Architectural Testing

Performance Test Report

Report No.: C6549.01-401-44

Rendered to:

SAINT-GOBAIN PERFORMANCE PLASTICS
SOLAR GARD®
San Diego, California

PRODUCT TYPE: 100 micron (4mil) Polyester Film
SERIES/MODEL: Solar Gard Sentinel 4mil

This report contains in its entirety:

Cover Page:	1 page
Report Body:	13 pages
Sketches:	1 page
Photographs:	12 pages
Drawings:	11 pages

SHAWN G. COLLINS
LICENSE
No. 70655
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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2013.07.12 11:19:23 -04'00'

Test Dates:	06/17/13
Through:	06/19/13
Report Date:	07/11/13

2250 Massaro Blvd
Tampa, FL 33619
phone: 813-628-4300
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1.0 Report Issued To: Saint-Gobain Performance Plastics
4540 Viewridge Avenue
San Diego, California 92123

2.0 Test Laboratory: Architectural Testing, Inc.
2250 Massaro Boulevard
Tampa, Florida 33619
813-628-4300

3.0 Project Summary:

3.1 Product Type: 100 micron (4mil) Polyester Film

3.2 Series/Model: Solar Gard Sentinel 4mil

3.3 Compliance Statement: Results obtained are tested values and were secured by using a modification to the designated test method.

3.4 Test Dates: 06/17/2013 – 06/19/2013

3.5 Test Record Retention End Date: All test records for this report will be retained until June 19, 2017.

3.6 Test Location: Architectural Testing, Inc. test facility in Tampa, Florida.

3.7 Test Sample Source: The test specimen was provided by the client. Representative samples of the test specimen will be retained by Architectural Testing for a minimum of four years from the test completion date.

3.8 Drawing Reference: The test specimen drawings have been reviewed by Architectural Testing and are representative of the test specimen reported herein. Test specimen construction was verified by Architectural Testing per the drawings located in Appendix C. Any deviations are documented herein or on the drawings.

3.9 List of Official Observers:

Name	Company
Miguel Detres	Saint-Gobain Performance Plastics
John McClane	Architectural Testing, Inc.
Dan White	Architectural testing, Inc.
Shawn G. Collins, P.E.	Architectural Testing, Inc.
Scott Parker	Architectural Testing, Inc.

4.0 Test Specification(s):

A modified version of ASTM E 1886-05, *Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.*

5.0 Test Specimen Description:

5.1 Product Sizes:

Test Specimens #1 - #3:

Overall Area: 10.0 m^2 (107.8 ft^2)	**Width**		**Height**	
	millimeters	**inches**	**millimeters**	**inches**
Overall size	3829	150-3/4	2616	103
Rough opening	3861	152	2629	103-1/2

Test Specimens #4:

Overall Area: 3.4 m^2 (36.1 ft^2)	**Width**		**Height**	
	millimeters	**inches**	**millimeters**	**inches**
Overall size	1321	52	2540	100
Rough opening	1334	52-1/2	2553	100-1/2

5.2 Frame Construction Test Specimens

Frame Member	**Material**	**Description**
Head/sill	Extruded aluminum	Extrusion drawing #15.
Jambs/vertical/ horizontal mullions	Extruded aluminum	Extrusion drawing #1. (Specimens #1-3) Extrusion drawing #16. (Specimen #4)
Shear blocks	Extruded aluminum	Extrusion drawings #8 intermediate mullions & 9 head and sill.
Wind load clips	Extruded aluminum	Extrusion drawing #6 vertical intermediate mullions & 7 jambs.
Pressure plate	Extruded aluminum	Extrusion drawing #4.

	Joinery Type	**Detail**
All corners	Mechanically	Mechanically fastened to wind load clips and/or shear blocks.

5.0 Test Specimen Description: (Continued)

5.3 Weatherstripping:

Description	Quantity	Location
EPDM; Glazing gasket	2 rows	Glazing pocket; horizontal and vertical frame members. Extrusion drawing #12.
EPDM; Glazing gasket	2 rows	Each side of pressure bar. Extrusion drawing #14.
EPDM; Thermal break gasket	1 row	Center of horizontal and vertical frame members. Extrusion drawing #13.

5.4 Glazing: *No conclusions of any kind regarding the adequacy or inadequacy of the glass in any glazed test specimen(s) can be made.*

Glass Type	Spacer Type	Interior Lite	Exterior Lite	Glazing Method
1" IG	Aluminum	¼" tempered	¼" tempered with 4mil organic coated film at exterior side	Exterior glazed onto glazing gasket and secured with a pressure bar. All exterior lites had organic coated film applied to the exterior side.

5.4 Glazing: Test Specimens #1 - #3:

Location	Quantity	Daylight Opening		Glass Bite mm (inch)
		millimeters	inches	
Upper and lower lites at corners	4	584 x 584	23 x 23	12.7 (½")
Center lites at jambs	2	584 x 1194	23 x 47	12.7 (½")
Top and bottom center lites	2	2407 x 584	94-3/4 x 23	12.7 (½")
Center lite	1	2407 x 1194	94-3/4 x 47	12.7 (½")

5.4 Glazing: Test Specimens#4:

Location	Quantity	Daylight Opening		Glass Bite mm (inch)
		millimeters	inches	
Lite	1	2407 x 1194	94-3/4 x 47	12.7 (½")

5.5 Drainage: No drainage was utilized.

5.0 Test Specimen Description: (Continued)

5.5 Drainage: No drainage was utilized.

5.6 Hardware: No hardware was utilized.

5.7 Reinforcement: No reinforcement was utilized.

6.0 Installation:

Test Specimens#1: **UltraSpan US 1100**
The nine lite specimen was installed into a C10 steel buck welded at the corners. The rough opening allowed for a ½" shim space. The shear block clips were secured to the vertical mullions at the head, sill and intermediate locations; with #12 x 2" pan head screws. The horizontal mullions were secured to the shear blocks with two (2) #12 x 7/8" flat head screws. The specimen was secured to the steel test buck utilizing ¼-20 x 1-1/2" hex head tek screws; four (4) each side of the "T" clip and four (4) in the "F" clip. The Solar Gard Sentinel 4mil film was applied to the exterior side of the insulated glass and cured for a period of 6 weeks. The perimeter of all film edges were cleaned with 91% isopropyl alcohol. *(Reference Photo #1)* Approximately an 8mm (5/16") wide bead of SCS2000 SilPruf silicone sealant was applied to the edges of the film on opposing lites. *(Reference Photo #2)* UltraSpan US 1100 was applied to the sealant bridging across the two opposing glazing pockets. *(Reference Photo #3)* Pressure was applied using application tools; to bond the UltraSpan US 1100 to the sealant and the sealant to the film. *(Reference Photo #4)* SCS 2000 SilPruf silicone sealant was applied to the underside of the pressure bar at the center and secured with ¼-20 x 1" HWHTCS F screws located 8" on center. *(Reference Photo #5)* UltraSpan US 1100 application at vertical pressure bar and horizontal mullion. *(Reference Photo #6 &7)* Specimens were allowed to cure for 21 days.

Test Specimens#2: **SCS 2000 SilPruf Silicone Sealant**
The nine lite specimen was installed into a C10 steel buck welded at the corners. The rough opening allowed for a ½" shim space. The shear block clips were secured to the vertical mullions at the head, sill and intermediate locations; with #12 x 2" pan head screws. The horizontal mullions were secured to the shear blocks with two (2) #12 x 7/8" flat head screws. The specimen was secured to the steel test buck utilizing ¼-20 x 1-1/2" hex head tek screws; four (4) each side of the "T" clip and four (4) in the "F" clip. The Solar Gard Sentinel 4mil film was applied to the exterior side of the insulated glass and cured for a period of 6 weeks. The perimeter of all film edges were cleaned with 91% isopropyl alcohol. *(Reference Photo #1)* SCS 2000 SilPruf silicone sealant was applied to the film edges at the perimeter of the lites. *(Reference Photo #8)* The pressure bars; without EPDM weatherstripping, were installed and secured with ¼-20 x 1" HWHTCS F screws located 8" on center. *(Reference Photo #9)* A void was created

6.0 Installation: (Continued)

Test Specimens#2: (Continued)
between the pressure bar and glass where the weatherstripping was; this void was filled and tooled with SCS 2000 SilPruf silicone sealant. *(Reference Photo #10)* Specimens were allowed to cure for 21 days.

Test Specimens#3: **Pentagon Flexible Membrane**
The nine lite specimen was installed into a C10 steel buck welded at the corners. The rough opening allowed for a ½" shim space. The shear block clips were secured to the vertical mullions at the head, sill and intermediate locations; with #12 x 2" pan head screws. The horizontal mullions were secured to the shear blocks with two (2) #12 x 7/8" flat head screws. The specimen was secured to the steel test buck utilizing ¼-20 x 1-1/2" hex head tek screws; four (4) each side of the "T" clip and four (4) in the "F" clip. The Solar Gard Sentinel 4mil film was applied to the exterior side of the insulated glass and cured for a period of 6 weeks. The perimeter of all film edges were cleaned with 91% isopropyl alcohol. The perimeter of all film edges were treated with an adhesion promoter (3M 4298). A 2-1/2" wide Pentagon Flexible Membrane was applied to the film edges; bridging the two opposing glazing pockets, and secured by 9/16" wide double-sided tape that was fabricated on the two outside edges of the Pentagon Flexible Membrane. The Pentagon Flexible Membrane was secured in place; to the film, by applied pressure using application tools. The pressure bars; with EPDM weatherstripping, were secured with ¼-20 x 1" HWHTCS F screws located 8" on center.

Test Specimen #4: **SCS2000 SilPruf Silicone Sealant**
The single lite specimen was installed into a C10 steel buck welded at the corners. The rough opening allowed for a ½" shim space. The jambs were secured to the head and sill utilizing 3- #12 x 2" hex head screws at each corner. The specimen was secured to the steel test buck utilizing ¼-20 x 1-1/2" tek hex head screws 4" from each corner and 24" on center at the head, sill and jambs.. The Solar Gard Sentinel 4mil film was applied to the exterior side of the insulated glass and cured for a period of 6 weeks. The perimeter of all film edges were cleaned with 91% isopropyl alcohol. SCS2000 SilPruf silicone sealant was applied to the film edges at the perimeter of the lite. The pressure bars; without EPDM weatherstripping, were installed and secured with ¼-20 x 1" HWHTCS F screws located 8" on center. A void was created between the pressure bar and glass where the weatherstripping was; this void was filled and tooled with SCS2000 SilPruf sealant. Specimens were allowed to cure for 21 days.

6.0 Installation: (Continued)

Location	Anchor Description	Anchor Location
Shear blocks to vertical mullions	#12 x 2" pan head screw	Two screws in shear blocks at the horizontal intermediate mullions; and three screws in shear blocks at the head and sill.
Horizontal mullions to shear block	#12 x 7/8" flat head screw	Two at each end of horizontal mullions.
Pressure bar to mullions	¼-20 x 1" HWHTCS F screw	4" from each end and 8" on center.
"T" clips and "F" clips	¼-20 x 1-1/2" hex head tek screw	Four each side of "T" clips; four in "F" clips.

7.0 Test Results: The results are tabulated as follows:

Modified ASTM E 1886, *Air Pressure Cycling; 50 cycles per pressure group*

Test Unit #1 UltraSpan US 1100/ Unbroken glass

Pressure		Indicator Number (Deflections) mm (inches) **Unbroken Glass**							
kPa	PSF	Cycle Times	1	2	3	4	5	6	7
0.0 to +1	0.0 to +20.9	4.35	0.25 (0.01)	0.51 (0.02)	0.25 (0.01)	0.76 (0.03)	3.05 (0.12)	0.76 (0.03)	10.41 (0.41)
0.0 to -1	0.0 to -20.9	4.53	1.27 (0.05)	4.57 (0.18)	0.76 (0.03)	3.81 (0.15)	11.18 (0.44)	4.57 (0.18)	15.24 (0.60)
0.0 to +2	0.0 to +41.8	4.02	1.52 (0.06)	4.57 (0.18)	0.76 (0.03)	3.81 (0.15)	11.43 (0.45)	4.83 (0.19)	15.49 (0.61)
0.0 to -2	0.0 to -41.8	5.65	2.29 (0.09)	6.35 (0.25)	1.02 (0.04)	5.59 (0.22)	15.75 (0.62)	6.10 (0.24)	20.32 (0.80)
0.0 to +3	0.0 to +62.7	5.63	2.03 (0.08)	6.35 (0.25)	1.52 (0.06)	5.08 (0.20)	14.48 (0.57)	4.57 (0.18)	23.37 (0.92)
0.0 to -3	0.0 to -62.7	6.03	3.05 (0.12)	9.40 (0.37)	1.27 (0.05)	8.38 (0.33)	23.37 (0.92)	8.89 (0.35)	27.94 (1.10)
0.0 to +4	0.0 to +87.8	7.12	2.29 (0.09)	10.16 (0.40)	1.52 (0.06)	7.87 (0.31)	22.35 (0.88)	6.10 (0.24)	31.50 (1.24)
0.0 to -4	0.0 to -87.8	6.70	4.57 (0.18)	13.72 (0.54)	2.29 (0.09)	12.45 (0.49)	34.54 (1.36)	13.72 (0.54)	36.83 (1.45)

Pressure		Indicator Number (Permanent Set) mm (inches) **Unbroken Glass**							
kPa	PSF	Cycle Times	1	2	3	4	5	6	7
0.0 to +1	0.0 to +20.9	4.35	*	*	*	*	*	*	*
0.0 to -1	0.0 to -20.9	4.53	0.76 (0.03)	1.02 (0.04)	0.51 (0.02)	1.02 (0.04)	2.03 (0.08)	1.02 (0.04)	1.52 (0.06)
0.0 to +2	0.0 to +41.8	4.02	0.25 (0.01)	0.25 (0.01)	0.51 (0.02)	0.25 (0.01)	0.25 (0.01)	0.25 (0.01)	<0.25 (<0.01)
0.0 to -2	0.0 to -41.8	5.65	0.25 (0.01)	1.02 (0.04)	0.51 (0.02)	1.02 (0.04)	2.03 (0.08)	1.02 (0.04)	<0.25 (<0.01)
0.0 to +3	0.0 to +62.7	5.63	0.51 (0.02)	0.25 (0.01)	0.76 (0.03)	<0.25 (<0.01)	0.25 (0.01)	0.76 (0.03)	<0.25 (<0.01)
0.0 to -3	0.0 to -62.7	6.03	2.03 (0.08)	1.78 (0.07)	0.51 (0.02)	2.29 (0.09)	4.57 (0.18)	2.03 (0.08)	2.79 (0.11)
0.0 to +4	0.0 to +87.8	7.12	1.27 (0.05)	<0.25 (<0.01)	1.02 (0.04)	0.51 (0.02)	0.76 (0.03)	1.02 (0.04)	0.25 (0.01)
0.0 to -4	0.0 to -87.8	6.70	3.30 (0.13)	3.05 (0.12)	1.02 (0.04)	3.56 (0.14)	9.14 (0.36)	5.08 (0.20)	4.83 (0.19)

*- No Permanent Sets taken.
***Observations**: No additional damage or deglazing was observed.*

7.0 Test Results: (Continued)

Modified ASTM E 1886, *Air Pressure Cycling; 50 cycles per pressure group*

Test Unit #1 UltraSpan US 1100/ Broken glass

Pressure		Indicator Number (Deflections) mm (inches) Broken Glass							
kPa	PSF	Cycle Times	1	2	3	4	5	6	7
0.0 to +1	0.0 to +20.9	5.09	1.27 (0.05)	3.05 (0.12)	0.76 (0.03)	2.79 (0.11)	7.11 (0.28)	2.03 (0.08)	74.68 (2.94)
0.0 to -1	0.0 to -20.9	6.32	1.02 (0.04)	3.05 (0.12)	1.02 (0.04)	2.54 (0.10)	7.37 (0.29)	3.30 (0.13)	100.84 (3.97)
0.0 to +2	0.0 to +41.8	7.97	1.27 (0.05)	5.08 (0.20)	0.76 (0.03)	4.57 (0.18)	12.95 (0.51)	3.30 (0.13)	109.22 (4.30)
0.0 to -2	0.0 to -41.8	8.54	1.78 (0.07)	5.84 (0.23)	1.52 (0.06)	4.83 (0.19)	12.45 (0.49)	5.84 (0.23)	185.17 (7.29)
0.0 to +3	**0.0 to +62.7**	***	***	***	***	***	***	***	***

Pressure		Indicator Number (Permanent Set) mm (inches) Broken Glass							
kPa	PSF	Cycle Times	1	2	3	4	5	6	7
0.0 to +1	0.0 to +20.9	5.09	1.02 (0.04)	1.02 (0.04)	0.51 (0.02)	1.27 (0.05)	2.54 (0.10)	0.51 (0.02)	39.88 (1.57)
0.0 to -1	0.0 to -20.9	6.32	0.76 (0.03)	1.02 (0.04)	0.76 (0.03)	0.76 (0.03)	0.76 (0.03)	0.76 (0.03)	65.53 (2.58)
0.0 to +2	0.0 to +41.8	7.97	1.02 (0.04)	1.27 (0.05)	1.02 (0.04)	1.52 (0.06)	3.05 (0.12)	0.76 (0.03)	77.72 (3.06)
0.0 to -2	0.0 to -41.8	8.54	1.02 (0.04)	0.76 (0.03)	1.02 (0.04)	1.02 (0.04)	1.27 (0.05)	0.76 (0.03)	151.89 (5.98)
0.0 to +3	**0.0 to +62.7**	***	***	***	***	***	***	***	***

Observations: On the way to +3kPa (+62.7psf) cyclic pressure group; the UltraSpan silicone material ripped at the top of the first horizontal mullion mid-span (bottom of broken glass). The opening was approximately 82" long. Testing was stopped. *(Reference Photo #11)*

Result: Glass remained in opening through +/- 2kPa (+/-41.8psf) pressure groups.

***Note**: See Architectural Testing Sketch #1 for indicator locations.*

7.0 Test Results: (Continued)

Modified ASTM E 1886, *Air Pressure Cycling; 50 cycles per pressure group*

Test Unit #2 SCS2000 SilPruf Silicone Sealant/ Broken glass

Pressure		Indicator Number (Deflections) mm (inches) Broken Glass							
kPa	PSF	Cycle Times	1	2	3	4	5	6	7
0.0 to +1	0.0 to +20.9	7.35	0.51 (0.02)	2.54 (0.10)	0.51 (0.02)	2.54 (0.10)	7.37 (0.29)	2.29 (0.09)	76.20 (3.00)
0.0 to -1	0.0 to -20.9	6.19	1.02 (0.04)	1.78 (0.07)	0.25 (0.01)	1.52 (0.06)	5.59 (0.22)	2.79 (0.11)	95.25 (3.75)
0.0 to +2	0.0 to +41.8	5.63	0.76 (0.03)	5.08 (0.20)	1.02 (0.04)	0.51 (0.02)	15.24 (0.60)	4.83 (0.19)	105.41 (4.15)
0.0 to -2	0.0 to -41.8	6.23	2.54 (0.10)	5.59 (0.22)	1.52 (0.06)	4.83 (0.19)	13.21 (0.52)	5.33 (0.21)	78.99 (3.11)
0.0 to +3	0.0 to +62.7	7.48	2.54 (0.10)	6.86 (0.27)	1.02 (0.04)	6.60 (0.26)	22.86 (0.90)	8.13 (0.32)	170.94 (6.73)
0.0 to -3	**0.0 to -62.7**	**8.58**	**5.33 (0.21)**	**8.89 (0.35)**	**2.29 (0.09)**	**8.13 (0.32)**	**21.84 (0.86)**	**8.89 (0.35)**	**78.49 (3.09)**

Pressure		Indicator Number (Permanent Set) mm (inches) Broken Glass							
kPa	PSF	Cycle Times	1	2	3	4	5	6	7
0.0 to +1	0.0 to +20.9	7.35	<0.25 (<0.01)	0.76 (0.03)	0.51 (0.02)	1.02 (0.04)	1.52 (0.06)	0.25 (0.01)	31.50 (1.24)
0.0 to -1	0.0 to -20.9	6.19	0.76 (0.03)	<0.25 (<0.01)	<0.25 (<0.01)	<0.25 (<0.01)	0.76 (0.03)	1.02 (0.04)	49.02 (1.93)
0.0 to +2	0.0 to +41.8	5.63	<0.25 (<0.01)	1.27 (0.05)	0.76 (0.03)	1.27 (0.05)	3.05 (0.12)	1.02 (0.04)	40.64 (1.60)
0.0 to -2	0.0 to -41.8	6.23	2.03 (0.08)	1.27 (0.05)	0.76 (0.03)	1.52 (0.06)	3.30 (0.13)	1.52 (0.06)	14.73 (0.58)
0.0 to +3	0.0 to +62.7	7.48	1.27 (0.05)	0.76 (0.03)	0.51 (0.02)	0.76 (0.03)	3.30 (0.13)	1.78 (0.07)	90.93 (3.58)
0.0 to -3	**0.0 to -62.7**	**8.58**	***	***	***	***	***	***	***

Observations: 27 cycles into cyclic pressure test; at -3kPa (-62.7psf) air leakage at upper right corner of the broken lite was observed. Removed test unit from wall; bagged area were air leakage occurred, replaced test unit on wall and continued with testing. At 36 cycles into -3kPa (-62.7psf) cyclic pressure group; the upper right corner deglazed. It is apparent there is cohesive failure of the SCS2000 SilPruf silicone sealant along the pressure bar. Testing was stopped. *(Reference Photo #12)*

Result: Glass remained in opening thru +3kPa (+62.7psf) pressure groups.
***Note**: See Architectural Testing Sketch #1 for indicator locations.*

7.0 Test Results: (Continued)

Modified ASTM E 1886, *Air Pressure Cycling; 50 cycles per pressure group*

Test Unit #3 Pentagon Flexible Membrane/ Broken glass

Pressure		Indicator Number (Deflections) mm (inches) Broken Glass							
kPa	PSF	Cycle Time	1	2	3	4	5	6	7
0.0 to +1	0.0 to +20.9	5.93	1.27 (0.05)	2.03 (0.08)	1.27 (0.05)	1.02 (0.04)	5.59 (0.22)	2.54 (0.10)	74.42 (2.93)
0.0 to -1	0.0 to -20.9	6.11	1.27 (0.05)	4.57 (0.18)	2.29 (0.09)	4.57 (0.18)	8.89 (0.35)	3.05 (0.12)	95.25 (3.75)
0.0 to +2	0.0 to +41.8	7.35	1.52 (0.06)	4.06 (0.16)	0.76 (0.03)	2.54 (0.10)	13.97 (0.55)	8.89 (0.35)	107.70 (4.24)
0.0 to -2	0.0 to -41.8	6.97	1.52 (0.06)	6.86 (0.27)	3.30 (0.13)	7.37 (0.29)	13.72 (0.54)	1.27 (0.05)	129.03 (5.08)
0.0 to +3	0.0 to +62.7	11.90	1.78 (0.07)	6.60 (0.26)	1.27 (0.05)	3.56 (0.14)	19.56 (0.77)	11.43 (0.45)	145.03 (5.71)
0.0 to -3	0.0 to -62.7	8.60	5.59 (0.22)	10.16 (0.40)	4.32 (0.17)	11.68 (0.46)	22.61 (0.89)	4.57 (0.18)	176.28 (6.94)
0.0 to +4	**0.0 to +87.8**	***	***	***	***	***	***	***	***

Pressure		Indicator Number (Permanent Set) mm (inches) Broken Glass							
kPa	PSF	Cycle Time	1	2	3	4	5	6	7
0.0 to +1	0.0 to +20.9	5.93	1.27 (0.05)	0.76 (0.03)	0.51 (0.02)	1.02 (0.04)	0.25 (0.01)	0.51 (0.02)	32.00 (1.26)
0.0 to -1	0.0 to -20.9	6.11	3.05 (0.12)	2.54 (0.10)	2.03 (0.08)	3.05 (0.12)	3.81 (0.15)	1.52 (0.06)	55.88 (2.20)
0.0 to +2	0.0 to +41.8	7.35	7.87 (0.31)	<0.25 (<0.01)	0.76 (0.03)	1.02 (0.04)	3.05 (0.12)	5.08 (0.20)	55.88 (2.20)
0.0 to -2	0.0 to -41.8	6.97	10.92 (0.43)	3.05 (0.12)	2.79 (0.11)	4.32 (0.17)	3.30 (0.13)	2.03 (0.08)	80.52 (3.17)
0.0 to +3	0.0 to +62.7	11.90	1.52 (0.06)	0.25 (0.01)	1.02 (0.04)	2.54 (0.10)	2.29 (0.09)	4.57 (0.18)	73.15 (2.88)
0.0 to -3	**0.0 to -62.7**	8.60	5.08 (0.20)	3.81 (0.15)	3.30 (0.13)	6.10 (0.24)	6.35 (0.25)	1.27 (0.05)	108.20 (4.26)
0.0 to +4	**0.0 to +87.8**	***	***	***	***	***	***	***	***

Observations: First cycle into the +4 kPa (+87.8psf) cyclic pressure group; cohesion failure of the double-sided tape on the Pentagon Flexible Membrane, at the top of the center lite mid-span. Testing was stopped. *(Reference Photo #13)*

Result: Glass remained in opening through +/- 3kPa (+/- 62.7psf) pressure groups.
***Note**: See Architectural Testing Sketch #1 for indicator locations.*

7.0 Test Results: (Continued)

Modified ASTM E 1886, *Air Pressure Cycling; 50 cycles per pressure group*

Test Unit #4 SCS2000 SilPruf Silicone Sealant/ Unbroken glass

Pressure		Indicator Number (Deflections) mm (inches) Unbroken Glass	
kPa	PSF	Cycle Time	1
0.0 to +1	0.0 to +20.9	2.82	9.40 (0.37)
0.0 to -1	0.0 to -20.9	*	8.13 (0.32)
0.0 to +2	0.0 to +41.8	5.27	16.26 (0.64)
0.0 to -2	0.0 to -41.8	3.84	13.97 (0.55)
0.0 to +3	0.0 to +62.7	4.84	21.34 (0.84)
0.0 to -3	0.0 to -62.7	3.89	18.54 (0.73)
0.0 to +4	0.0 to +87.8	5.63	23.88 (0.94)
0.0 to -4	0.0 to -87.8	4.45	25.15 (0.99)

Pressure		Indicator Number (Permanent Set) mm (inches) Unbroken Glass	
kPa	PSF	Cycle Time	1
0.0 to +1	0.0 to +20.9	2.82	0.25 (0.01)
0.0 to -1	0.0 to -20.9	*	<0.25 (<0.01)
0.0 to +2	0.0 to +41.8	5.27	0.51 (0.02)
0.0 to -2	0.0 to -41.8	3.84	0.25 (0.01)
0.0 to +3	0.0 to +62.7	4.84	0.76 (0.03)
0.0 to -3	0.0 to -62.7	3.89	0.51 (0.02)
0.0 to +4	0.0 to +87.8	5.63	1.02 (0.04)
0.0 to -4	0.0 to -87.8	4.45	2.03 (0.08)

Observations: No additional damage or deglazing was observed.

*: No Data taken.

***Note**: See Architectural Testing Sketch #1 for indicator locations.*

7.0 Test Results: (Continued)

Modified ASTM E 1886, *Air Pressure Cycling; 50 cycles per pressure group*

Test Unit #4 SCS2000 SilPruf Silicone Sealant/ Broken glass

Pressure		Indicator Number (Deflections) mm (inches) Broken Glass	
kPa	PSF	Cycle Time	1
0.0 to +1	0.0 to +20.9	6.53	91.19 (3.59)
0.0 to -1	0.0 to -20.9	5.56	129.79 (5.11)
0.0 to +2	0.0 to +41.8	***	***

Pressure		Indicator Number (Permanent Set) mm (inches) Broken Glass	
kPa	PSF	Cycle Time	1
0.0 to +1	0.0 to +20.9	6.53	9.65 (0.38)
0.0 to -1	0.0 to -20.9	5.56	88.39 (3.48)
0.0 to +2	0.0 to +41.8	***	***

Observations: Five (5) cycles into to +2kPa (+41.8psf) cyclic pressure group; adhesion failure of hard coat layer on film, at the head and left side of glass. Testing was stopped. *(Reference Photo #14)*

Result: Glass remained in opening through +/- 1kPa (+/-20.9psf) pressure groups.

***Note**: See Architectural Testing Sketch #1 for indicator locations.*

8.0 Test Equipment:

Cycling Mechanism: Computer controlled centrifugal blower with electronic pressure measuring device

Deflection Measuring Device: Linear transducers.

Tape and film were used to seal against air leakage during structural testing. In our opinion, the tape and film did not influence the results of the test.

Architectural Testing 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 Architectural Testing, Inc. for the entire test record retention period.

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 Architectural Testing, Inc.

For ARCHITECTURAL TESTING, Inc.

Digitally Signed by: Scott Parker

Scott Parker
Technician

Digitally Signed by: Shawn G. Collins

Shawn G. Collins, P.E.
Manager- Regional Operations

SP:sgc

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix-A: Sketches (1)
Appendix-B: Photographs (11)
Appendix-C: Drawings (16)

Appendix A

Sketches

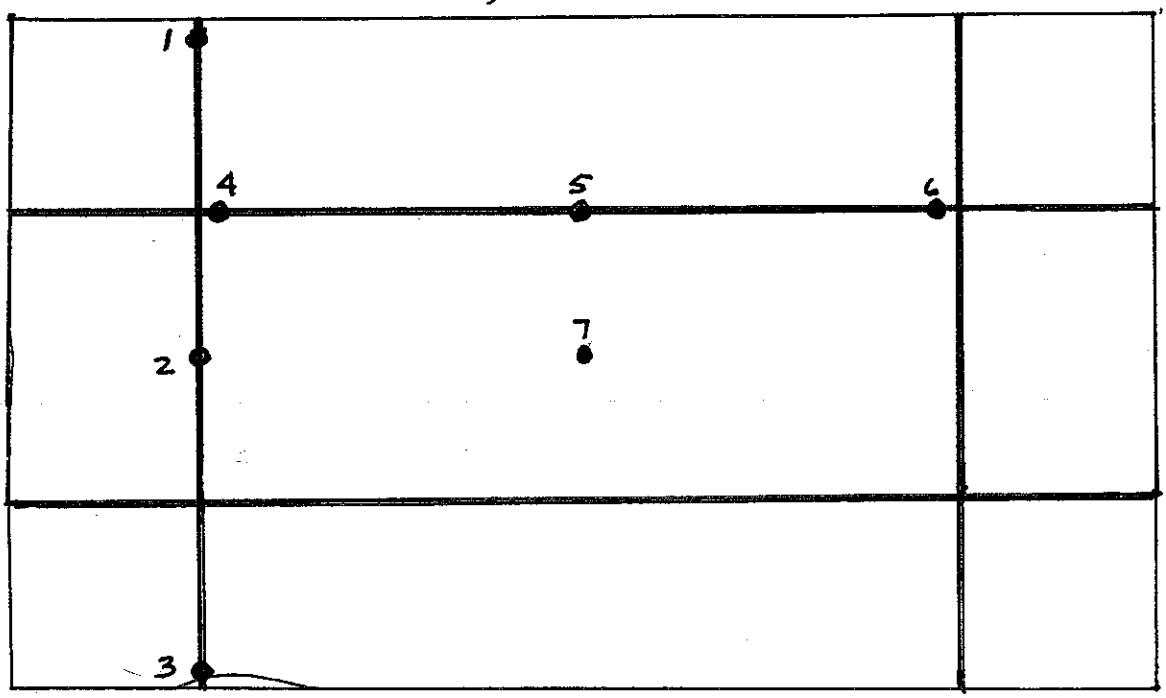
7/3/2013 SP

Achitectural Testing, Inc.

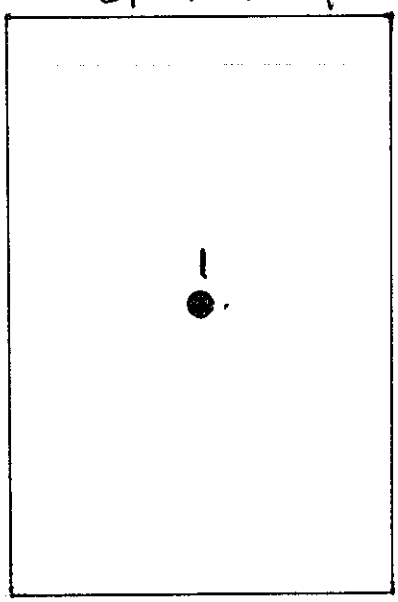
Sketch #1

TEST Specimen #1, 2 & 3

● - Indicator Locations



SPECIMEN #4



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Appendix B
Photographs

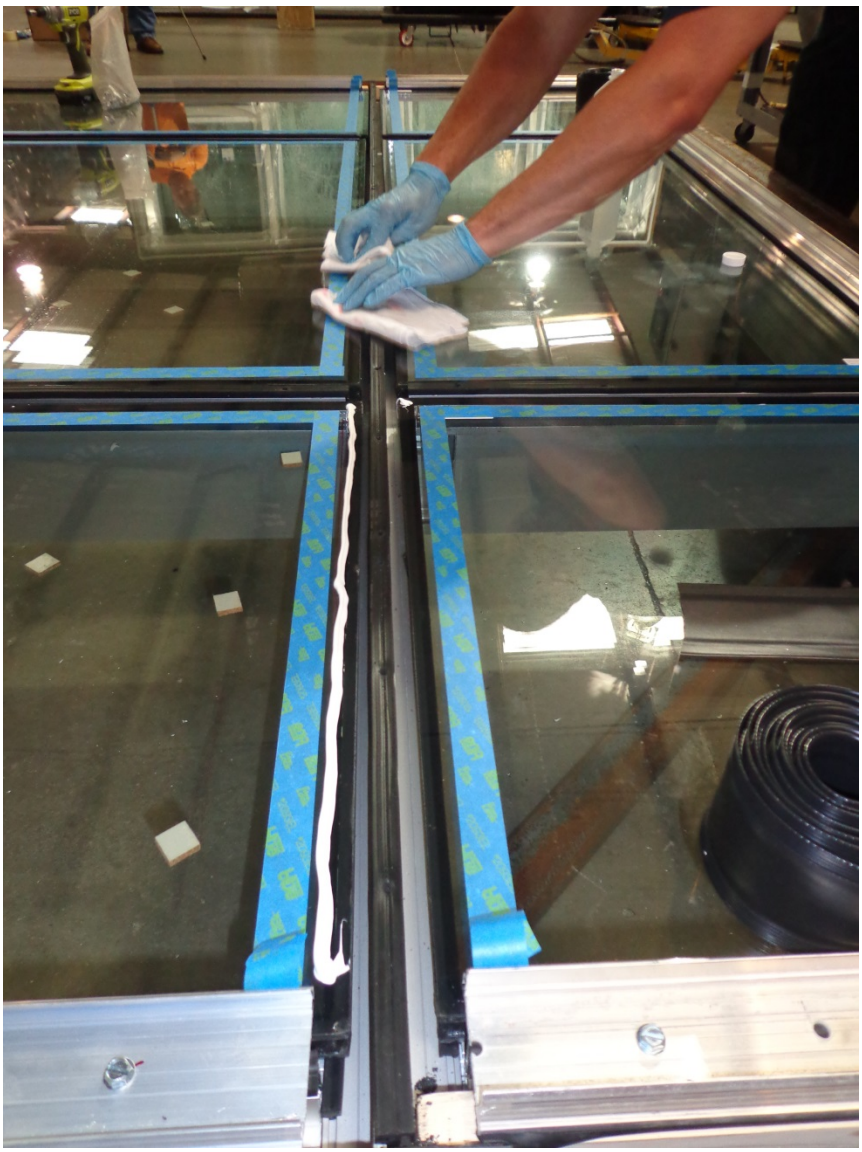

Photo No. 1
Specimen #1
Edges being cleaned with 91% isopropyl alcohol on UltraSpan US 1100.

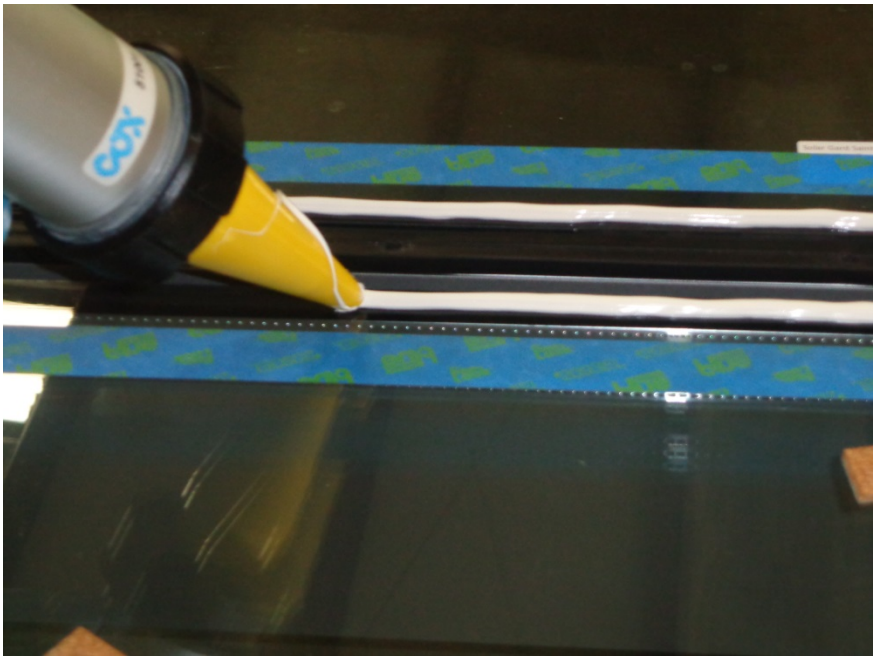

Photo No. 2
Specimen #1
SCS2000 SilPruf silicone sealant applied to edges of
Solar Gard Sentinel 4mil Film.

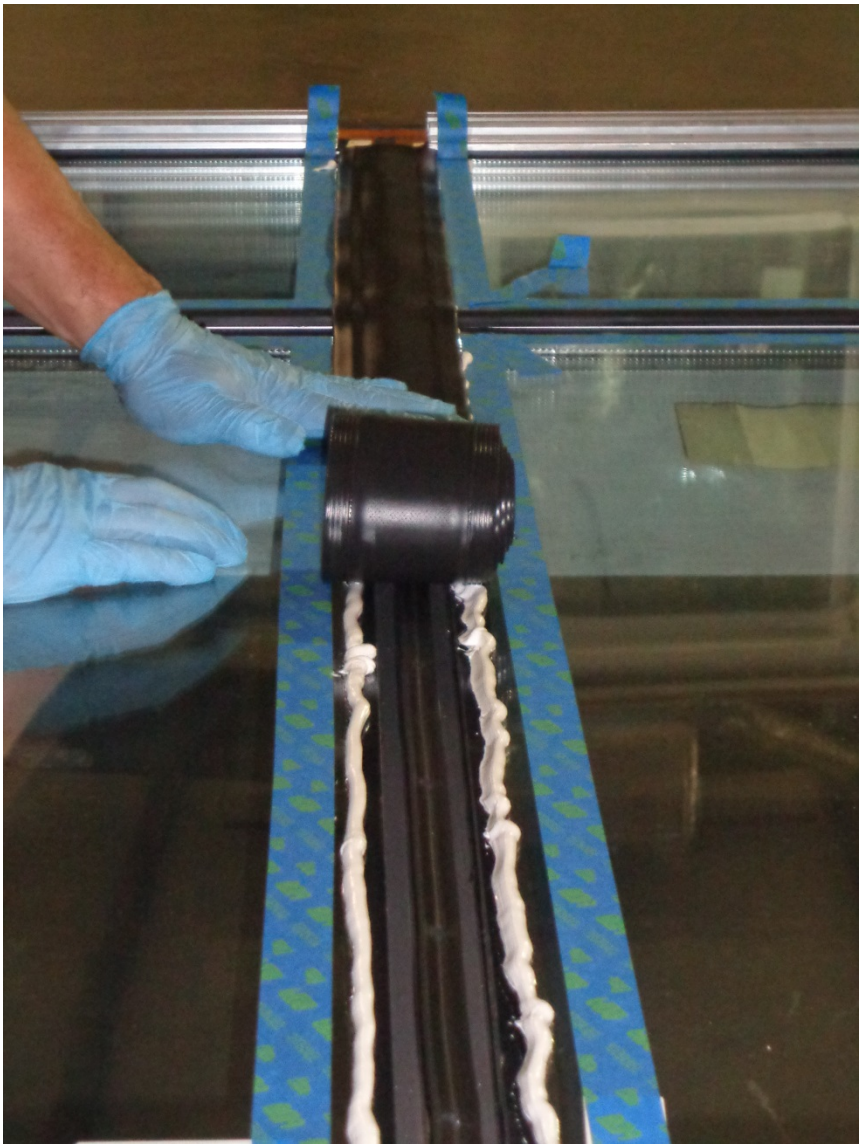

Photo No. 3
Specimen #1
UltraSpan US 1100 silicone membrane was applied to the sealant bridging across the two opposing glazing pockets.

Photo No. 4
Specimen #1
Pressure was applied using application tools, bonding the UltraSpan US 1100 silicone membrane to the silicone sealant and the sealant to the film.

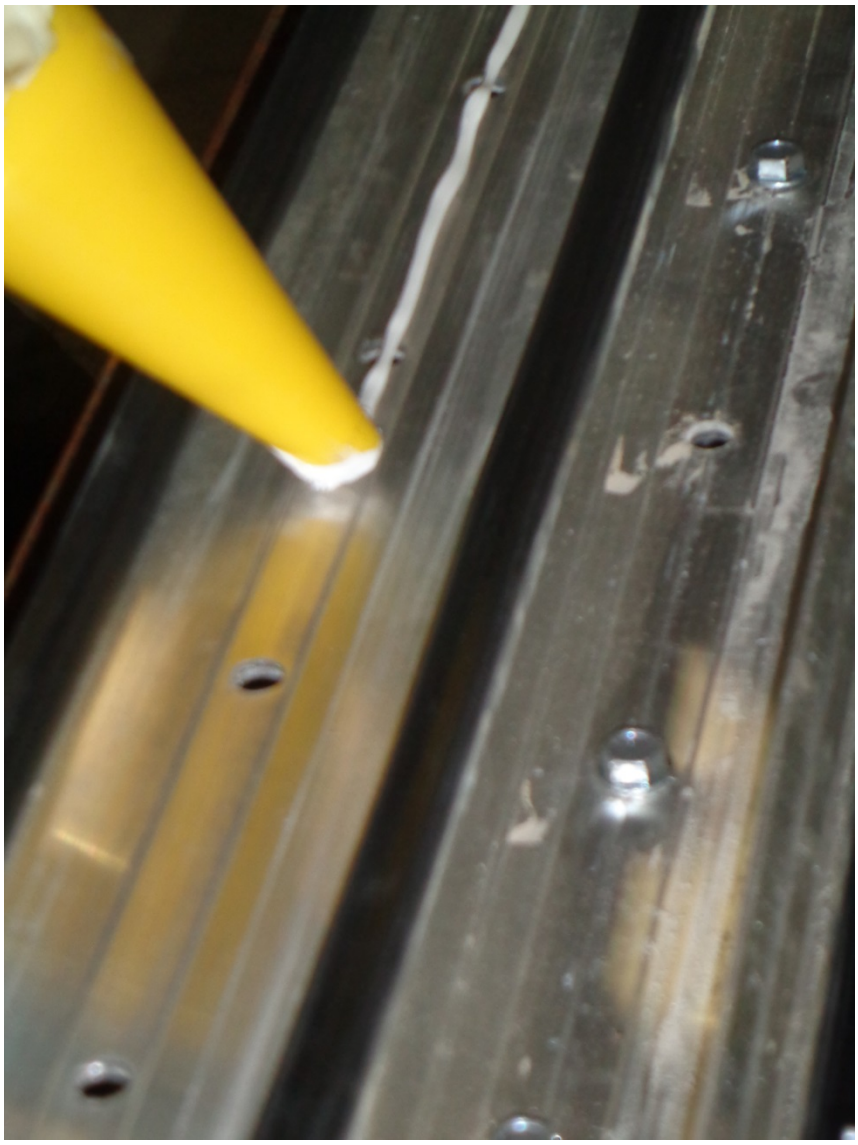

Photo No. 5
Specimen #1
SCS2000 SilPruf silicone sealant was applied to the underside of the pressure bar at the center and secured with ¼-20 x 1" HWHTCS F screws located 8" on center.

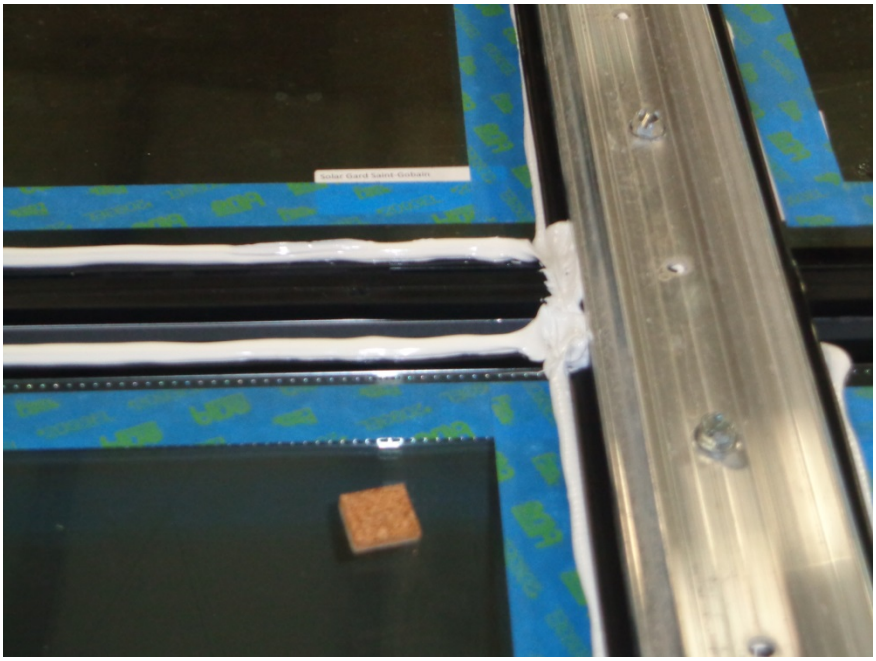

Photo No. 6
Specimen #1
SCS2000 SilPruf silicone sealant application at vertical pressure bar and horizontal mullion.

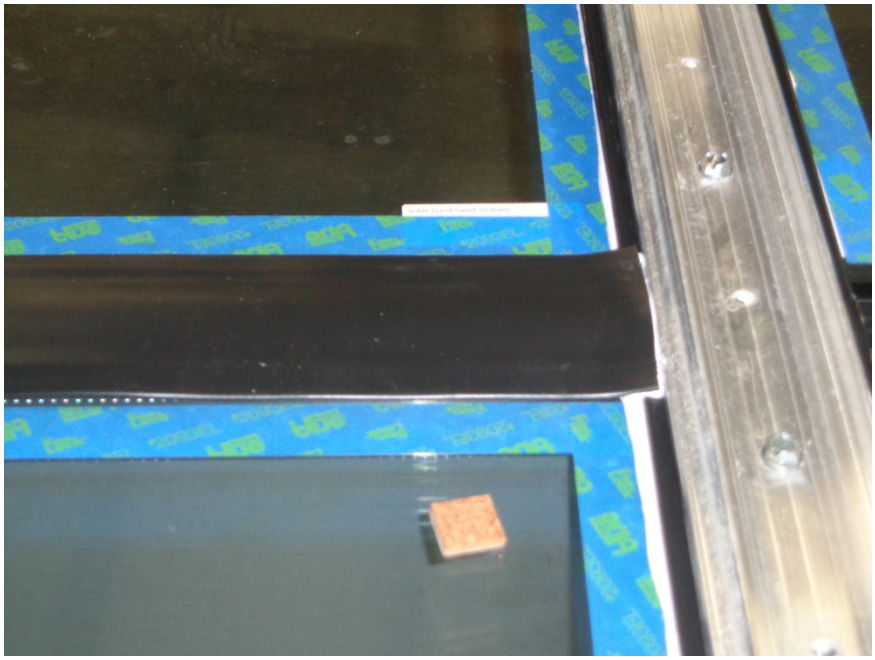

Photo No. 7
Specimen #1
UltraSpan US 1100 silicone membrane application at vertical pressure bar and horizontal mullion.

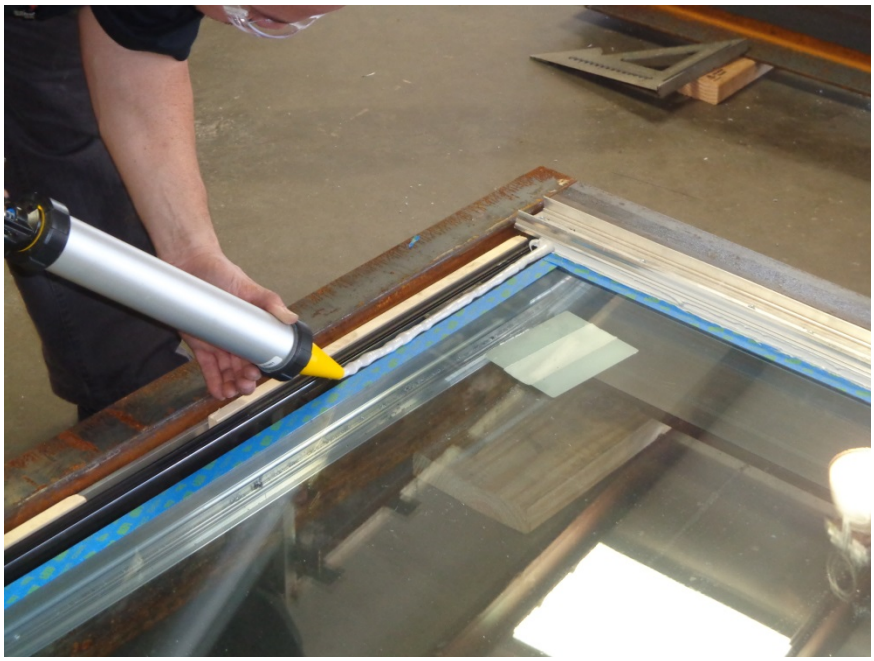

Photo No. 8
Specimen #2
SCS2000 SilPruf silicone sealant was applied to the film edges at the perimeter of the lites.

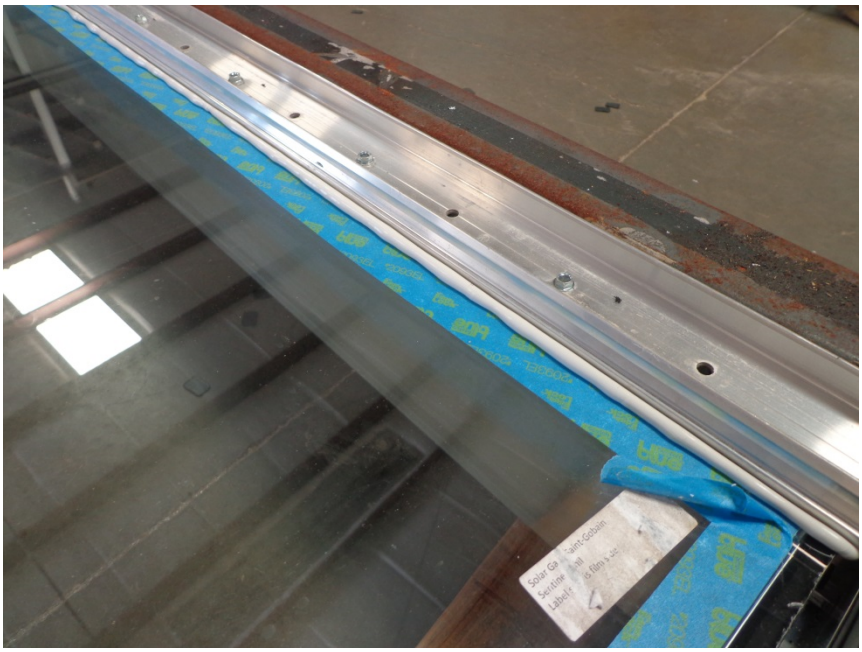

Photo No. 9
Specimen #2
The pressure bars; without EPDM weatherstripping, were installed and secured with ¼-20 x 1" HWHTCS F screws located 8" on center.

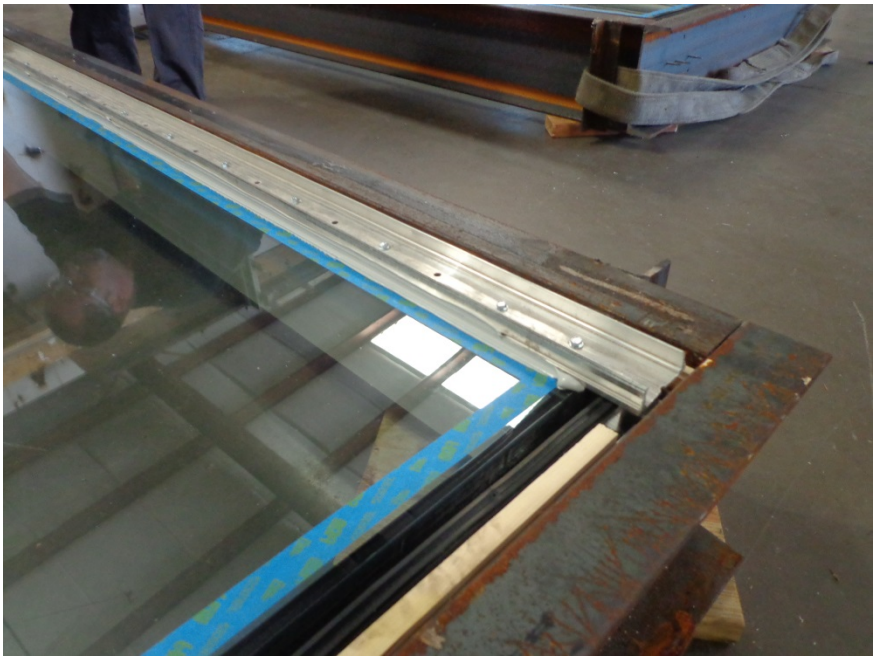

Photo No. 10
Specimen #2
A void was created between the pressure bar and glass where the weatherstripping was; this void was filled and tooled with SCS2000 SilPruf silicone sealant.

Photo No. 11
Specimen #1
On the way to +3kPa (+62.7psf) cyclic pressure group; the UltraSpan US 1100 silicone membrane ripped at the top of the first horizontal mullion mid-span (bottom of broken glass). The opening was approximately 82" long.

Photo No. 12
Specimen #2
At 36 cycles into -3kPa (-62.7psf) cyclic pressure group; the upper right corner deglazed. Cohesive failure of the SCS2000 SilPruf silicone sealant along the pressure bar.

Photo No. 13
Specimen #3
First cycle into the +4 kPa (+87.8psf) cyclic pressure group; cohesion failure of the double-sided tape on the Pentagon Flexible Membrane, at the top of the center lite mid-span.

Photo No. 14
Specimen #4
Five (5) cycles into to +2kPa (+41.8psf) cyclic pressure group; adhesion failure of hard coat layer on film, at the head and left side of glass.

Appendix C

Drawings

Architectural Testing

Test sample complies with these details.
Deviations are noted.

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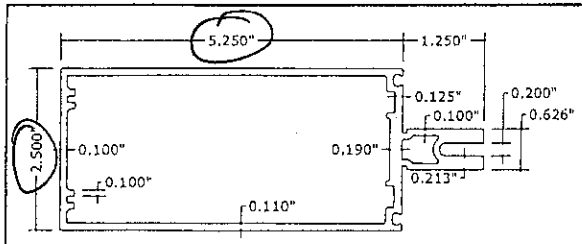
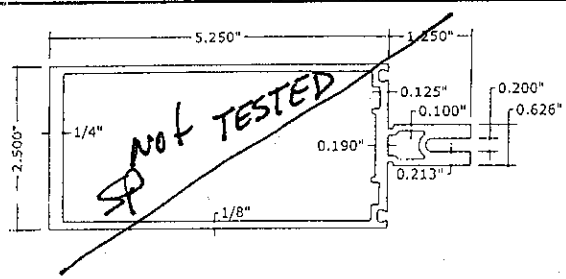
Date 7/3/2013 Tech SP

TEST SPECIMENS #1, 2 & 3



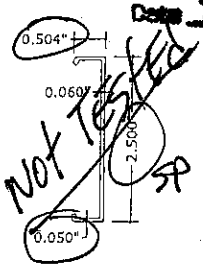
SP

1 LIGHT MULLION
6" = 1'-0" 6063-T6 ALUM



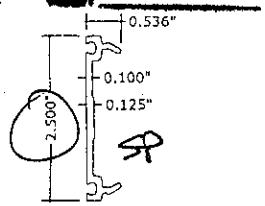
SP Not TESTED

~~2 HEAVY MULLION~~
~~6" = 1'-0" 6063-T6 ALUM~~



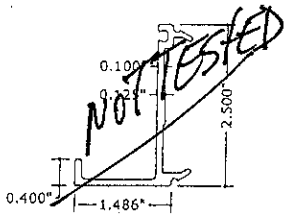
NOT TESTED SP

3 SNAP ON CAP
6" = 1'-0" 6063-T6 ALUM



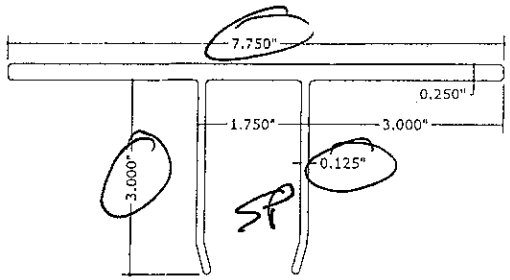
SP

4 PRESSURE PLATE
6" = 1'-0" 6063-T6 ALUM



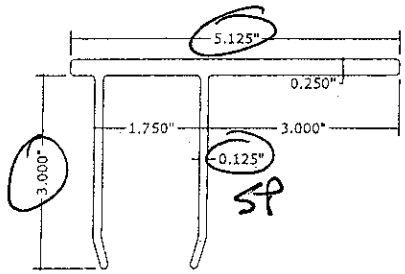
NOT TESTED

~~5 PERIMETER PRESSURE PLATE~~
~~6" = 1'-0" 6063-T6 ALUM~~



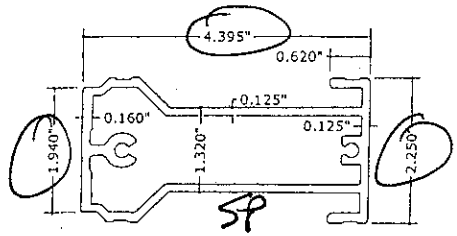
SP

6 "T" CLIP
6" = 1'-0" 6063-T6 ALUM



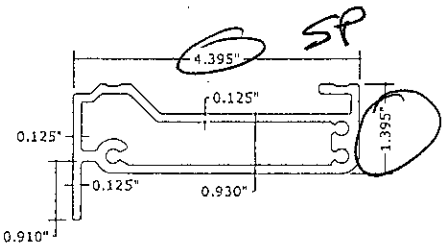
SP

7 "F" CLIP
6" = 1'-0" 6063-T6 ALUM



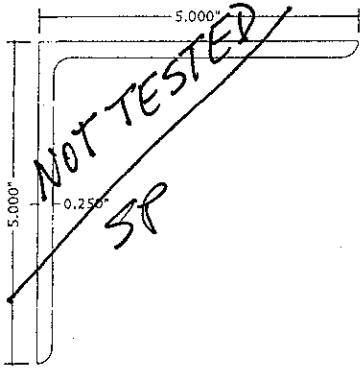
SP

8 SHEAR BLOCK
6" = 1'-0" 6063-T6 ALUM



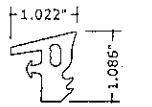
SP

9 HEAD/SILL SHEAR BLOCK
6" = 1'-0" 6063-T6 ALUM

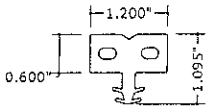


NOT TESTED SP

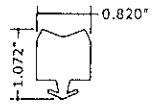
~~10 WIND LOAD CLIP~~
~~6" = 1'-0" A36 STEEL~~



12 GLAZING GASKET SP
1'-0" = 1'-0" EPDM



13 THERMAL BREAK SP
1'-0" = 1'-0" EPDM

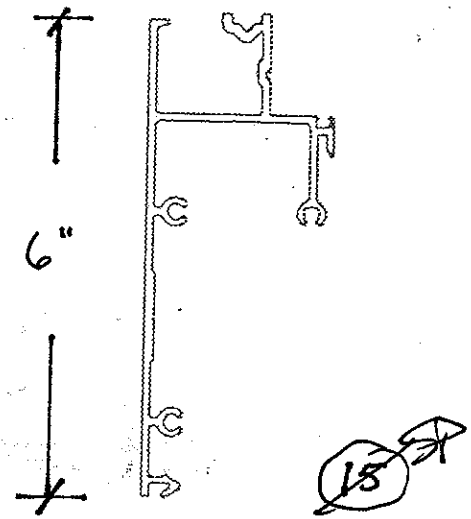


14 PERIMETER GASKET SP
1'-0" = 1'-0" EPDM

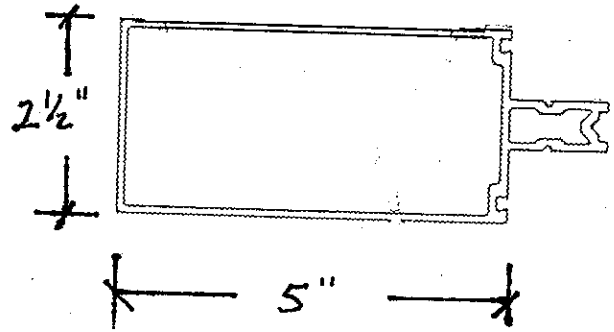
BILL OF MATERIALS

	DESCRIPTION	MATERIAL
1	2-1/2"x5-1/4" LIGHT MULLION FOR 1" GLASS	6063-T6 ALUMINUM
~~2~~	~~2-1/2"x5-1/4" HEAVY MULLION FOR 1" GLASS~~	~~6063-T6 ALUMINUM~~
3	SNAP ON CAP	6063-T6 ALUMINUM
4	PRESSURE PLATE	6063-T6 ALUMINUM
~~5~~	~~PERIMETER PRESSURE PLATE~~	~~6063-T6 ALUMINUM~~
6	"T" CLIP	6063-T6 ALUMINUM
7	"F" CLIP	6063-T6 ALUMINUM
8	SHEAR BLOCK	6063-T6 ALUMINUM
9	HEAD/SILL SHEAR BLOCK	6063-T6 ALUMINUM
~~10~~	~~WIND LOAD CLIP~~	~~A36 STEEL~~
11	JOINT PLUG	
12	GLAZING GASKET - 70 DUROMETER	EPDM
13	THERMAL BREAK - 70 DUROMETER	EPDM
14	PERIMETER GASKET - 70 DUROMETER	EPDM
15	1" SETTING BLOCK	

(15) HEAD / SILL



(16) JAMBS



Architectural Testing

Test sample complies with these details.
Deviations are noted.

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Date 7/3/2013 Tech SP

SPECIMEN #4

MOMENTIVE
performance materials

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# C6549.01-401-44
Date 7/3/2013 Tech SP

UltraSpan* US1100
pre-cured silicone weatherstrip

Product Description

UltraSpan US1100 is a low modulus pre-cured silicone rubber weatherstrip and is an excellent candidate to consider for use in new and remedial sealing, splicing, flashing, roofing applications, and oversealing of failed building sealants. UltraSpan can provide a long lasting, durable, watertight weatherseal as a primary or a secondary seal over moving and non-moving joints. UltraSpan can be applied in the field or factory and bonded to a wide variety of construction materials.

Typical Performance Properties

- **Silicone Durability** – Pre-cured weatherstrip exhibits excellent long-term resistance to natural weathering, including: ultraviolet radiation, high and low temperatures, rain and snow, with negligible change in elasticity performance.
- **High Performance Rubber** – The Low Modulus (+200%) movement capability can reduce strain on substrate surfaces and can accommodate seismic movements, live loads, and absorb large amounts of elongation while providing excellent recovery from high movement construction joints.
- **Silicone Compatibility** – Compatible with all GE silicone sealants allowing UltraSpan to be adhered to a wide range of construction materials.
- **Product Versatility** – Achieve a complete warrantable weatherseal system when used in combination with GE SilShield* SEC2400 Silicone Architectural Coating and GE SilPruf* family of sealants.
- **Unique Ridged Profile** – Control sealant thickness and reduce squeeze-out for cleaner installation and improved application quality.
- **Product Offering** – Available in a variety of standard sizes from 1 to 5 inch widths in 100 ft. rolls. Available in custom colors and flat sheets, up to 48 inches in width.
- **Potential Reduced Labor Cost** – An economical alternative to cast-in-place wet-seals or cutting out and reinstalling existing failed building sealants.
- **Thermal Stability** – Remains elastic over a wide range of temperature differentials of common building systems or facades -55°F (-48°C) to 400°F (93°C).

Momentive Performance Materials is an exclusive licensee of General Electric. Momentive Performance Materials provides versatile materials as the starting point for its creative approach to ideas that help enable new developments across hundreds of industrial and consumer applications.

We are helping customers solve product, process, and performance problems; our silanes, fluids, elastomers, sealants, resins, adhesives, urethane additives, and other specialty products are delivering innovation in everything from car engines to biomedical devices. From helping to develop safer tires and keeping electronics cooler, to improving the feel of lipstick and ensuring the reliability of adhesives, our technologies and enabling solutions are at the frontline of innovation.

Exclusive
Licensee

UltraSpan* US1100 pre-cured silicone weatherstrip

Basic Uses

- UltraSpan may be suitable for use as a weatherproofing splice material for building repair and restoration of existing failed building sealants.
- UltraSpan may be suitable for use when repairing failed sealants in building joints, leaking skylights, flashing, parapets, window perimeter joints and on EIFS.
- UltraSpan may be suitable for use on internal curtainwall frames and high movement splice areas.

Packaging

UltraSpan is available in 100 foot rolls. Standard widths are: 1", 1.5", 2", 3", 4", and 5". Custom UltraSpan is available in flat sheets up to 48 inches. Minimums apply.

Colors

UltraSpan is available in 8 standard colors, translucent, and can be custom colored.

Grade	Color
US1101	Translucent
US1102	White
US1103	Black
US1104	Limestone
US1108	Light Grey
US1109	Aluminum
US1110	Dark Grey
US1120	Precast White
US1197	Bronze

ULTRASPAN PRODUCT DESIGNATION BY WIDTH AND COLOR

Overall Width Code	Overall Width	Working Width	UltraSpan Color and Width Guide							
			White	Black	Limestone	Light Gray	Aluminum	Dark Gray	Precast White	Bronze
10	1 inch	0.4 inches	US1102-10	US1103-10	US1104-10	US1108-10	US1109-10	US1110-10	US1120-10	US1197-10
15	1.5 inches	0.5 inches	US1102-15	US1103-15	US1104-15	US1108-15	US1109-15	US1110-15	US1120-15	US1197-15
20	2 inches	1 inch	US1102-20	US1103-20	US1104-20	US1108-20	US1109-20	US1110-20	US1120-20	US1197-20
30	3 inches	2 inches	US1102-30	US1103-30	US1104-30	US1108-30	US1109-30	US1110-30	US1120-30	US1197-30
40	4 inches	3 inches	US1102-40	US1103-40	US1104-40	US1108-40	US1109-40	US1110-40	US1120-40	US1197-40
50	5 inches	4 inches	US1102-50	US1103-50	US1104-50	US1108-50	US1109-50	US1110-50	US1120-50	US1197-50

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# C6549.01-401 C6549.01-401-44

Date 7/3/2013 Tech SP

Limitations

UltraSpan is not recommended:

- For use underwater or in other applications where the product will be in continuous contact with water.
- For use in food contact applications.
- When painting of the cured weather strip is desired (unless GE SilShield* SEC2400 Architectural Wall Coating is used).
- Where frequent abrasion or physical abuse is encountered in joints on or below grade.

Precautions

Some materials that bleed plasticizers or oils can cause a discoloration on the surface of silicone weatherstrip. When sealing to or over such substrates as: rubberized gaskets, bituminous-based materials, butyl or oil-based products, oily woods, tapes, etc. Compatibility testing is recommended prior to use to confirm the suitability of these materials when in contact with each other.

Technical Services

Additional technical information and literature may be available. Contact Technical Services or a representative. Laboratory testing and application engineering are available upon request.

Specifications

Typical property values of UltraSpan US1100 as supplied and installed are set forth in the tables below.

Typical Properties – Supplied

Property	Value(1)	Test Method
Consistency	Pre-cured silicone rubber	

Typical Properties – Cured

Property	Value(1)	Test Method
Hardness, Durometer (Type A Indentor)	33	ASTM D2240
Ultimate Tensile Strength	800 psi (5.52 MPa)	ASTM D412
Ultimate Elongation	500%	ASTM D412
Tensile Strength, die B	100 ppi	ASTM D624
Tensile at 50% Elongation	8.4 psi (0.058 MPa)	Internal Test(2)
Tensile at 100% Elongation	12 psi (0.083 MPa)	Internal Test(2)
Joint Movement Capability	+200/-100%	ASTM C719
Service Temperature Range	-55°F (-48°C) to +400°F (98°C)	

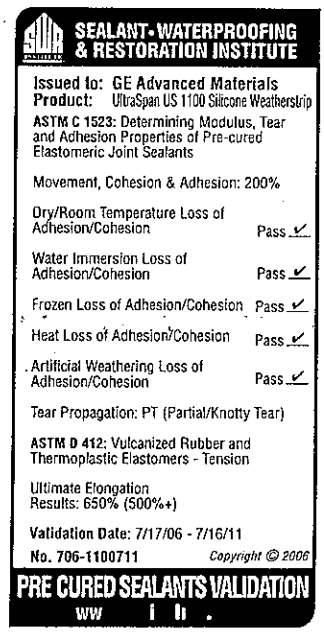
(1) Average value. Actual value may vary.
(2) Contact Technical Services for a description of the test method.

Applicable Standards

UltraSpan US1100 meets or exceeds the requirements of the following specifications:

American Society for Testing & Materials International
ASTM C1518 Standard Specification for Precured Elastomeric Silicone Joint Sealants; Movement Class 200, Tear Class PT.

UltraSpan US1100 carries SWR Institute validation @ +200% movement with Partial / Knotty Tear (PT) characteristics.



Architectural Testing

Test sample complies with these details.
Deviations are noted.

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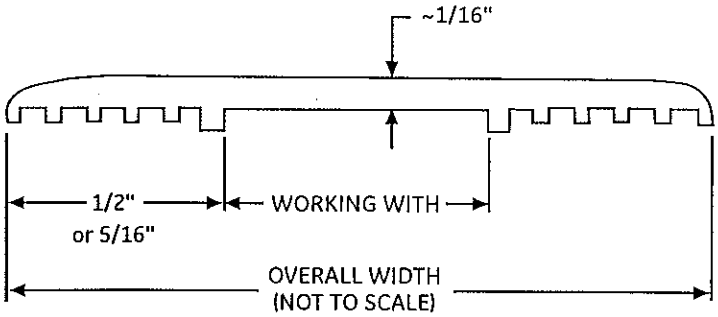
Joint Designs and Dimensions

Joint Movement – All moving (dynamic) joints must not allow movement in excess of the performance properties of the UltraSpan US1100 pre-cured weatherstrip.

Joint Width – When using UltraSpan US1100, refer to the nominal working width data below. The nominal working width is the largest joint width which can be covered with UltraSpan US1100. Refer to Figure below.

Nominal Overall Width (inches)	Nominal Working Width (inches)
1	0.4
1.5	0.5
2	1
3	2
4	3
5	4



"WORKING WIDTH" is the largest joint width that can be covered.

Installation

For surface preparation and cleaning procedures, refer to the technical data sheet of the sealant being used to apply UltraSpan.

Weatherstrip Application

A sealant may be applied to either the UltraSpan and/or the substrate surfaces as shown in Figures 1-3.

Apply two appropriate sized beads of sealant in sufficient amount to fill the grooved areas on the UltraSpan. Typically, a 1/8" to 3/8" bead will be sufficient but rougher surfaces may require a larger amount.

- Seat the UltraSpan into the sealant using hand pressure. As the UltraSpan is seated, the sealant should fill the channels, usually a small amount of adhesive squeezes out alongside the UltraSpan.
- Small adjustments to the placement of UltraSpan may be done at this time, but lifting the UltraSpan and re-seating should be avoided as removing and re-seating may require additional sealant.
- Use a small roller to apply sufficient pressure to the UltraSpan to bond the part into its final location.
- Tool excess sealant and if masking tape was used, remove masking tape immediately.
- If mitered or field cut corners are used, apply enough sealant under the corner joint so the squeeze-out fills the miter joint.
- Apply masking tape in areas of high visibility to ensure good aesthetics.
- Horizontal joints must be completed before application of vertical joints.

Figures 1-3

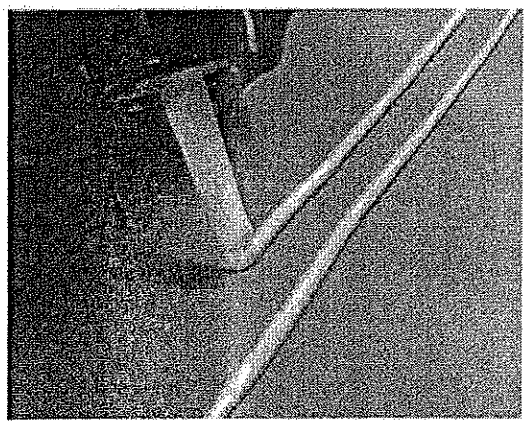


Figure 1 - Dispense silicone onto substrate.

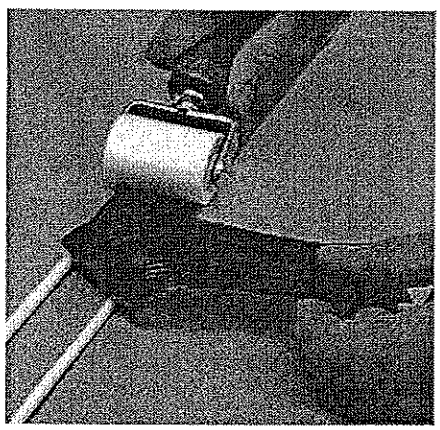


Figure 2 - Place weatherstrip into silicone and seat UltraSpan US1100 silicone weatherstrip using a roller.

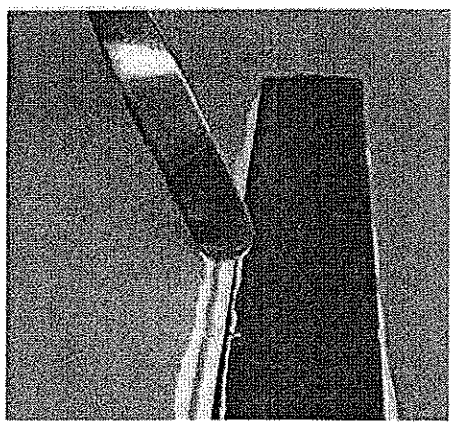


Figure 3 - Tool excess silicone from squeeze-out and if masking tape was used remove immediately. (Masking tape must be removed before silicone skins over, usually within 20 minutes of dispensing.)

Availability

Information on ordering US1100 and/or custom shapes can be obtained from Momentive Performance Materials,[1] Waterford, NY or an authorized GE construction sealants product distributor. For information regarding cost or for available project warranty information, contact your local distributor or Momentive Performance Materials[1] Territory Manager. Contact Customer Service at: 877-943-7325.

Government Requirement

Prior to considering use of a Momentive Performance Materials[1] silicone product in fulfilling any government requirement, please contact the Government and Trade Compliance office.

Patent Status

Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute the permission, inducement or recommendation to practice any invention covered by any patent, without authority from the owner of the patent.

Product Safety, Handling and Storage

Customers considering the use of this product should review the latest Material Safety Data Sheet and label for product safety information, handling instructions, personal protective equipment if necessary, and any special storage conditions required. Material Safety Data Sheets are available at www.momentive.com or, upon request, from any Momentive Performance Materials[1] representative. Use of other materials in conjunction with Momentive Performance Materials[1] products (for example, primers) may require additional precautions. Please review and follow the safety information provided by the manufacturer of such other materials.

Emergency Service

Momentive Performance Materials[1] maintains an around-the-clock emergency service for its products. The American Chemistry Council (CHEMTREC), Transport Canada (CANUTEC), and the Chemical Emergency Agency Service also maintain an around-the-clock emergency service for all chemical products:

Location	GE Branded Products	All Chemical Products
Mainland U.S., Puerto Rico	518.233.2500	CHEMTREC: 800.424.9300
Alaska, Hawaii	518.233.2500	CHEMTREC: 800.424.9300
Canada	518.233.2500	CANUTEC: 613.996.6666 (collect) or CHEMTREC: 800.424.9300
Europe, Middle East, Africa	+32.(0)14.58.45.45 (Belgium)	CHEMTREC: +1-703.527.3887 (collect)
Latin America, Asia/Pacific, all other locations worldwide	+518.233.2500	CHEMTREC: +1-703.527.3887 (collect)
At sea	Radio U.S. Coast Guard, which can directly contact Momentive Performance Materials[1] at 518.233.2500	CHEMTREC: 800.424.9300

DO NOT WAIT. Phone if in doubt. You will be referred to a specialist for advice.

[1] Momentive Performance Materials is an exclusive licensee of General Electric

Architectural Testing

Test sample complies with these details.
Deviations are noted.

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CUSTOMER SERVICE CENTERS

North America	**E** cs-na.silicones@momentive.com		
	• Specialty Fluids	**T** +1.800.523.5862	**F** +1.304.746.1654
	• UA, Silanes and Specialty Coatings	**T** +1.800.334.4674	**F** +1.304.746.1623
	• RTV's and Elastomers	**T** +1.800.332.3390	**F** +1.304.746.1623
	• Consumer Sealants & Construction Sealants and Adhesives	**T** +1.877.943.7325	**F** +1.304.746.1654
Latin America	**E** cs-la.silicones@momentive.com		
	• Argentina & Chile	**T** +54.11.4862.9544	**F** +54.11.4862.9544
	• Brazil	**T** +55.11.4534.9650	**F** +55.11.4534.9660
	• Mexico & Central America	**T** +52.55.5899.5135	**F** +52.55.5899.5138
	• Venezuela, Ecuador, Peru Colombia & Caribbean	**T** +58.212.285.2149	**F** +58.212.285.2149
Europe, Middle East, Africa and India	**E** cs-eur.silicones@momentive.com	**T** +00.800.4321.1000 **T** +31.164.225350	
Pacific	**E** cs-ap.silicones@momentive.com	**T** +1.800.820.0202 **T** +0.81.276.20.6182	**F** +81.276.31.6259
Worldwide Hotline		**T** +1.607.786.8131 **T** +1.800.295.2392	**F** +1.607.786.8309
Visit us at Momentive.com			

161-035-00E-GL
CDS: DataUS1100 (9/08)

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Test sample complies with these details.
Deviations are noted.
Report# C6549.01-401-44
Date 7/12/2013 Tech SP

SCS2000 SilPruf*
silicone sealant

Product Description

GE SCS2000 SilPruf is a silicone sealant designed for weathersealing applications. Supplied as a paste, SCS2000 is a one-component, medium-modulus, neutral cure silicone useful on a wide variety of materials in new or remedial applications.

Typical Performance Properties

Performance

- **Silicone Durability** - cured silicone rubber exhibits excellent long term resistance to natural weathering including: extreme temperatures, ultraviolet radiation, rain and snow, with negligible change in elasticity.
- **Adhesion** - primerless adhesion to many substrates and finishes. May be considered a candidate for use with numerous construction-related materials, including: glass, polycarbonate, vinyl, numerous plastics, treated and untreated wood, fluoropolymer and powder coated paints, conversion-coated and anodized aluminum, EIFS, brick, terra-cotta, ceramic and porcelain materials, concrete and natural stones. Some finishes or substrates may require a primer.
- **±50% Movement Capacity (ASTM 719)** - can accommodate 50% movement in both extension and compression and has excellent recovery after cycling.
- **Low VOC** - significantly lower than the U.S. Green Building Council's Leadership in Energy and Environmental Design (L.E.E.D.) program's requirements. Neutral cure byproduct with low odor.
- **Thermal Stability (cured state)** - once cured, the material remains elastic over a range of -48°C (-55°F) to 100°C (212°F).

Application

- **Stable Consistency (uncured state)** - supplied as a lightweight paste, the consistency of which remains relatively unchanged over a wide temperature range. The paste is able to be easily gunned and tooled under hot and cold conditions.
- **Extended Work Life** - designed to allow the user sufficient time for placement and tooling.
- **Low Sag or Slump** - useful for application to horizontal, vertical or overhead surfaces.

continued

Licensed
Products

Typical Performance Properties (continued)

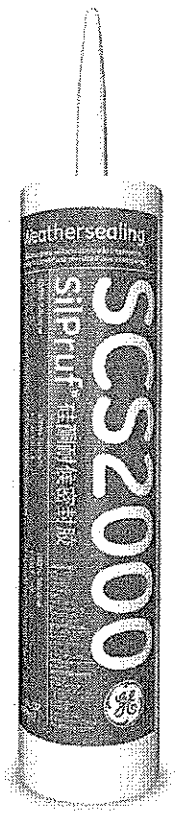
Product Compatibility

- **Full adhesive and chemical compatibility** with SEC2400 SilShield* silicone elastomeric coating and US1100 UltraSpan* silicone pre-cured weatherstrip. Neutral Cure byproduct with low odor.
- **Compatible with the following silicone products:** IGS3703, IGS3703E, IGS3713-D1, IGS3723, IGS3743, SCS9000, SCS2350, SCS2700, SCS1800, SCS2800, US1100, SEC2400, SWS, SSG4000, SSF4000E, SSG4000AC, SSG4800J, SSG4400, SSG4600 and RGS7700.

Basic Uses

SCS2000 is recommended for weatherproofing

- Between dissimilar or similar materials in either new or remedial glazing and sealing applications
- Around window perimeters and punched openings



Packaging

SCS2000 is available in the following configurations:

- 310 ml plastic caulking cartridges
  - ☐ Cartridges are packed in cardboard boxes (24 qty)
  - ☐ Cartridges are dispensed using a single component hand or air-pressured caulking gun
- 600 ml foil sausage packs
- 200 liter drums
- Cartridges & pails are designed for convenience in shipping and are easily handled by warehouse workers and mechanics on scaffolds and staging.
- Sausage packs are designed to reduce volume of used containers compared to conventional sealant cartridges, resulting in reduced waste
- Sausage packs also boost productivity by cutting typical reload time in half.

Colors

SCS2000 SilPruf sealant is available in several standard and special colors. Please contact Customer Service at 00.800.4321.1000 for more information.

Limitations

SCS2000 sealant is not recommended:

- for use underwater or in other applications where the product will be in continuous contact with water.
- for use in food contact applications.
- when painting of the cured sealant is desired (unless appropriate specialized paint products are used).

SCS2000 sealant should not be applied or used:

- as a structural adhesive in Structural Glazing applications.
- under exceedingly hot or cold conditions (see Sealant Application section for additional information).
- on wet, damp, frozen or contaminated surfaces.
- on excessively basic or acidic substrates.

Precautions

- This material requires atmospheric moisture to cure from paste to rubber and may not attain its listed final cured rubber properties when used in designs or applications where the silicone is encapsulated and lacks access to atmospheric moisture.
- When sealing against natural stones, Momentive Performance Materials recommends that stain testing be performed prior to use to ascertain the visual acceptability of the sealant-stone combination. Momentive Performance Materials recommends evaluation of SCS9000 when sealing to natural stones.
- Some materials that bleed plasticizers or oils can cause a discoloration on the surface of sealants. When sealing to or over items such as rubberized gaskets, bituminous-based materials, butyl or oil-based products, oily woods, tapes, etc., Momentive Performance Materials recommends that compatibility testing be performed prior to use to confirm the suitability of the use of these materials when in contact with each other.
- Silicone materials are hydrophobic in nature and if inadvertently over-applied onto adjacent joint surfaces (even if removed immediately), can create a waterproofing effect on some substrate types when the substrate is wet. See section on Masking.

Technical Services

Complete technical information and literature are available from Momentive Performance Materials. Laboratory facilities and application engineering are available upon request from Momentive Performance Materials.

Specifications

Typical property values of SCS2000 sealant as supplied and cured are set forth in the tables below. Typical product data values should not be used as specifications. Assistance with specifications is available by contacting Momentive Performance Materials at 00.800.4321.1000.

Typical Properties – Supplied

Property	Value(1)	Test Method
Consistency	Paste	N/A
Polymer	100% silicone	N/A
VOC	23 g/l	WPSTM C1454
Work Life (tooling time)	20-30 minutes	N/A
Tack Free Time	5-9 hours (@ 23°C, (73°F), 50% RH)	ASTM C679
Sag/Slump	< 2 mm	ISO 7390

Typical Properties – Cured

Property	Value(1)	Test Method
Hardness, Durometer (Type A Indentor)	24	ASTM D2240, ISO 868
Ultimate Tensile Strength	1.6 MPa (232 psi)	ASTM D412, ISO 37, S2
Ultimate Elongation	700%	ASTM D412, ISO 37, S2
Tensile at 100% Elongation	0.45 MPa (65 psi)	ASTM D412, ISO 37, S2
Ultimate Tensile Strength	0.7 MPa (102 psi)	ASTM C1135
Ultimate Elongation	250%	ASTM C1135
Shear Strength (@ 6 mm (1/4") thickness)	0.84 MPa (121 psi)	ASTM C961
Peel Strength (average)	4 N/mm	ASTM C795
Joint Movement Capability	± 50% ± 25%	ASTM C719 ISO 11600
Service Temperature Range (after cure)	-48°C to 100°C (-55°F to +212°F)	
Weathering and U.V. Resistance	Excellent	GE 20 yr. study
Cure Time (6 mm (1/4") deep section)	2-4 days	N/A
Full Cure (most common bead sizes)	10-14 days	N/A

(1) Average value. Actual value may vary.

Applicable Standards

SCS2000 meets or exceeds the requirements of the following specifications:

American Society for Testing & Materials International

- ASTM C920 Standard Specification for Elastomeric Joint Sealants;

  Type S, Grade NS, Class 50, Use A, G, M, O

U.S. Federal Specifications:
(widely referenced but cancelled Sept. 1996)

- TT-S-001543A Sealing Compound: Silicone Rubber Base (for Caulking, Sealing & Glazing in Buildings and Other Structures)
- TT-S-00230C Sealing Compound: Elastomeric Type, Single Component (for Caulking, Sealing & Glazing in Buildings and Other Structures)

International Organization for Standardization

- ISO 11600 - Type G & F - 25LM

Syndicat National des Joints et Facafes

- SNJF F&G, classe 25E

Suggested References

In addition to the guidelines provided on this datasheet, Momentive Performance Materials recommends that designers and users of SCS2000 familiarize themselves with the latest editions of following industry guidelines and best practices:

1.) ASTM C1193 Standard Guide for Use of Joint Sealants.
2.) ASTM C1481 Standard Guide for Use of Joint Sealants with Exterior Insulation & Finish Systems (EIFS).
3.) ASTM C1472 Standard Guide for Calculating Movement and Other Effects When Establishing Sealant Joint Width.
4.) SWR Institute's Applying Liquid Sealants Applicator Training Program.

Joint Designs and Dimensions - Weathersealing Applications

Joint Movement - The dimensions of joints in typical construction applications change daily as a result of solar heat gain and building sway, and throughout the year due to seasonal changes. The movement in a sealant bead installed on the sun-side of a building or during the hottest portion of the day will be almost entirely in extension during the cold season or cycle; while the movement of a bead installed during the coldest condition will be almost entirely in compression during the hotter season or cycle. In addition to these above movements, the designer should consider the effect of construction tolerances in his/her project to minimize the occurrence of over-sized or under-sized joints during construction. All moving (dynamic) joints must be designed so as not to allow three-sided adhesion of the sealant to occur (reference ASTM C1193). Three-sided adhesion hinders the ability of the sealant to extend and compress freely as desired and can lead to early joint failure.

Joint Width - When using SCS2000, the designed joint width must be at least twice the total anticipated joint movement. For example, if the total anticipated movement in an expansion joint in which SCS2000 is to be installed is 6 mm (1/4"), the designed joint width must be at least 12 mm (1/2"). The designer may want to consider additional width to accommodate construction tolerances (reference ASTM C1472). Large panels or lites should allow a minimum width of 6 mm (1/4") for the sealant bead, mostly to allow for a proper installation (very small/narrow beads become difficult to install and can accommodate less movement). Glazing of plastic or larger-sized metal panels may require larger than usual joint widths due to the greater movement potential (higher coefficients of thermal expansion). Consult with Momentive Performance Materials Technical Services for recommendations on large or unusual applications.

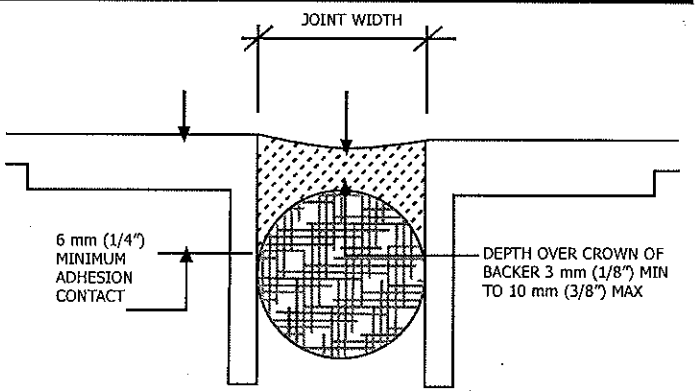
Butt Jointing - A thin installation of silicone sealant can better accommodate more movement than a deep installation, as the deeper bead will result in additional stress being imposed on both the sealant and the bonding surfaces during joint movement. Figure 1 illustrates the general guidelines for installation of SCS2000 SilPruf sealant into a typical butt joint configuration of widths up to 5 cm (2").

1.) The recommended sealant profile is an hourglass shape with the depth of the sealant over the crown of the backer rod to be no thinner than 3 mm (1/8") and no thicker than 10 mm (3/8"), and
2.) A minimum of 6 mm (1/4") of adhesive bonding contact must be made to all surfaces to which the sealant is intended to adhere.

When used in joints exceeding 5 cm (2") in width:

3.) The recommended sealant profile is an hourglass shape with the depth of the sealant over the crown of the backer rod to be no thinner than 6 mm (1/4") and no thicker than 10 mm (3/8"), and
4.) A minimum of 10 mm (3/8") of adhesive bonding contact must be made to all surfaces to which the sealant is intended to adhere.

Figure 1



Joint Backer Materials

Backer materials, typically backer rod, provide the following benefits to aide in the correct application of SCS2000.

1.) To control and provide the desired sealant depth.
2.) Create a formed joint cavity that allows for the desired hourglass sealant shape.
3.) Provide a firm backup which helps attain full wetting of the substrates when the sealant is tooled.
4.) Act as a bond breaker to eliminate adhesion on the backside of a joint (three-sided adhesion).

Non-gassing polyethylene, polyolefin or polyurethane foam rod is the recommended back-up material for use with SCS2000 SilPruf sealant. If the joint is too shallow to allow foam rod, use a polyethylene tape (as a bond breaker to eliminate three-sided adhesion). On EIFS and porous substrate applications, a closed cell backer rod is recommended (open cell backer materials absorb and hold water which can affect long-term sealant adhesion on these materials). Backer rod should be 25-50% greater (confirm with manufacturer of backer rod as to type selected) than the width of the joint, thereby providing continuous pressure against the joint walls, and expanding and contracting with the joint movement without pushing the sealant out of the joint during the compression cycle or falling away during the extension cycle. Rubber backup materials may stain the sealant and are not recommended, unless tested and verified for compatibility.

Installation

Sealants may not adhere or maintain long-term adhesion to substrates if the surface is not prepared and cleaned properly before sealant application. Using proper materials and following prescribed surface preparation and cleaning procedures is vital for sealant adhesion. IN ALL CASES IT IS IMPORTANT TO CONFIRM THE ACCEPTIBILITY OF EACH SEALANT-SUBSTRATE COMBINATION WITH A LAB OR SITE ADHESION TEST PRIOR TO PROCEEDING WITH PROJECT INSTALLATION. Momentive Performance Materials can provide lab and field adhesion testing information and suggestions to user upon request.

Surface Preparation

Porous Materials (concrete, masonry, brick, stone, etc.)

- Joints must be clean, dry and sound prior to application of the sealant. All contaminants, impurities, or other adhesion inhibitors (such as moisture/frost, oils, concrete form release agents, old sealants, asphalt and other surface treatments, etc.) must be removed from the surfaces to which the sealant is intended to adhere.
- Clean where necessary by wire brush, mechanical abrading, grinding, sanding, saw cutting, blast cleaning (sand or water), or a combination of these methods to provide a stable clean surface for sealant application.
- Remove dust and other remaining loose particles with a soft bristle brush or by using an oil-free air blow.
- Polished stone surfaces and smooth sawn edges can be cleaned using a solvent dampened rag (allow sufficient time for solvent to evaporate prior to application of the sealant). When handling solvents, refer to manufacturer's MSDS for information on handling, safety and personal protective equipment.
- Cleaning of surfaces should be done within 1 to 2 hours of when the sealant is to be applied.
- Since porous materials can absorb and retain moisture, it is important to confirm that substrates are dry prior to application of the sealant.

Non-Porous Materials
(glass, metals, plastics, ceramics, etc.)

- Clean by using a two-rag wipe technique → wet one rag with solvent and wipe the surface with it, then use the second rag to wipe the wet solvent from the surface BEFORE it evaporates (allowing the solvent to dry on the surface without immediately wiping with a second cloth can negate the cleaning procedure because the contaminants may simply be re-deposited as the solvent dries). In all cases where used, solvents should be wiped dry with a clean, white cloth or other lint-free wiping materials. Change the cleaning rags frequently, as they become dirty. It is easier to see the dirt accumulating on the rag if white rags are used. Do not dip used cleaning rags into the cleaning solvent as this can contaminate the solvent (cleaning with contaminated solvent can result in sealant adhesion issues). Always use clean solvent-resistant containers for solvent use and storage.
- When cleaning deep, narrow structural glazing cavities, wrap the cleaning cloth around a clean, narrow-blade putty knife. This permits force to be applied to the cleaned surface.
- Isopropyl Alcohol (IPA) is a commonly-used solvent and has proven useful for most non-porous substrates encountered in architectural construction applications. Xylene and Toluene have also been found useful on many substrates. When handling solvents, refer to manufacturer's MSDS for information on handling, safety and personal protective equipment.
- Architectural coatings, paints and plastics should be cleaned with a solvent approved by the manufacturer of the product or which does not harm or alter the finish.
- Cleaning of surfaces should be done within 1 to 2 hours of when the sealant is to be applied.
- Difficult or nearly impossible to see on a joint substrate, frost is likely to develop on substrates when temperatures drop near the freezing point. Since frost and moisture will interfere with proper sealant adhesion, it is important to confirm that substrates are dry prior to application of the sealant.

Exterior Insulation and Finish Systems (EIFS)

- The use of an appropriate silicone primer is required on all EIFS substrates. Consult Momentive Performance Materials Technical Services for sealant-primer-substrate recommendations.
- Confirm with the EIFS supplier which finish the sealant should be applied to (*i.e.,* base coat or base coat with EIFS primer).
- All EIFS surfaces must be clean, dry and sound and in an acceptable condition to receive sealant. Confirm with the EIFS supplier or project architect or consultant, what joint conditions are considered acceptable for sealant installation to proceed. If unacceptable conditions are found, cease installation of sealant until corrections are made.
- To clean EIFS, lightly abrade the joint surfaces using a synthetic brush or pad and then remove dust and other remaining loose particles with a soft bristle brush or using an oil-free air blow.
- Cleaning of surfaces should be done within 1 to 2 hours of when the sealant is to be applied.
- Since EIFS materials can absorb and retain moisture, it is important to confirm that the EIFS materials are dry prior to application of the sealant.

Priming

SCS2000 attains primerless adhesion to many commonly encountered construction materials. However, some materials with variable surface characteristics may require the use of a primer to help obtain durable long-term adhesion. Prior to use, trial applications should be made to check adhesion to the specific materials to be used on the project. See the GE sealants primer datasheets for product specific information on use and priming instructions. PRIMER APPLICATION IS NOT A SUBSTITUTE FOR SURFACE PREPARATION. Consult Momentive Performance Materials[1] Technical Services for sealant-primer-substrate recommendations.

CAUTION: Primers may contain solvents. When handling solvents, refer to manufacturer's MSDS for information on handling, safety and personal protective equipment.

Masking

The use of masking tape is recommended where appropriate to ensure a neat job and to protect adjoining surfaces from over-application of sealant. Masking tape can prevent contact of sealant with adjoining surfaces that otherwise would be permanently marred or damaged by such contact or by cleaning methods required to remove sealant systems. When tooling, use care not to spread the sealant over the face of the substrates adjacent to the joint or masking as the silicone can be extremely difficult to remove on rough or porous substrates. Do not allow masking tape to touch clean surfaces to which the silicone sealant is to adhere (adhesive on masking tape can interfere with adhesion of silicone). Masking tape should be removed immediately after tooling the sealant and before the sealant begins to skin over (tooling time).

Sealant Application

- Apply sealant in a continuous operation, horizontally in one direction and vertically from the bottom to the top of the joint opening, applying a positive pressure adequate to properly fill and seal the joint width.
- Tool or strike the sealant with a concave tool applying light pressure to spread the material against the back-up material and the joint surfaces to ensure a void-free application.
- In glazing applications, tool the sealant at the sill so that precipitation and cleaning solutions will not pool.
- Excess sealant should be cleaned from glass, metal and plastic surfaces while still uncured. On porous surfaces the excess sealant should be allowed to progress through the initial cure or set-up. It should then be removed by abrasion or other mechanical means.
- Due to the smooth consistency of SCS2000, tooling agents such as water, soap, or detergent solutions are not necessary or recommended. Dry tooling is recommended.
- Sealant application is not recommended when the temperature is below 4°C (40°F) or if frost or moisture is present on the surfaces to be sealed.
- Application of SCS2000 is not recommended to surfaces above 50°C (122°F).
- The cure rate of this product is dependent upon temperature and the availability of atmospheric moisture. Under Standard Conditions (relative humidity of 50 ± 5% at an air temperature of 23 of ± 1°C [73.4 ± 2°F]) this material can attain a cured thickness of 2-3 mm per 24 hours (assuming ample access to atmospheric moisture). As temperature decreases, the cure rate slows down (and vice versa). Low moisture environments will also reduce the cure rate. Near-confined spaces which limit the overall access to atmospheric moisture will cure only from that surface which has access to the atmosphere. Colder temperatures can significantly increase cure times and can open the possibility of sealant irregularities if joint movement occurs while sealant is not fully cured. The following reference provides additional information on Movement-During-Cure of sealant joints: ASTM C1193 - Standard Guide for Use of Joint Sealants; section 12.5.

Patent Status

Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute the permission, inducement or recommendation to practice any invention covered by any patent, without authority from the owner of the patent.

Product Safety, Handling and Storage

Customers considering the use of this product should review the latest Material Safety Data Sheet and label for product safety information, handling instructions, personal protective equipment if necessary, and any special storage conditions required. Material Safety Data Sheets are available at www.ge.com/silicones or, upon request, from any MPM representative. Use of other materials in conjunction with MPM sealants products (for example, primers) may require additional precautions. Please review and follow the safety information provided by the manufacturer of such other materials.

Emergency Service

MPM maintains an around-the-clock emergency service for its products. The American Chemistry Council (CHEMTREC) and CareChem24 International also maintain an around-the-clock emergency service for all chemical products:

Location	Momentive Performance Materials Products	All Chemical Products
Mainland U.S., Puerto Rico	518.233.2500	CHEMTREC: 800.424.9300
Alaska, Hawaii	518.233.2500	CHEMTREC: 800.424.9300
Canada	518.233.2500	CHEMTREC: 800.424.9300
Europe	+518.233.2500 (Albanian, Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Lithuanian, Norwegian, Polish, Portuguese, Romanian, Russian, Serbo-Croatian, Slovak, Spanish, Swedish, Turkish, Ukrainian)	+44.(0)208.762.8322 (UK)
Middle East, All countries, except Israel	+518.233.2500	+961.3.487.287 (Lebanon)
Middle East, Israel	+518.233.2500	+44.(0)208.762.8322 (UK)
Latin America, Asia/Pacific, all other locations worldwide	+518.233.2500	CHEMTREC: +1-703.527.3887 (collect)
At sea	Radio U.S. Coast Guard, which can directly contact Momentive Performance Materials at 518.233.2500 or CHEMTREC at 800.424.9300.	

DO NOT WAIT. Phone if in doubt. You will be referred to a specialist for advice.

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# C6549.01-401-44

Date 7/12/2013 Tech SP

CUSTOMER SERVICE CENTERS

North America	**E** cs-na.silicones@momentive.com		
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	• RTVs and Elastomers	**T** +1.800.332.3390	**F** +1.304.746.1623
	• Consumer Sealants & Construction Sealants and Adhesives	**T** +1.877.943.7325	**F** +1.304.746.1654
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161-005-00E-GL
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