

**ASTM E 1886 / ASTM E 1996 AND
ASTM E 283, ASTM E 330, ASTM E 331
TEST REPORT**

Rendered to:

BEKAERT SPECIALTY FILMS, LLC

**SERIES/MODEL: Solar Gard Armorcoat 8-mil Film
PRODUCT TYPE: Fixed Window with Applied Film**

This report contains in its entirety:

**Cover Page: 1 page
Report Body: 10 pages
Sketches: 4 pages
Drawings: 5 pages**

**Report No.: 85700.01-401-44
Revision 1: 10/03/08
Test Date: 09/18/08
Report Date: 10/01/08
Expiration Date: 09/18/12**

ASTM E 1886 / ASTM E 1996 AND ASTM E 283, ASTM E 330, ASTM E 331
TEST REPORT

Rendered to:

BEKAERT SPECIALTY FILMS, LLC
8575-A Somerset Drive
Largo, Florida 33773

Report No.: 85700.01-401-44
Revision 1: 10/03/08
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Project Summary: Architectural Testing, Inc. was contracted by Bekaert Specialty Films, LLC to perform testing on three Series/Model Solar Gard Armorcoat 8-mil Film, fixed window with applied film. The samples tested met the performance requirements set forth in the referenced test procedures for a ± 2394 Pa (± 50.0 psf) Design Pressure with missile impacts corresponding to Missile Level C and Wind Zone 2. Test specimen description and results are reported herein. The samples were provided by the client.

Test Procedures: The test specimens were evaluated in accordance with the following:

ASTM E 283-04, Test Method for Determining Rate of Airflow Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen

ASTM E 330-02, Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference

ASTM E 331-00, Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference

ASTM E 1886-02, Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

ASTM E 1996-02, Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.

Test Specimen Description:

Series/Model: Solar Gard Armorcoat 8-mil Film

Product Type: Fixed Window with Applied Film

Overall Size: 1308 mm (4' 3-1/2") wide by 2540 mm (8' 4") high

Daylight Opening Size: 1181 mm (3' 10-1/2") wide by 2400 mm (7' 10-1/2") high

Finish: All aluminum was mill finish.

Glazing Details: The glass was comprised of one sheet of 4.76 mm (3/16") clear tempered glass and an 8-mil (0.008") thick applied film on the interior side of the glass. The glass was exterior glazed onto a bed of Dow 995 silicone sealant, cap sealed and secured from the exterior perimeter with a vinyl wedge gasket.

Weatherstripping:

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
Custom snap-in vinyl molding	1	Exterior perimeter of the fixed lite

Frame Construction: The frame was constructed of extruded aluminum members with straight-cut and butted corners. The corners were sealed and secured with two #8 x 1-1/4" Philips head screws per corner through the jambs into the head and sill.

Hardware: No hardware was utilized.

Drainage: No drainage was utilized.

Reinforcement: No reinforcement was utilized.

Installation: The fixed window was installed into a 2 x 10 Spruce-Pine-Fir #2 wood test buck. The aluminum window frame was secured to the interior perimeter with #14 x 3-1/2" wood screws spaced 6" from the ends and 22" on center securing the frame members to the buck. The exterior was sealed with silicone.

Test Results:

The results are tabulated as follows:

<u>Test Method</u>	<u>Title of Test</u>	<u>Results</u>
ASTM E 283	Air Infiltration	
	1.60 psf (25 mph)	0.09 cfm/ft ²
	6.27 psf (50 mph)	0.19 cfm/ft ²
ASTM E 331	Water Resistance	
	7.52 psf	No leakage
ASTM E 330	Uniform Load Deflection	
	(Deflections reported were taken on the aluminum frame between fasteners with a 22" span)	
	(Loads were held for 10 seconds)	
	2400 Pa (50.16) psf (positive)	<0.01"
	2400 Pa (50.16) psf (negative)	0.01"
ASTM E 330	Uniform Load Structural	
	(Permanent sets reported were taken on the aluminum frame between fasteners with a 22" span)	
	(Loads were held for 10 seconds)	
	3600 Pa (75.24) psf (positive)	<0.01"
	3600 Pa (75.24) psf (negative)	<0.01"

Test Results: (Continued)

ASTM E 1886, *Large Missile Impact*

Conditioning Temperature: 25.5°C (78°F)

Missile Weight: 1717 g (4.6 lbs)

Missile Length: 1.25 m (4' 1")

Muzzle Distance from Test Specimen: 1.83 m (6' 0")

Test Unit #1

Impact #1: Missile Velocity: 11.9 m/s (39.2 fps); orientation within $\pm 5^\circ$ of vertical

Impact Area: Center of glazing

Observations: Missile impacted the target area fractured the filmed glass with no penetration.

Results: Pass

Test Unit #2

Impact #1: Missile Velocity: 12.5 m/s (41.1 fps); orientation within $\pm 5^\circ$ of vertical

Impact Area: Lower left corner of glazing.

Observations: Missile impacted the target area fractured the filmed glass with no penetration.

Results: Pass

Test Unit #3

Impact #1: Missile Velocity: 12.3 m/s (40.4 fps); orientation within $\pm 5^\circ$ of vertical

Impact Area: Upper right corner of glazing.

Observations: Missile impacted the target area fractured the filmed glass with no penetration.

Results: Pass

Note: See Architectural Testing Sketches #1, #2 and #3 for impact locations.

Test Results: (Continued)

ASTM E 1886, Air Pressure Cycling

Test Unit #1

Design Pressure: ±2394 Pa (±50.0 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
478.8 to 1197 (10 to 25)	3500	2.47	0.76 (0.03)	1.02 (0.04)	0.76 (0.03)
0.0 to 1436.4 (0 to 30)	300	3.13	1.27 (0.05)	1.02 (0.04)	0.76 (0.03)
1197 to 1915.2 (25 to 40)	600	1.97	1.52 (0.06)	1.78 (0.07)	1.52 (0.06)
718.2 to 2394 (15 to 50)	100	2.67	2.03 (0.08)	2.03 (0.08)	1.78 (0.07)
			Permanent Set		
			1.52 (0.06)	1.27 (0.05)	0.51 (0.02)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
718.2 to 2394 (15 to 50)	50	3.26	2.79 (0.11)	3.56 (0.14)	3.05 (0.12)
1197 to 1915.2 (25 to 40)	1050	1.78	2.79 (0.11)	3.30 (0.13)	2.79 (0.11)
0.0 to 1436.4 (0 to 30)	50	2.98	2.54 (0.10)	3.05 (0.12)	2.54 (0.10)
478.8 to 1197 (10 to 25)	3350	1.89	2.03 (0.08)	2.54 (0.10)	1.78 (0.07)
			Permanent Set		
			1.52 (0.06)	1.52 (0.06)	1.27 (0.05)

Observations: At the conclusion of the test, there was no tear or delaminating of the glass.

Results: Pass

Note: See Architectural Testing Sketch #4 for indicator locations. Test Specimens 1, 2 and 3 were cycled in a common chamber.

Test Results: (Continued)

ASTM E 1886, Air Pressure Cycling

Test Unit #2

Design Pressure: ±2394 Pa (±50.0 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
478.8 to 1197 (10 to 25)	3500	2.47	1.27 (0.05)	1.27 (0.05)	1.27 (0.05)
0.0 to 1436.4 (0 to 30)	300	3.13	1.27 (0.05)	1.52 (0.06)	1.27 (0.05)
1197 to 1915.2 (25 to 40)	600	1.97	2.54 (0.10)	2.54 (0.10)	2.03 (0.08)
718.2 to 2394 (15 to 50)	100	2.67	2.79 (0.11)	2.79 (0.11)	2.54 (0.10)
			Permanent Set		
			1.52 (0.06)	1.52 (0.06)	1.02 (0.04)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
718.2 to 2394 (15 to 50)	50	3.26	5.08 (0.20)	4.57 (0.18)	4.32 (0.17)
1197 to 1915.2 (25 to 40)	1050	1.78	4.57 (0.18)	4.32 (0.17)	2.81 (0.15)
0.0 to 1436.4 (0 to 30)	50	2.98	4.06 (0.16)	3.81 (0.15)	3.30 (0.13)
478.8 to 1197 (10 to 25)	3350	1.89	3.56 (0.14)	3.30 (0.13)	2.79 (0.11)
			Permanent Set		
			2.54 (0.10)	2.54 (0.10)	2.28 (0.09)

Observations: At the conclusion of the test, there was no tear or delaminating of the glass.

Result: Pass

Note: See Architectural Testing Sketch #4 for indicator locations.

Test Results: (Continued)

ASTM E 1886, Air Pressure Cycling

Test Unit #3

Design Pressure: ±2394 Pa (±50.0 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
478.8 to 1197 (10 to 25)	3500	2.47	0.76 (0.03)	0.76 (0.03)	0.51 (0.02)
0.0 to 1436.4 (0 to 30)	300	3.13	0.76 (0.03)	0.76 (0.03)	0.51 (0.02)
1197 to 1915.2 (25 to 40)	600	1.97	1.27 (0.05)	1.27 (0.05)	1.02 (0.04)
718.2 to 2394 (15 to 50)	100	2.67	1.52 (0.06)	1.52 (0.06)	1.27 (0.05)
			Permanent Set		
			0.76 (0.03)	0.76 (0.03)	0.51 (0.02)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
718.2 to 2394 (15 to 50)	50	3.26	3.05 (0.12)	3.05 (0.12)	2.03 (0.08)
1197 to 1915.2 (25 to 40)	1050	1.78	3.30 (0.13)	3.05 (0.12)	2.54 (0.10)
0.0 to 1436.4 (0 to 30)	50	2.98	3.30 (0.13)	2.79 (0.11)	2.54 (0.10)
478.8 to 1197 (10 to 25)	3350	1.89	3.05 (0.12)	2.54 (0.10)	2.03 (0.08)
			Permanent Set		
			2.29 (0.09)	2.03 (0.08)	1.52 (0.06)

Observations: At the conclusion of the test, there was no tear or delaminating of the glass.

Result: Pass

Note: See Architectural Testing Sketch #4 for indicator locations.

General Note: Upon completion of testing, the specimens met the requirements of Section 7 of ASTM E 1996.

Test Equipment:

Cannon: Constructed from steel piping utilizing compressed air to propel the missile

Missile: 2x4 Southern Pine

Timing Device: Electronic Beam Type

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

Deflection Measuring Device: 1" dial indicators

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.

Drawing Reference: The test specimen drawings have been reviewed by Architectural Testing and are representative of the test specimen reported herein.

List of Official Observers:

Name

Company

Nick Routh

Bekaert Specialty Films, LLC

Steve Schroer

Bekaert Specialty Films, LLC

Miguel Detres

Bekaert Specialty Films, LLC

Scott Parker

Architectural Testing, Inc.

John McClane

Architectural Testing, Inc.

Detailed drawings, data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period, such materials shall be discarded without notice and the service life of this report will expire.

Results obtained are tested values and were secured by 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 specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.

John C. McClane
Laboratory Manager

Joseph A. Reed, P.E.
Director - Engineering and Product Testing

JCM:ck/cmd

Attachments (pages): This report is complete only when all attachments listed are included.

Appendix-A: Sketches (4)

Appendix-B: Drawings (5)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	10/01/08	N/A	Original report issue
1	10/03/08	Cover page	Reverse the heading
		Page 1	Reverse the heading
		Page 4	Corrected "laminated glass" to "filmed glass"

Appendix A

Sketches

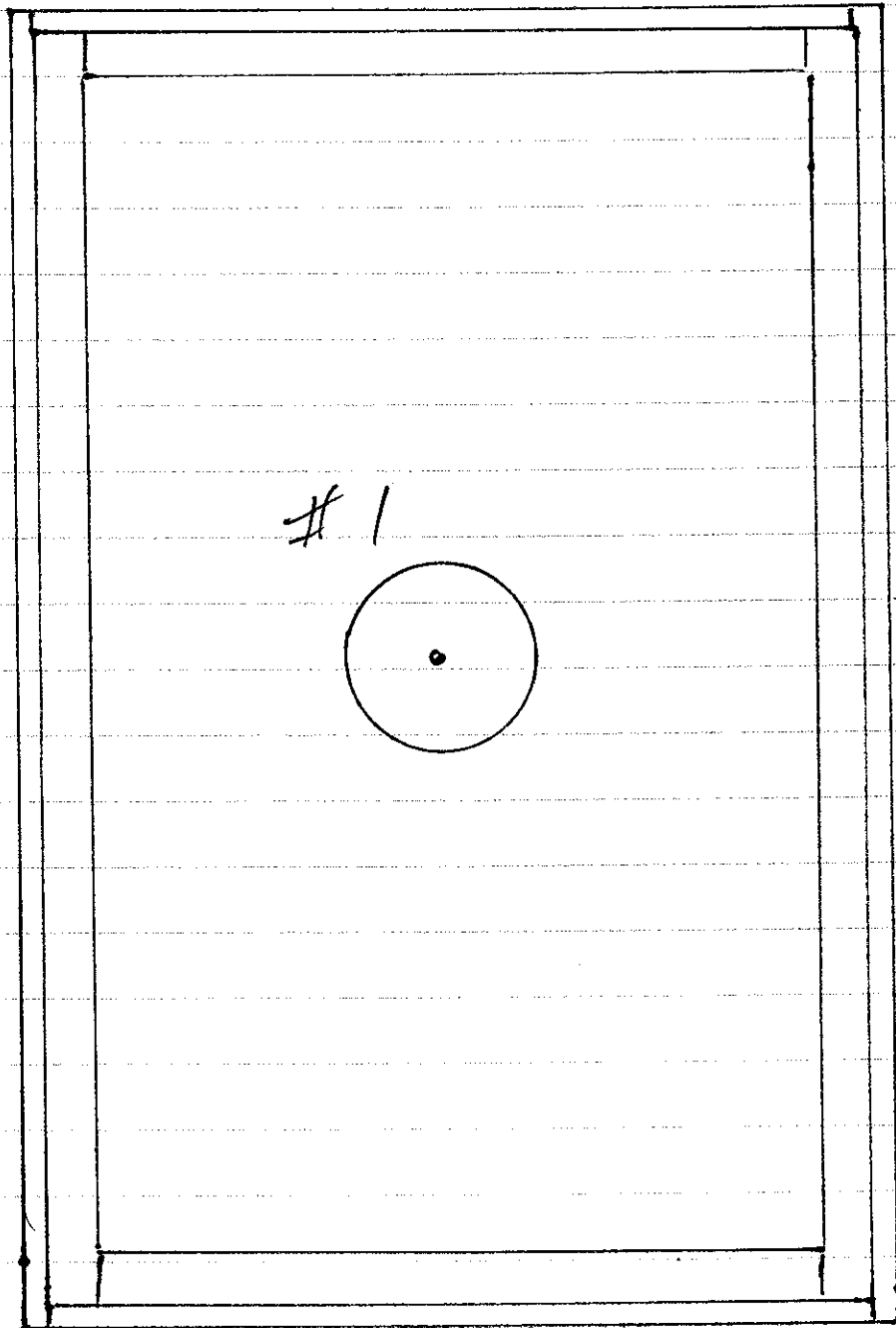
ATI SKETCH # 1

09/23/08

1-OF-4

SPECIMEN # 1

IMPACT LOCATIONS



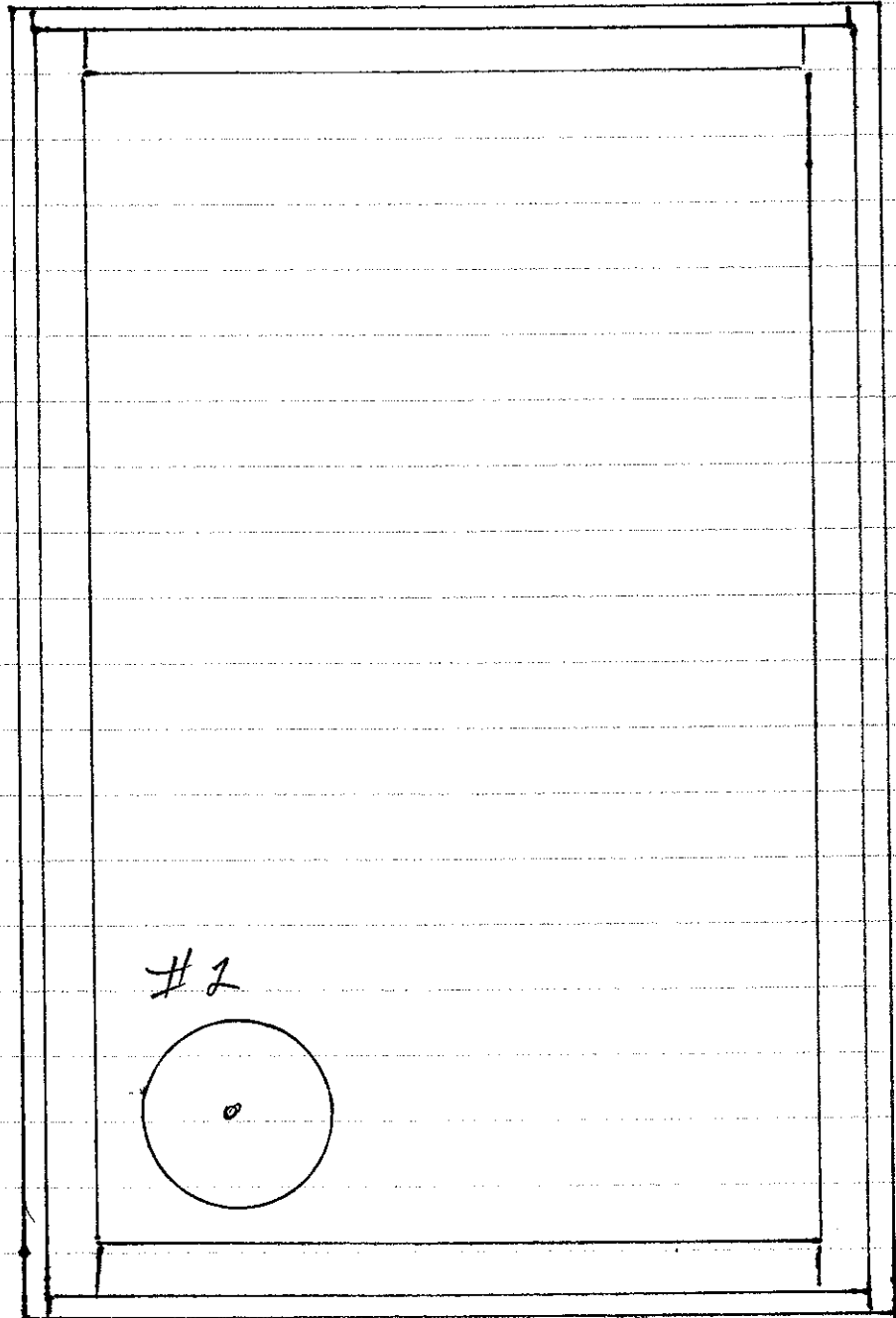
ATI SKETCH # 2

09/23/08

2-OF-4

SPECIMEN # 2

IMPACT LOCATIONS

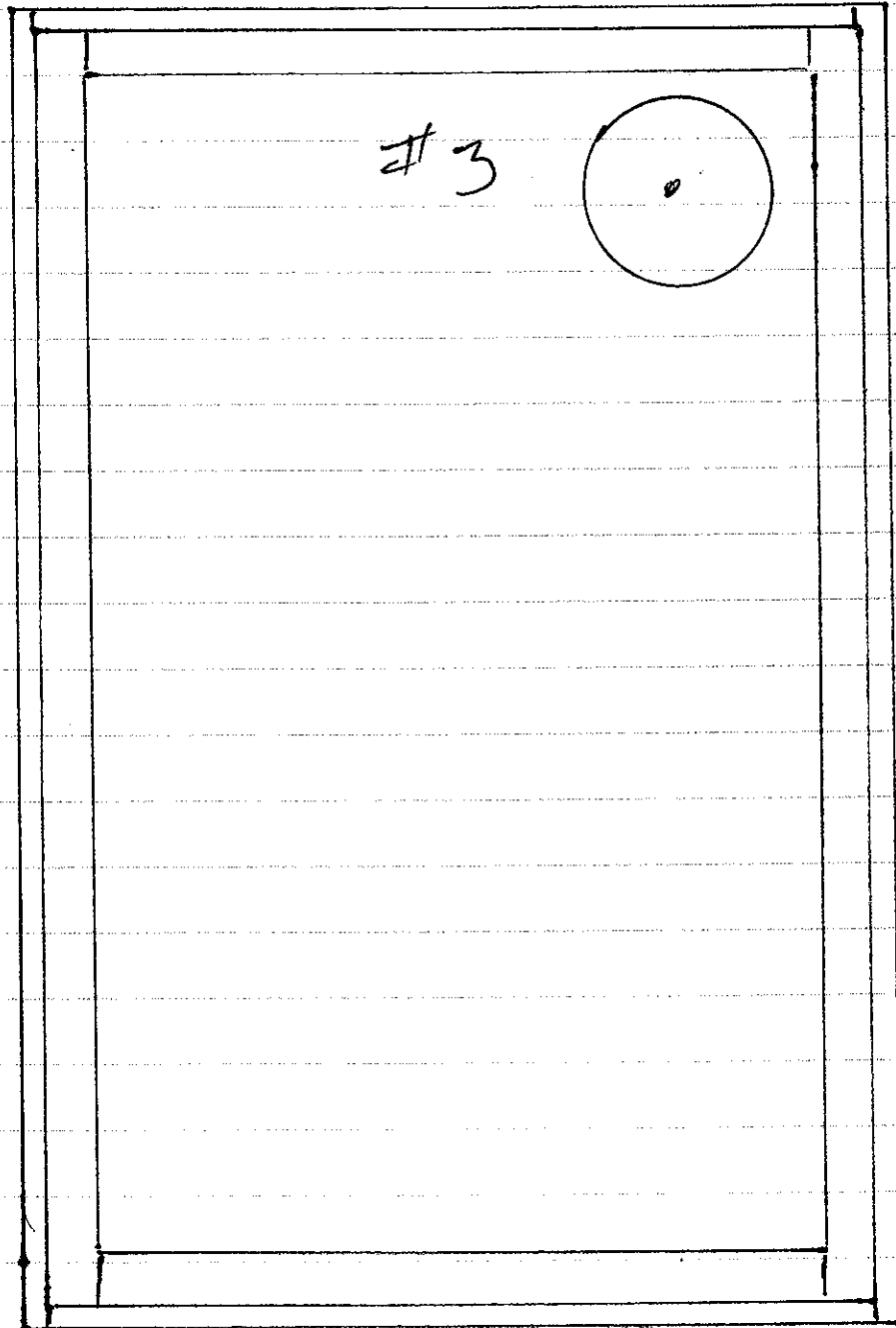


ATI SKETCH # 3

09/23/08

3-OF-4

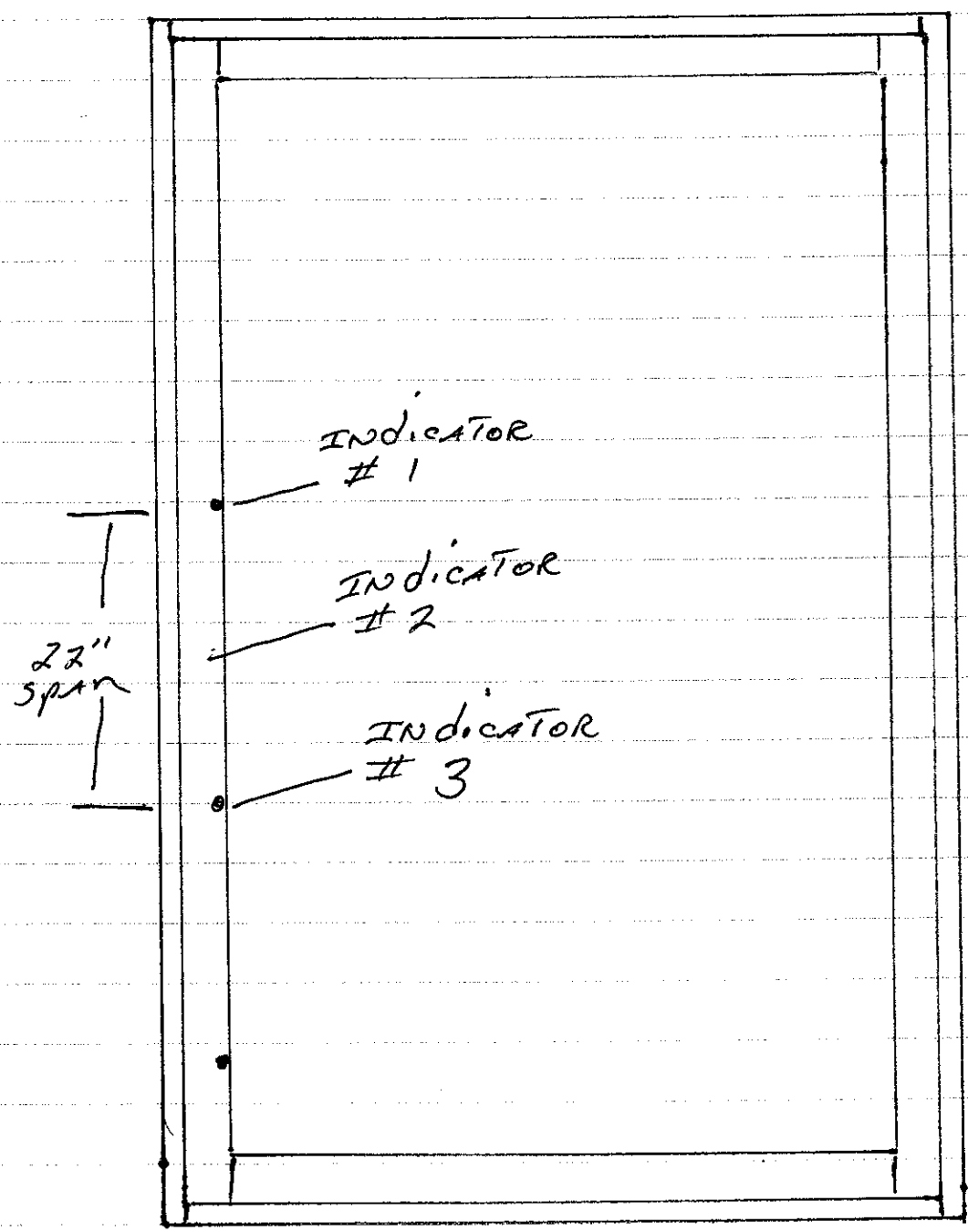
SPECIMEN # 3
IMPACT LOCATIONS



ATI SKETCH # 4

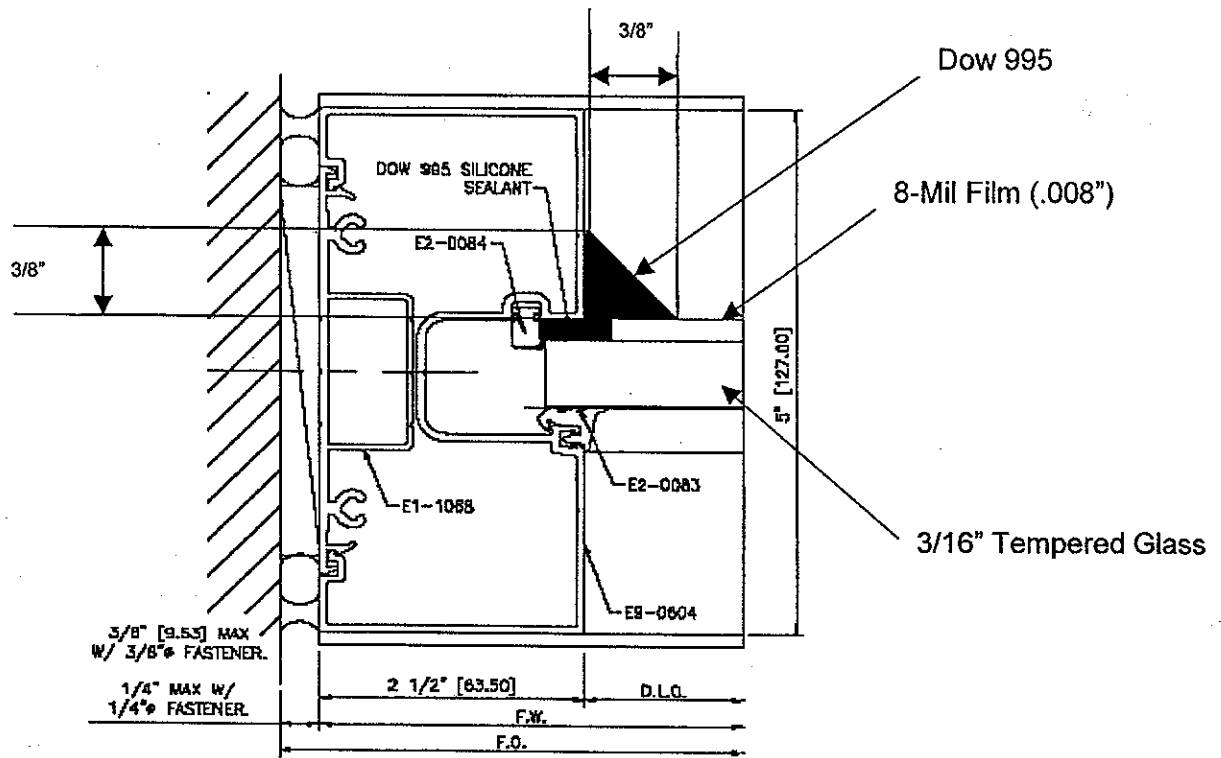
09/23/08
4-OF-4

SPECIMEN # 1, 2, 3 AND 4
INDICATOR LOCATIONS



Appendix B

Drawings



NOTE:

Film, Glass and Dow 995 Coverage not to scale.

Dow coverage is 3/8" on film and 3/8" on frame.



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# 85700.01

Date 9/24/08 Tech JCM

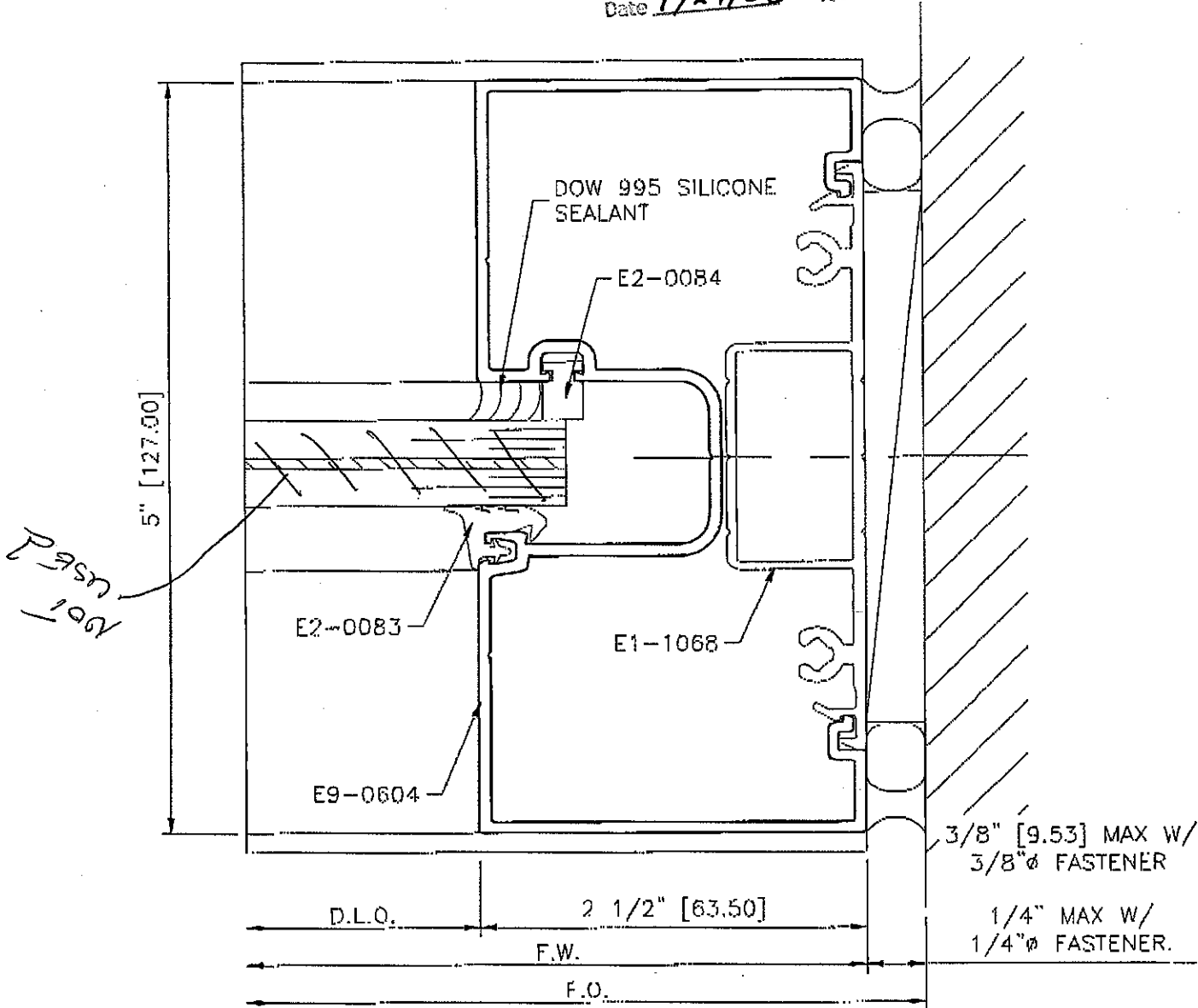
YKK AP America Inc.
YHS 50 - Hurricane Storefront System
RIGHT JAMB DETAIL



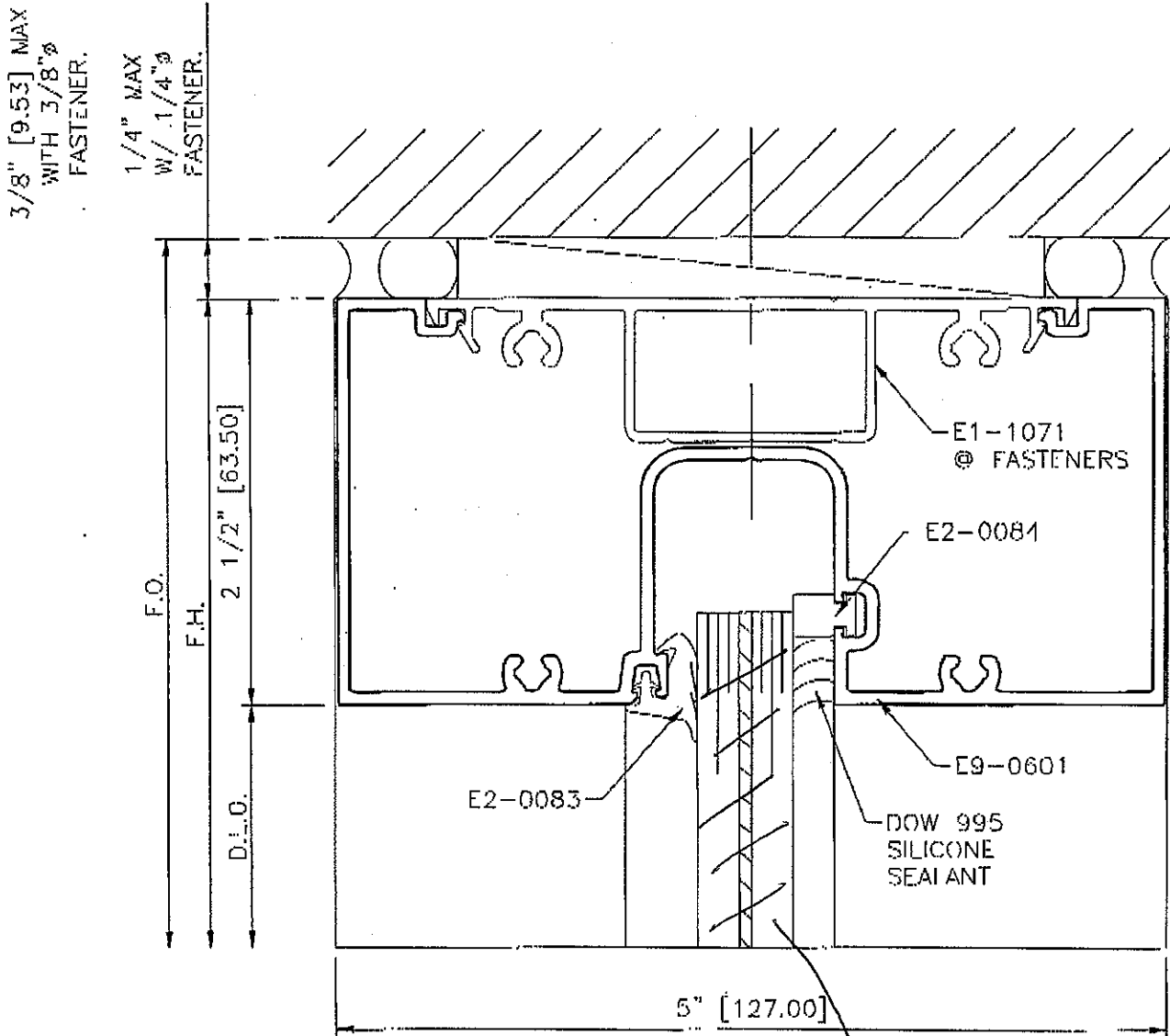
Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# 85700.01
Date 9/24/08 Tech JCM



YKK AP America Inc.
YHS 50 - Hurricane Storefront System
HEAD DETAIL



Date 9/24/08 Tech Jcm
Report# 85700.01

Test sample complies with these details.
Deviations are noted.

Architectural Testing

NOT USED

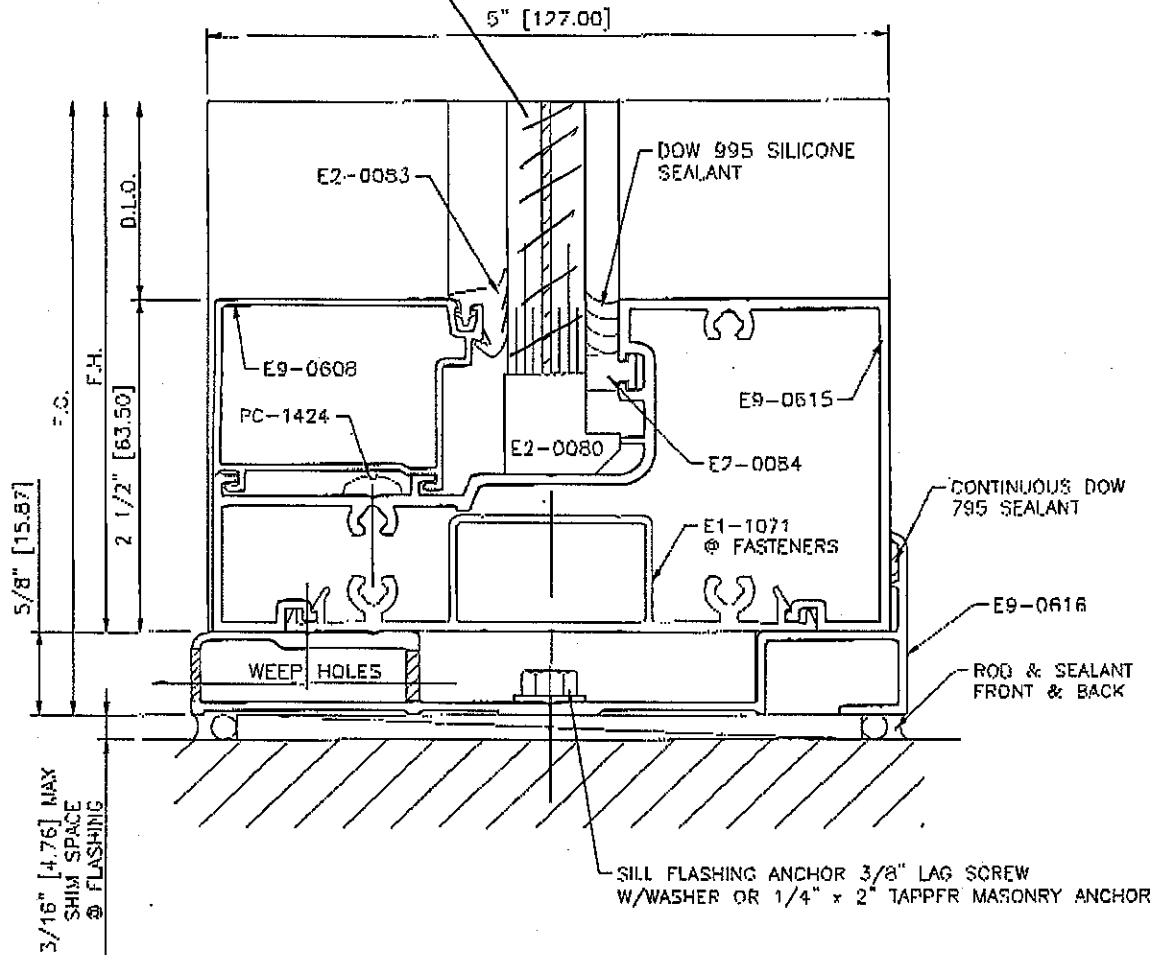
YKK AP America Inc.
YHS 50 - Hurricane Storefront System
SILL DETAIL



Test sample complies with these details.
Deviations are noted.

Report# 85700.01
Date 9/24/08 Tech Jcm

NOT USED



YKK AP America Inc.
YHS 50 - Hurricane Storefront System
LEFT JAMB DETAIL



 Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# 85700.01
Date 9/24/08 Tech JCM

