Architectural Testing

ASTM E 1886 and ASTM E 1996
TEST REPORT

Rendered to:

FLEETWOOD WINDOWS AND DOORS

SERIES/MODEL: Norwood 3070 CR
PRODUCT TYPE: Aluminum Sliding Glass Door (OOXXOO)

Report No.:	**87274.02-109-44**
Test Dates:	**12/23/08**
Through:	**01/02/09**
Report Date:	**04/03/09**
Expiration Date:	**01/02/13**

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FLEETWOOD WINDOWS AND DOORS
P. O. Box 1086
Corona, California 92880

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Project Summary: Architectural Testing, Inc. was contracted by Northshore Window and Door to perform testing on three Series/Model Norwood 3070 CR, aluminum sliding glass doors (OOXXOO). The samples tested met the performance requirements set forth in the referenced test procedures for a ±2400 Pa (±50.0 psf) Design Pressure with missile impacts corresponding to Missile Level D and Wind Zone 3. This report is a reissue of the original Report No. 87274.01-109-44. This report is reissued in the name of Fleetwood Windows and Doors through written authorization of Northshore Window and Door. 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 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.*

ASTM E 1996-05, *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: Norwood 3070 CR

Product Type: Aluminum Sliding Glass Door (OOXXOO)

Overall Size: 6531 mm (257-1/8") wide by 2826 mm (111-1/4") high

Panel Size (2): 1175 mm (46-1/4") wide by 2788 mm (109-3/4") high

Fixed Daylight Opening Size (4): 987 mm (38-7/8") wide by 2610 mm (102-3/4") high

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Test Specimen Description: (Continued)

Finish: All aluminum was painted.

Glazing Details: The unit was glazed with 1-1/16" thick insulating glass constructed of a sheet of 7/16" thick laminated glass inboard, a sheet of 1/4" thick tempered glass outboard and an aluminum spacer system. The laminated glass was constructed of two sheets of 3/16" thick clear annealed glass and a 0.100" thick DuPont SentryGlas® Plus interlayer. The glass was channel glazed with a wrap-around flexible rubber gasket.

Weatherstripping:

Description	Quantity	Location
0.270" backed by 0.320" high polypile	6 Rows	Sill
0.270" backed by 0.500" high polypile with center fin	1 Row	Interlock stile of both operable panels
0.270" backed by 0.230" high polypile	2 Rows	Primary panel lock stile
0.270" backed by 0.310" high dual fin rubber gasket	1 Row	Exterior track of the jamb against the interior side of the fixed panel

Frame Construction: The frame was constructed of extruded aluminum. The corners were coped, butted, and fastened with three #10 x 3/4" pan head screws. The corners were sealed with silicone. The sill was placed upon an extruded aluminum base. Snap-in extruded aluminum liners were utilized in the jambs and the exterior tracks of the fixed panels at the head and sill. The sill utilized three snap-on stainless steel caps, one per panel track.

Panel Construction: The panels were constructed of extruded thermally improved aluminum. The corners were coped, butted, and fastened with two #9 x 3" flat head screws at the top and bottom. The fixed panels utilized an extruded aluminum guide block in place of the rollers. The guide block was secured to the bottom rail with one #10 x 2" flat head screw. The exterior panels were secured to the frame with #8 x 5/8" self-tapping pan head screws located 3-1/2" from each end and midspan.

Test Specimen Description: (Continued)

Hardware:

Description	Quantity	Location
Locking handle	1	Primary panel lock stile, 44" from bottom rail
Handle	1	Secondary panel lock stile, 44" from bottom rail
Roller assembly	2 per operable panel	Bottom rail, 2" from each end

Drainage: No drainage was utilized.

Reinforcement: No reinforcement was utilized.

Installation: The sliding glass door was installed into a Spruce-Pine-Fir wood buck. The door was secured through the frame with groups of three #10 x 3" flat head screws, located 3-1/2" from the corners and spaced 24" on center through the jambs and head, and spaced 42" on center through the sill. The exterior perimeter of the jambs and head were sealed with Grace Vycor® flashing tape. The sill was placed on a bead of silicone.

Test Results: The following results have been recorded:

ASTM E 1886, *Large Missile Impact*

Conditioning Temperature: 16°C (60°F)
Missile Weight: 4105 g (9.05 lbs)
Missile Length: 2.4 m (7' 10-1/16")
Muzzle Distance from Test Specimen: 5.2 m (17.0 ft.)

Test Unit #1

Impact #1: Missile Velocity: 15.2 m/s (50.0 fps); orientation within ±5° of horizontal
Impact Area: Center of primary locking panel
Observations: Missile impacted target area, shattered exterior tempered glass and fractured interior laminated glass, no penetration.
Results: Pass

Missile Weight: 4191 g (9.24 lbs)
Missile Length: 2.4 m (8' 0-1/6")

Test Unit #2

Impact #1: Missile Velocity: 15.3 m/s (50.3 fps); orientation within ±5° of horizontal
Impact Area: Lower left corner of primary locking panel
Observations: Missile impacted target area, shattered exterior tempered glass and fractured interior laminated glass, no penetration.
Results: Pass

Test Unit #3

Impact #1: Missile Velocity: 15.5 m/s (51.0 fps); orientation within ±5° of horizontal
Impact Area: Upper right corner of primary locking panel
Observations: Missile impacted target area, shattered exterior tempered glass and fractured interior laminated glass, no penetration.
Results: Pass

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

Test Results: (Continued)

ASTM E 1886, ***Air Pressure Cycling***

Test Unit #1

Design Pressure: ±2400 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	#4	#5	#6
480 to 1200 (10.0 to 25.0)	3500	3.9	8.9 (0.35)	19.6 (0.77)	5.1 (0.20)	7.1 (0.28)	36.8 (1.45)	5.3 (0.21)
0 to 1440 (0 to 30.0)	300	4.9	8.9 (0.35)	21.8 (0.86)	5.1 (0.20)	7.1 (0.28)	40.4 (1.59)	5.6 (0.22)
1200 to 1920 (25.0 to 40.0)	600	4.0	8.9 (0.35)	25.4 (1.00)	5.6 (0.22)	8.4 (0.33)	51.1 (2.01)	7.4 (0.29)
720 to 2400 (15.0 to 50.0)	100	4.2	8.9 (0.35)	29.7 (1.17)	6.6 (0.26)	9.7 (0.38)	63.5 (2.50)	8.6 (0.34)
			Permanent Set					
			2.3 (0.09)	5.3 (0.21)	2.8 (0.11)	4.1 (0.16)	3.8 (0.15)	3.6 (0.14)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)					
			#1	#2	#3	#4	#5	#6
720 to 2400 (15.0 to 50.0)	50	4.5	9.1 (0.36)	31.8 (1.25)	11.7 (0.46)	9.1 (0.36)	66.3 (2.61)	13.5 (0.53)
1200 to 1920 (25.0 to 40.0)	1050	4.2	9.7 (0.38)	27.9 (1.10)	11.7 (0.46)	8.4 (0.33)	57.2 (2.25)	12.8 (0.50)
0 to 1440 (0 to 30.0)	50	4.9	3.6 (0.14)	17.0 (0.67)	4.6 (0.18)	4.3 (0.17)	35.8 (1.41)	3.3 (0.13)
480 to 1200 (10.0 to 25.0)	3350	3.5	3.6 (0.14)	16.5 (0.65)	4.3 (0.17)	4.1 (0.16)	34.3 (1.35)	2.5 (0.10)
			Permanent Set					
			1.8 (0.07)	3.8 (0.15)	2.5 (0.10)	2.3 (0.09)	3.3 (0.13)	1.3 (0.05)

Observations*: During the second set of negative cycling, the second fixed panel from the exterior, laminated glass fractured. No other additional damage.*

Result: Pass

Note*: See Architectural Testing Sketch #2 for indicator locations.*

Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #2

Design Pressure: ±2400 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	#4	#5	#6
480 to 1200 (10.0 to 25.0)	3500	3.8	4.6 (0.18)	19.3 (0.76)	4.3 (0.17)	4.1 (0.16)	34.0 (1.34)	3.8 (0.15)
0 to 1440 (0 to 30.0)	300	5.0	5.8 (0.23)	21.6 (0.85)	4.6 (0.18)	20.3 (0.18)	38.4 (1.51)	4.1 (0.16)
1200 to 1920 (25.0 to 40.0)	600	3.8	7.1 (0.28)	24.6 (0.97)	6.1 (0.24)	5.6 (0.22)	49.0 (1.93)	5.1 (0.20)
720 to 2400 (15.0 to 50.0)	100	4.6	8.6 (0.34)	29.7 (1.17)	7.9 (0.31)	7.1 (0.28)	66.8 (2.63)	6.4 (0.25)
			Permanent Set					
			0.5 (0.02)	0.3 (0.01)	0.8 (0.03)	0.5 (0.02)	3.3 (0.13)	0.3 (0.01)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)					
			#1	#2	#3	#4	#5	#6
720 to 2400 (15.0 to 50.0)	50	4.9	8.4 (0.33)	34.0 (1.34)	11.9 (0.47)	9.7 (0.38)	71.1 (2.80)	11.9 (0.47)
1200 to 1920 (25.0 to 40.0)	1050	3.6	7.9 (0.31)	30.2 (1.19)	11.4 (0.45)	8.9 (0.35)	61.0 (2.40)	11.7 (0.46)
0 to 1440 (0 to 30.0)	50	4.6	7.1 (0.28)	23.6 (0.93)	10.2 (0.40)	7.6 (0.30)	47.8 (1.88)	4.8 (0.19)
480 to 1200 (10.0 to 25.0)	3350	3.8	6.9 (0.27)	25.1 (0.99)	10.2 (0.40)	7.4 (0.29)	45.7 (1.80)	3.8 (0.15)
			Permanent Set					
			3.6 (0.14)	6.4 (0.25)	5.6 (0.22)	3.3 (0.13)	10.2 (0.40)	2.5 (0.10)

***Observations**: During second set of positive loads, the second panel from the exterior left, the laminated glass fractured. Both exterior right, fixed panels laminated glass fractured.*

Result: Pass

***Note**: See Architectural Testing Sketch #2 for indicator locations.*

Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #3

Design Pressure: ±2400 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	#4	#5	#6
480 to 1200 (10.0 to 25.0)	3500	3.8	6.9 (0.27)	18.3 (0.72)	13.7 (0.54)	6.1 (0.24)	42.2 (1.66)	8.1 (0.32)
0 to 1440 (0 to 30.0)	300	4.6	6.9 (0.27)	19.3 (0.76)	13.7 (0.54)	6.6 (0.26)	47.2 (1.86)	8.1 (0.32)
1200 to 1920 (25.0 to 40.0)	600	4.8	7.4 (0.29)	24.1 (0.95)	14.0 (0.55)	7.9 (0.31)	60.2 (2.37)	9.1 (0.36)
720 to 2400 (15.0 to 50.0)	100	5.0	8.6 (0.34)	29.0 (1.14)	15.0 (0.59)	8.9 (0.35)	71.1 (2.80)	9.9 (0.39)
			Permanent Set					
			1.3 (0.05)	2.5 (0.10)	1.5 (0.06)	2.0 (0.08)	7.1 (0.28)	1.8 (0.07)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)					
			#1	#2	#3	#4	#5	#6
720 to 2400 (15.0 to 50.0)	50	4.0	10.2 (0.40)	30.5 (1.20)	12.2 (0.48)	10.4 (0.41)	70.6 (2.78)	12.2 (0.48)
1200 to 1920 (25.0 to 40.0)	1050	3.3	9.9 (0.39)	27.4 (1.08)	11.7 (0.46)	9.7 (0.38)	61.7 (2.43)	11.9 (0.47)
0 to 1440 (0 to 30.0)	50	4.0	9.7 (0.38)	21.3 (0.84)	10.7 (0.42)	8.1 (0.32)	47.8 (1.88)	10.7 (0.42)
480 to 1200 (10.0 to 25.0)	3350	3.6	10.4 (0.41)	20.8 (0.82)	12.2 (0.48)	8.6 (0.34)	46.2 (1.82)	11.9 (0.47)
			Permanent Set					
			7.6 (0.30)	6.6 (0.26)	8.6 (0.34)	5.1 (0.20)	12.2 (0.48)	9.1 (0.36)

***Observations**: No additional damage.*

Result: Pass

***Note**: See Architectural Testing Sketch #2 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 Fir

Timing Device: Electronic Beam Type

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

Deflection Measuring Device: Linear transducers

Tape and film were not used to seal against air leakage during structural testing.

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
Joseph A. Reed, P.E.	Architectural Testing, Inc.
Russell W. Clark	Architectural Testing, Inc.

This report is reissued in the name of Fleetwood Windows and Doors through written authorization of Northshore Window and Door to whom the original report was rendered. The original Northshore Window and Door Report No. is 87274.01-109-44.

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 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: Russell Clark

Russell W. Clark
Technician

Digitally Signed by: Joseph A. Reed

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

RWC:dem

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix-A: Sketches (2)

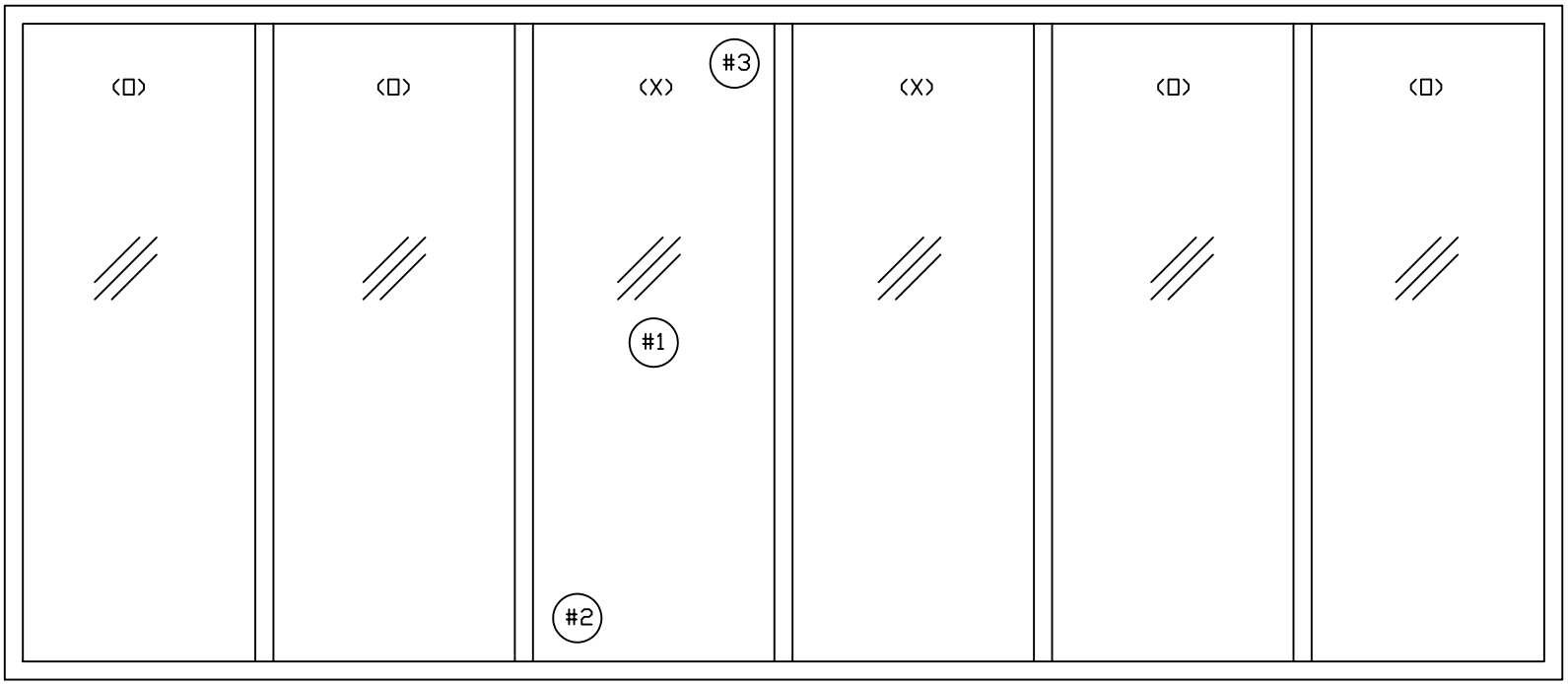
Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	04/03/09	N/A	Original report issue – Reissued Report No. 87274.01-109-44 in the name of Fleetwood Windows and Doors

Appendix A

Sketches

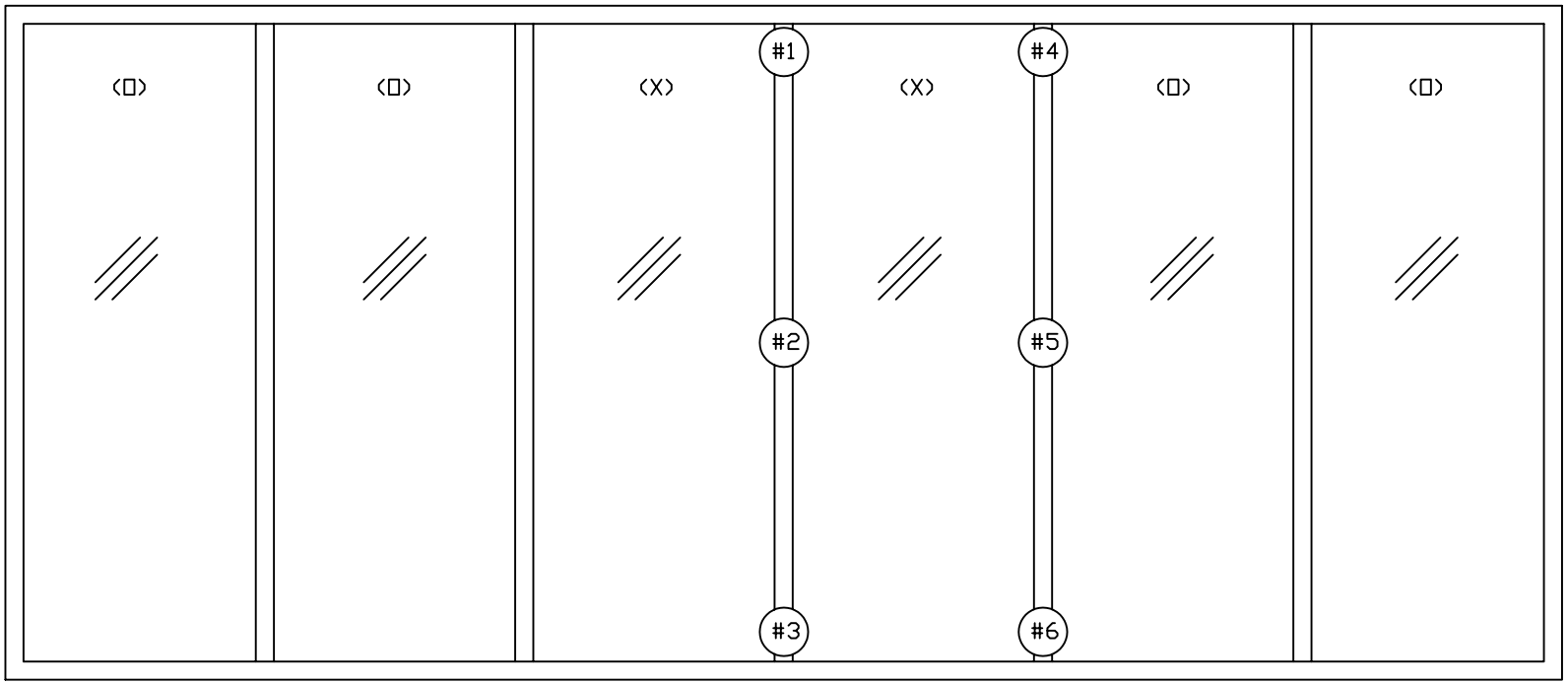
REV	DATE	DESCRIPTION	BY



IMPACT LOCATIONS

PROJECT NO. 87274.01 109-44	PROJECT NAME: Sliding Door - ASTM E 1886/1996 CLIENT: Northshore Window and Door	Architectural Testing	DRAWING: Sketch #1(Impacts)	DWG. BY: TJM DATE: 1/13/09	SHEET 1 OF 1

REV	DATE	DESCRIPTION	BY



INDICATOR LOCATIONS

PROJECT NO. 87274.01 109-44	PROJECT NAME: Sliding Door - ASTM E 1886/1996 CLIENT: Northshore Window and Door	Architectural Testing	DRAWING Sketch #2 (Indicators)	DWG. BY: TJM DATE: 1/13/09	SHEET 1 OF 1