elongation (lb_f)	Load at 100% Elongation (lb_f)	Peak Load (lb_f)	Tensile Strength (psi)	Cohesive Failure (%)
1	1.0	37.1	56.6	75.2	88.8	89.3	90	10
2	1.1	37.5	58.3	76.1	79.5	80.0	75	10
3	1.0	36.3	54.8	73.9	89.9	90.4	87	10
4	1.1	37.4	56.0	74.6	84.5	86.6	81	10
5	1.0	36.8	56.1	74.3	84.3	84.3	83	25
Average	**1.0**	**37.0**	**56.4**	**74.8**	**85.4**	**86.1**	**83**	

1 hour at 88ºC Condition

Specimen No.	Area (in^2)	Load at 10% Elongation (lb_f)	Load at 25% Elongation (lb_f)	Load at 50% Elongation (lb_f)	Load at 100% Elongation (lb_f)	Peak Load (lb_f)	Tensile Strength (psi)	Cohesive Failure (%)
1	1.0	30.3	44.9	60.7	68.1	69.3	71	10
2	1.0	27.7	44.0	60.3	65.4	68.3	68	50
3	1.0	27.3	42.4	54.5	54.6	58.0	58	100
4	1.0	30.2	45.7	61.3	78.3	78.3	81	10
5	1.0	31.0	47.3	63.3	72.4	75.0	73	10
Average	**1.0**	**29.3**	**44.9**	**60.0**	**67.8**	**69.8**	**70**	

Test Procedures and Test Results: (Continued)

ASTM C1135 - Tensile Adhesion
(Continued)

1 hour at -29ºC Condition

Specimen No.	Area (in^2)	Load at 10% Elongation (lb_f)	Load at 25% Elongation (lb_f)	Load at 50% Elongation (lb_f)	Load at 100% Elongation (lb_f)	Peak Load (lb_f)	Tensile Strength (psi)	Cohesive Failure (%)
1	1.0	56.7	86.1	117.2	131.2	131.2	125	25
2	1.0	55.6	81.2	109.3	102.6	115.3	110	50
3	1.0	53.3	81.0	109.9	109.7	116.5	115	50
4	1.0	53.1	78.6	107.9	117.9	119.6	124	25
5	1.0	45.7	70.5	97.0	98.7	105.8	109	50
Average	**1.0**	**52.9**	**79.5**	**108.3**	**112.0**	**117.7**	**117**	

7 days Deionized Water Immersion Condition

Specimen No.	Area (in^2)	Load at 10% Elongation (lb_f)	Load at 25% Elongation (lb_f)	Load at 50% Elongation (lb_f)	Load at 100% Elongation (lb_f)	Peak Load (lb_f)	Tensile Strength (psi)	Cohesive Failure (%)
1	1.0	35.2	52.6	71.4	90.5	94.5	97	10
2	1.1	39.0	57.0	77.6	97.4	101.4	93	10
3	1.1	39.0	55.9	75.5	90.4	91.3	86	10
4	1.0	34.3	52.5	71.7	79.7	81.9	79	10
5	1.0	33.9	49.6	67.2	82.2	82.3	80	10
Average	**1.0**	**36.3**	**53.5**	**72.7**	**88.0**	**90.3**	**87**	

5,000 Hour QUV Condition

Specimen No.	Area (in^2)	Load at 10% Elongation (lb_f)	Load at 25% Elongation (lb_f)	Load at 50% Elongation (lb_f)	Load at 100% Elongation (lb_f)	Peak Load (lb_f)	Tensile Strength (psi)	Cohesive Failure (%)
1	1.0	32.3	54.4	75.7	39.6	78.6	80	50
2	1.0	35.5	56.4	77.5	19.7	85.6	84	25
3	1.0	38.4	58.0	79.5	--*	84.7	87	50
4	1.1	30.6	52.3	61.2	45.0	68.0	62	50
5	1.2	42.3	64.6	86.4	--*	88.9	77	25
Average	**1.1**	**35.8**	**57.1**	**76.1**	**34.8**	**81.2**	**78**	

**Specimens did not stretch to 100% elongation.*

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period.

Results obtained are tested values and were secured using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For INTERTEK-ATI:

Digitally Signed by: Joseph M. Brickner

Joseph M. Brickner
Laboratory Supervisor
Components / Materials Testing

Digitally Signed by: Dawn M. Chaney

Dawn M. Chaney
Technician Team Lead
Components / Materials Testing

DMF:jmb/dmc/kf

Attachments (pages) This report is complete only when all attachments listed are included.
Appendix A - Photographs (3)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	02/10/17	N/A	Original report issue
1	12/04/17	Throughout	Changed client name from Dow Corning Corporation to Dow Chemical Company
2	01/11/18	Throughout	Changed company name from Dow Chemical Company to Dow Silicones Corporation.

APPENDIX A

Photographs

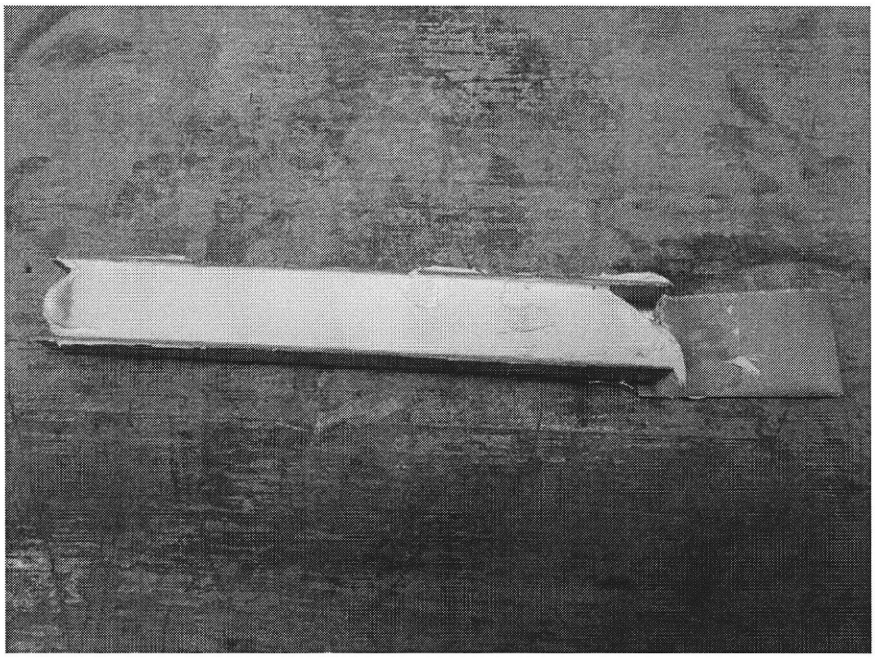


Photo No. 1
Typical Rheological Flow Test Specimen

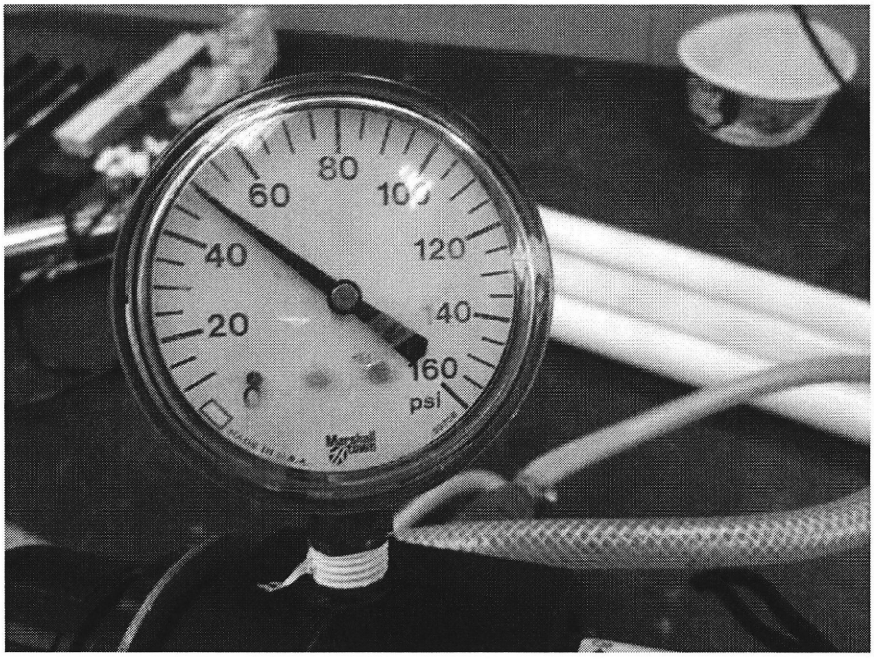


Photo No. 2
Extrudibility Pressure Detail

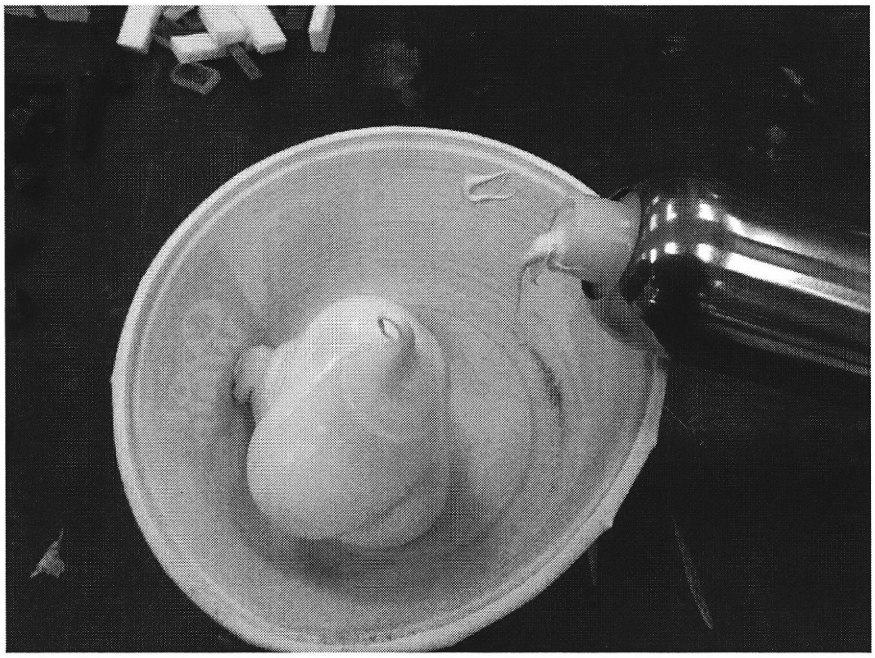


Photo No. 3
Extrudibility Test Complete

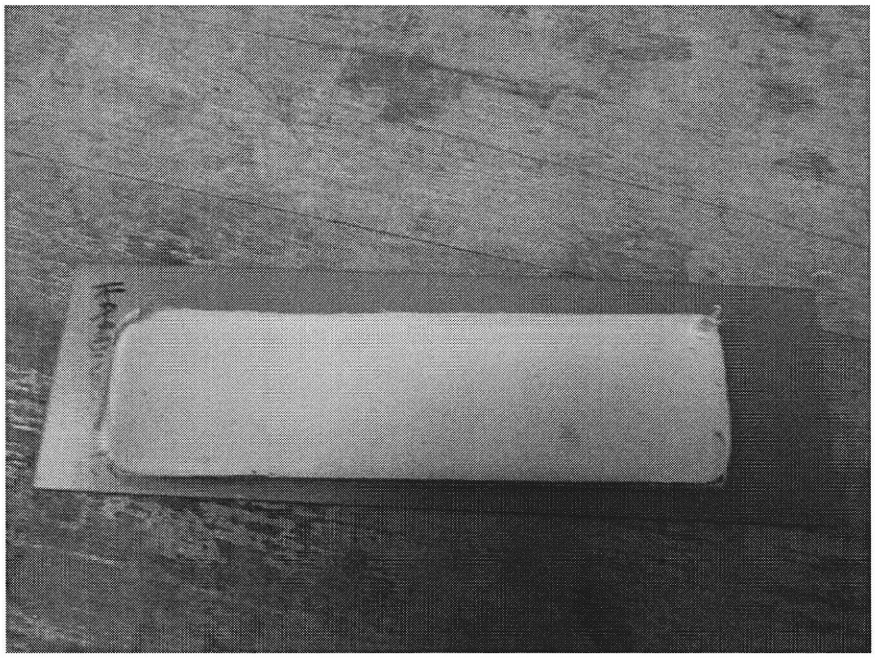


Photo No. 4
Hardness Test Specimen

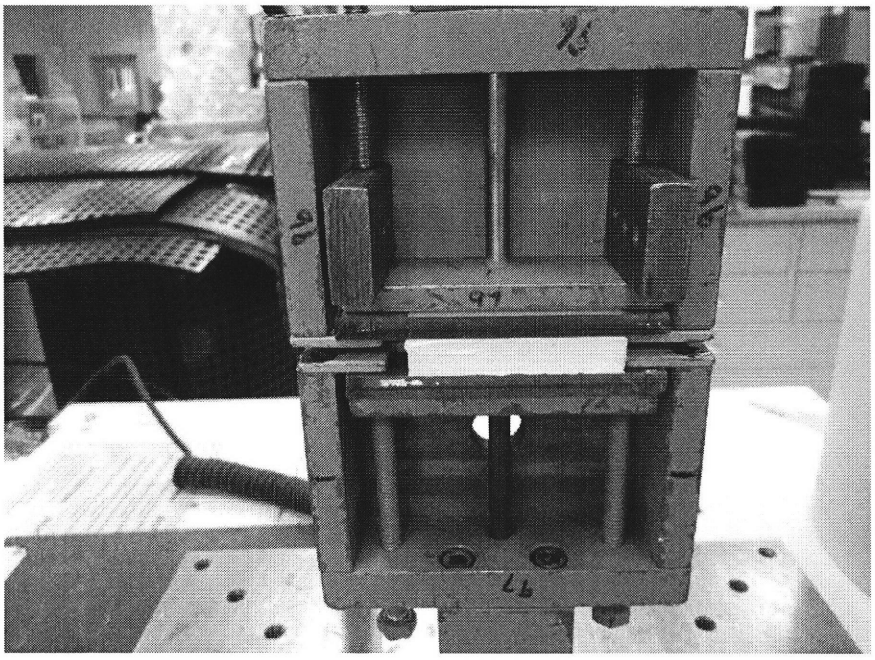


Photo No. 5
Tensile Adhesion - Test Set-Up

Photo No. 6
Tensile Adhesion - Failure Detail

TERRACOTTA TILE PANEL SEALANT LOAD TESTING REPORT

Report Number: 82191102.0003
Service Date: 05/15/19
Report Date: 05/16/19

SCAN

7911 NE 33rd Dr, Ste 190
Portland, OR 97211-1919
503-281-7515

Client

Streimer Sheet Metal Works Inc
Attn: Jacob Dorfler
740 N Knott St
Portland, OR 97227

Project

The Portland Building Reconstruction
1120 SW 5th Ave
Portland, OR 97204

Project Number: 82191102

Summary: Mayes / Terracon representatives performed load testing on terracotta panels, stone clips, and Dow DOWSIL 795 silicone building sealant in general accordance with test program provided by DCI Engineers to Streimer Sheet Metal Works, dated March 7th, 2019. The load testing was intended to determine the bond strength of the sealant and the terracotta tile, specifically in its capacity to resist lateral movement of the stone clips within the kerf of the tile.

Specimen Preparation: On 3/28/2019, Chris Wageman with Streimer Sheet Metal Works was on site at Mayes / Terracon's Portland laboratory. All materials used as test specimens unique to this load testing program were delivered by Chris Wageman during this visit, including the sealant, the terracotta tile panels, and the metal stone clip used during the load testing. During this visit, 0.50"-length segments of DOWSIL 795 sealant were installed into the full depth of the kerf of (2) terracotta panels, with (2) segments being installed in each of the panel's (2) kerfs, for a total of (8) 0.50"-length, full-depth sealant segments. The depth of the kerfs were approximately .065", and their widths were approximately 0.18".

These (8) segments were intentionally installed in such a manner that the distance between in interior edge of the segment and the exterior edge of the kerf ranged from 4-7/8" to 6-1/8", with generally equal distribution of placement throughout this range. The sealant was left to cure in ambient indoor conditions, until the time of the load testing, which occurred on 5/15/2019.

See Photographs 1 and 2 for image of typical sealant installation into kerf, with clip resting in kerf, and with markups to indicate intended loading path during testing.

Testing Apparatus/Setup: Load testing was performed on 5/15/2019, after necessary equipment to assemble the following described test apparatus had been acquired. The load tests were performed by Chuck Schneider with Mayes / Terracon. The tile panels themselves were held to a steel frame with a ratchet strap, with the kerf containing the sealant segment to be tested facing up, and running horizontally. The stone clip was then placed into the kerf on the interior side of the sealant segment, resting directly next to it. The top surface of this clip was coated with lithium grease, and a rotating element of the steel frame was spun into position immediately on top of it with less than a 1/16" gap, where the rotating element was locked into position. This setup ensured that the force would be pulled as laterally as possible, and precluded the clip from being pulled up and out of the kerf during testing; the grease on the clip's upper surface minimized the friction between the clip and the steel member holding it in a horizontal position. Grease was applied to the top of the clip before each of the (8) tests.

MAYES TESTING ENGINEERS
A Terracon COMPANY
7911 NE 33rd Dr, Ste 190
Portland, OR 97211-1919
503-281-7515

Report Number: 82191102.0003
Service Date: 05/15/19
Report Date: 05/16/19

Client
Streimer Sheet Metal Works Inc
Attn: Jacob Dorfler
740 N Knott St
Portland, OR 97227

Project
The Portland Building Reconstruction
1120 SW 5th Ave
Portland, OR 97204

Project Number: 82191102

There were three existing holes in the clip itself. A 3/8" steel cable was passed through the closest hole to the kerf's exterior, doubled back on itself and pinned together with a rope clip. The other end of this cable was similarly rope-clipped to an eyebolt threaded to the central axis of a Com-Ten model 301 dial pressure gauge with a functional range from 0 to 1,000 pounds, readable to the nearest 5 pounds, and calibrated on 7/31/2018. The base of the gauge was placed vertically against two tube steel bars attached to the main steel frame itself; these bars acted as a reaction frame for the loads applied outwardly to the sealant by the clip. The steel cable connecting the clip to the pressure gauge was visually checked to ensure tautness, as well as perpendicularity along two axes, to minimize load bias. See Photographs 3 through 9 for detailed images of the load testing setup.

Load Testing: Once the apparatus and specimen was in place as described, the pressure gauge was loaded via hand-turning the central axis, slowly pulling the clip towards the gauge, with the force reacting against the bars attached to the steel frame. After establishing a datum at 15 pounds loaded, the load on the clip was increased 10-pound increments over 5 seconds with a 5 second 'rest' in between increments, until, in each of the (8) tests, the clip 'sliced' through the kerf and the sealant was no longer resisting its motion. The maximum load achieved was then recorded. See Photograph 10 for image of sealant reacting and deforming against the clip, shortly before failure of the sealant at the end of that particular test.

In all cases, the sealant remained bonded to the tile, with a kerf-deep channel cut through its thickness by the edge of the clip. It was noted that in between each increment of 10 pounds of load, the pressure remained constant, indicating that the system was rigid and unyielding with the load applied.

As per the testing program, after the first test did not achieve a 150-pound load, Greg Nourse with DCI was contacted to determine whether or not to proceed; it was decided that the remaining (7) tests should be conducted regardless of strength, to provide data to the SER.

Test Result Summary: The total load resisted by the sealant-tile bond against the clip's motion ranged from 40 pounds to 80 pounds; without the 15-pound initial load established in the testing program decremented from the ultimate values, these loads ranged from 55 pounds to 95 pounds. The chart below includes values both with and without this 15-pound load decremented from the ultimate applied load. The segments were tested in order of the distance from the interior of the sealant to the exterior of the kerf, and are presented in that order, along with the average loads and standard deviations of both decremented and non-decremented ultimate loads.

TERRACOTTA TILE PANEL SEALANT LOAD TESTING REPORT

MAYES TESTING ENGINEERS
A Terracon COMPANY

7911 NE 33rd Dr, Ste 190
Portland, OR 97211-1919
503-281-7515

Report Number: 82191102.0003
Service Date: 05/15/19
Report Date: 05/16/19

Client

Streimer Sheet Metal Works Inc
Attn: Jacob Dorfler
740 N Knott St
Portland, OR 97227

Project

The Portland Building Reconstruction
1120 SW 5th Ave
Portland, OR 97204

Project Number: 82191102

Test Result Analysis:

Distance to Edge:	Decremented Load:	Measured Load:
6-1/8"	80 pounds	95 pounds
6"	40 pounds	55 pounds
5-7/8"	45 pounds	60 pounds
5-5/8"	50 pounds	65 pounds
5-1/2"	65 pounds	80 pounds
5-3/8"	65 pounds	80 pounds
5-1/8"	50 pounds	65 pounds
4-7/8"	60 pounds	75 pounds
Average:	**56.9 pounds**	**71.9 pounds**
Std Deviation:	**12.2 pounds**	**12.2 pounds**

Services: Check sealant load resistance in general conformance with DCI's test program

Mayes Testing Engineers Rep.: Charles Schneider
Reported To:
Contractor:
Report Distribution:
(1) Streimer Sheet Metal Works Inc, Jacob Dorfler
(1) DCI Engineers, Prabhanjan Wagh

Reviewed By:

Trevor Tickner
Department Manager III

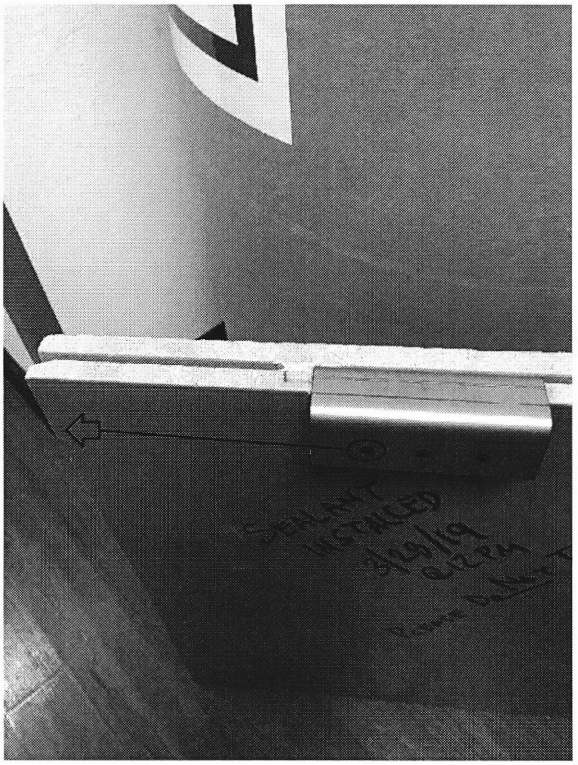


Photo #1 Installed Sealant, From Above

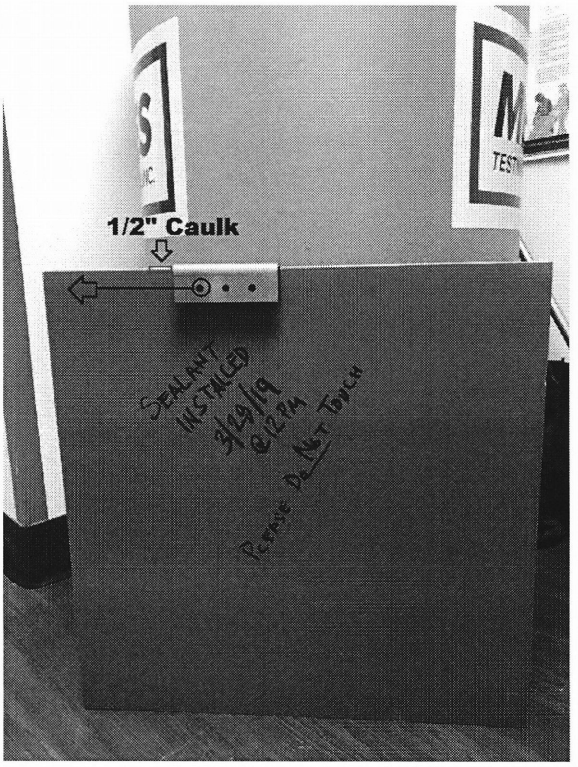


Photo #2 Installed Sealant, From Side

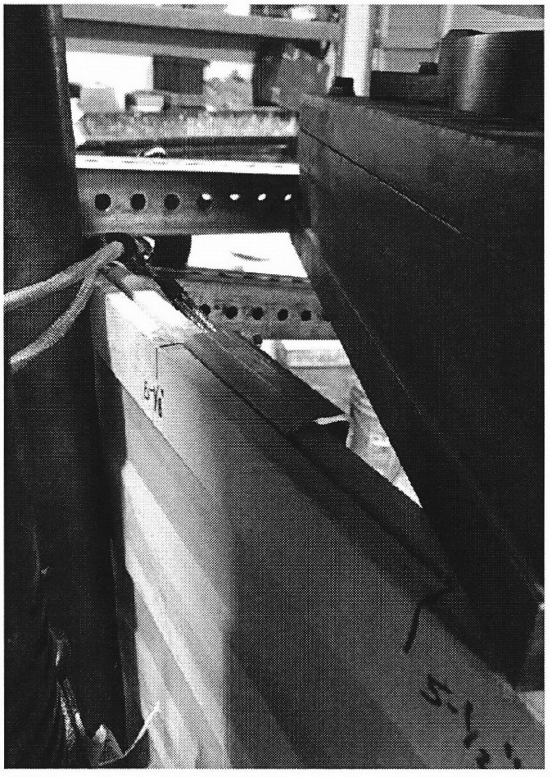


Photo #3 Clip Resting Against Sealant in Kerf

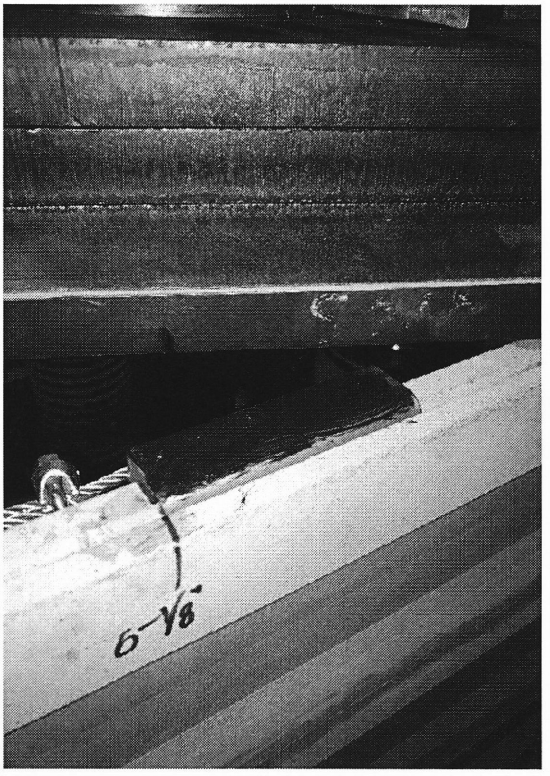


Photo #4 Greased Clip, Top Surface

The Portland Building Reconstruction	Subject: Terracotta Tile Panel Sealant Load Testing	Terracon
	Report Number: 82191102.0003	
1120 SW 5th Ave	Technician: Chuck Schneider	7911 NE 33rd Dr, Ste 190
Portland, OR 97204	Date: 05/15/19	Portland, OR 97211-1919
	Scale: Not to Scale	**503-281-7515**

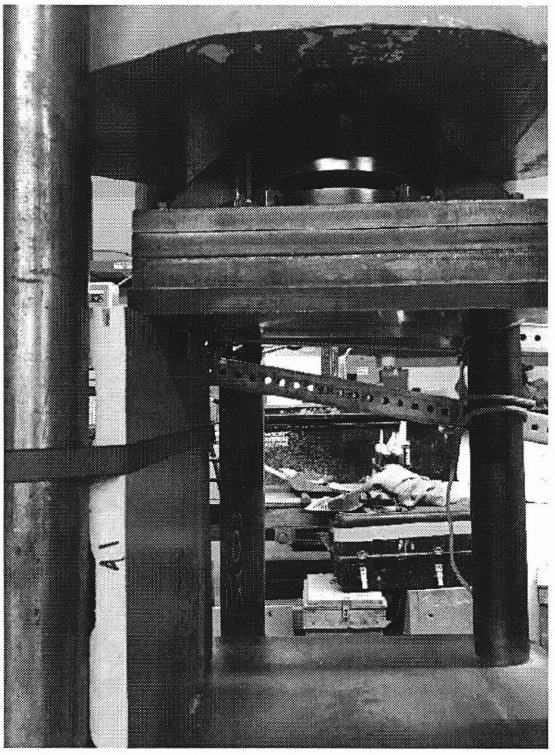


Photo #5 Locked Upper Rotating Frame

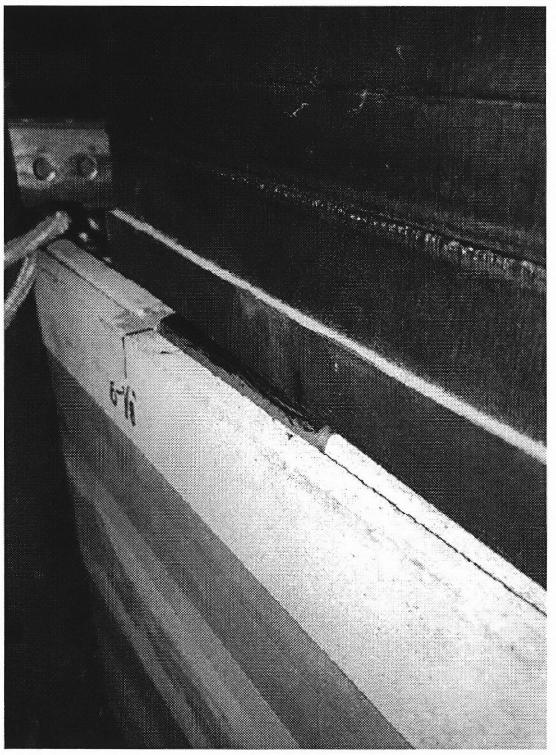


Photo #6 Greased Clip Under Rotating Frame

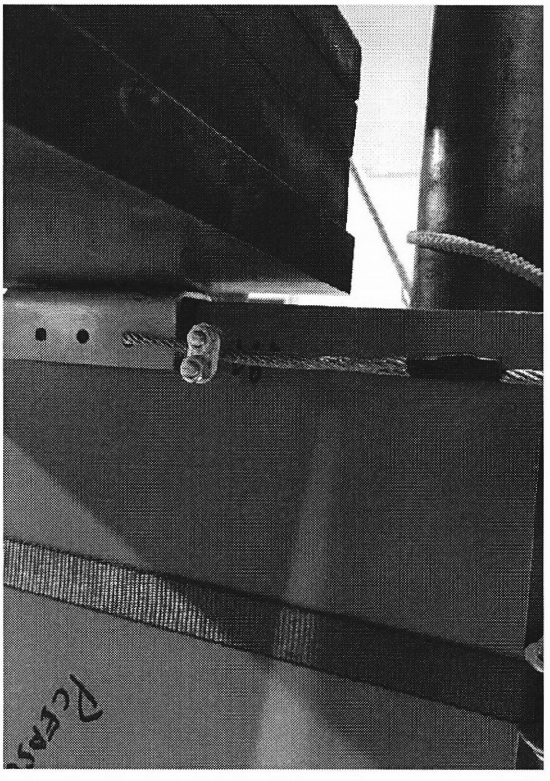


Photo #7 Cable Connection at Clip

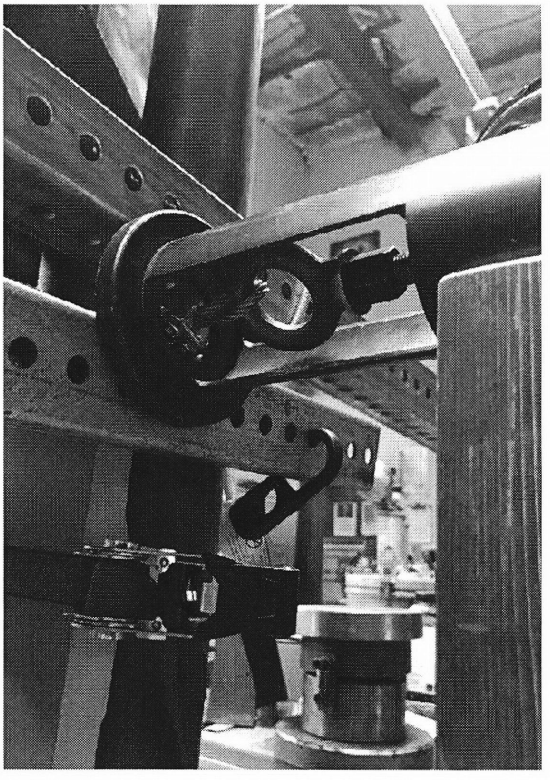


Photo #8 Cable Connection and Pressure Gauge

The Portland Building Reconstruction	Subject: Terracotta Tile Panel Sealant Load Testing	Terracon
	Report Number: 82191102.0003	
1120 SW 5th Ave	Technician: Chuck Schneider	7911 NE 33rd Dr, Ste 190
Portland, OR 97204	Date: 05/15/19	Portland, OR 97211-1919
	Scale: Not to Scale	**503-281-7515**

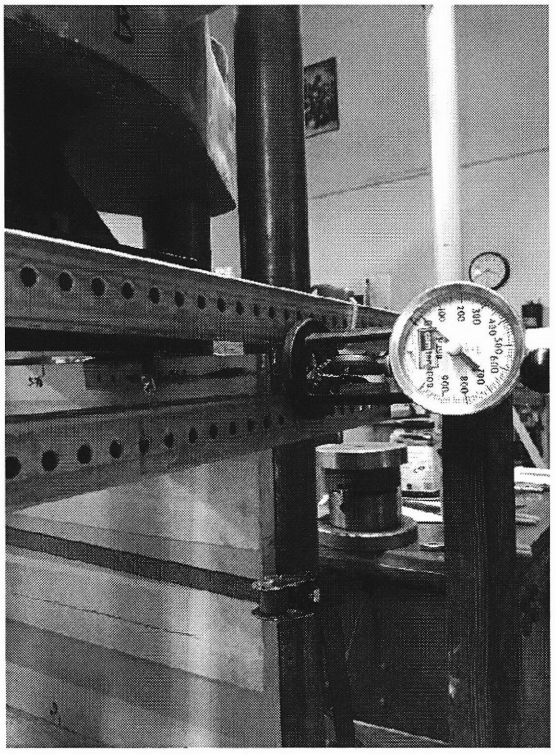


Photo #9 Image of Entire Loading Apparatus

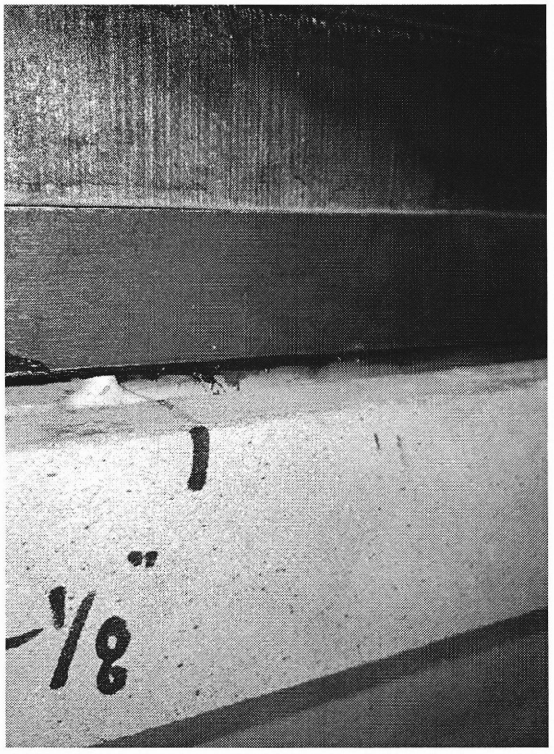


Photo #10 Partially Failed Sealant and Clip

The Portland Building Reconstruction	Subject: Terracotta Tile Panel Sealant Load Testing	Terracon
	Report Number: 82191102.0003	
1120 SW 5th Ave	Technician: Chuck Schneider	7911 NE 33rd Dr, Ste 190
Portland, OR 97204	Date: 05/15/19	Portland, OR 97211-1919
	Scale: Not to Scale	**503-281-7515**

	Project No. 18031-0058	Sheet No.
Project: Portland Building- Terra cotta Anchorage	Date: 28-Jun-2018	By: PW
Subject: Seismic 'Fp'		

SEISMIC DESIGN REQUIREMENTS FOR NONSTRUCTURAL COMPONENTS ASCE 7-10

S_{DS} = **0.73** g
a_p = **2.5**
I_p = **1**
W_p = **31** lbs
R_p = **2.5**
z = **43.67** ft
h = **193.667** ft
Ω = **2.5**

$$F_p = \frac{0.4 a_p S_{DS} W_p}{\left(\frac{R_p}{I_p}\right)}\left(1 + 2\frac{z}{h}\right)$$ = **13.3 lbs**

Weight of each terracotta panel

Equation 13.3-2 $F_p = 1.6 S_{DS} I_p W_p$ = **36.6 lbs**

Equation 13.3-3 $F_p = 1.6 S_{DS} I_p W_p,$ = **6.9 lbs**

Equation 13.3-1 controls, F_p = **13.3 lbs**

For h = 43.67 ft

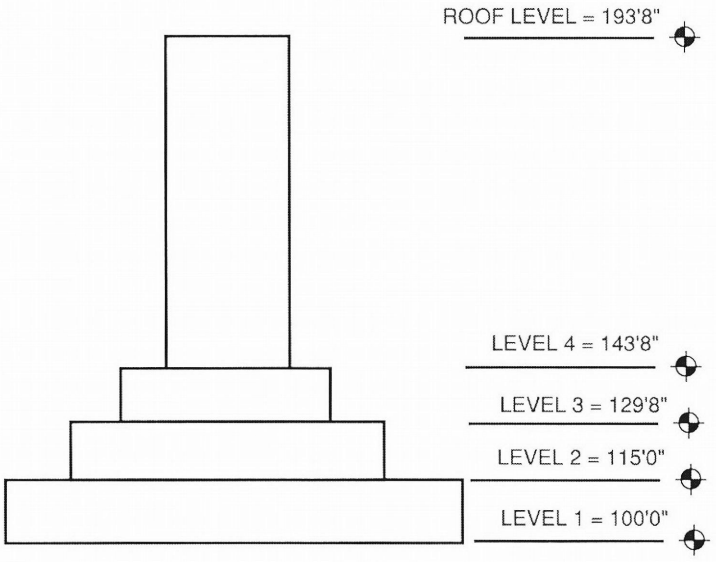
S_{DS} = **0.73** g
a_p = **2.5**
I_p = **1**
W_p = **31** lbs
R_p = **2.5**
z = **43.67** ft
h = **43.67** ft
Ω = **2.5**

$$F_p = \frac{0.4 a_p S_{DS} W_p}{\left(\frac{R_p}{I_p}\right)}\left(1 + 2\frac{z}{h}\right)$$ = **27.2 lbs**

Equation 13.3-2 $F_p = 1.6 S_{DS} I_p W_p$ = **36.2 lbs**

Equation 13.3-3 $F_p = 1.6 S_{DS} I_p W_p,$ = **6.8 lbs**

Equation 13.3-1 controls, F_p = **27.2 lbs**



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