

**ASTM E 1886 and ASTM E 1996
TEST REPORT**

Rendered to:

FLEETWOOD WINDOWS AND DOORS

SERIES/MODEL: Kona 3800

PRODUCT TYPE: Aluminum Fixed Window

Report No.: 87278.02-109-44
Test Date: 12/08/08
And: 12/09/08
Report Date: 04/03/09
Expiration Date: 12/09/12

ASTM E 1886 and ASTM E 1996 TEST REPORT

Rendered to:

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

Report No.: 87278.02-109-44
Test Date: 12/08/08
And: 12/09/08
Report Date: 04/03/09
Expiration Date: 12/09/12

Project Summary: Architectural Testing, Inc. was contracted by Northshore Window and Door to perform testing on three Series/Model Kona 3800, aluminum fixed windows. The samples tested met the performance requirements set forth in the referenced test procedures for a ± 2393 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. 87278.01-109-44. 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: Kona 3800

Product Type: Aluminum Fixed Window

Overall Size: 1226 mm (48-1/4") wide by 2743 mm (108") high

Fixed Daylight Opening Size: 1156 mm (45-1/2") wide by 2667 mm (105") high

Test Specimen Description: (Continued)

Finish: Anodized aluminum.

Glazing Details: The unit was glazed with 1" thick insulating glass constructed of a sheet of 3/16" thick tempered glass outboard, a sheet of 7/16" thick laminated glass inboard and an aluminum spacer system. The laminated glass was comprised of two sheets of 3/16" thick clear annealed glass and a 0.090" thick DuPont SentryGlas® Plus interlayer. The glass was set from the exterior onto a hollow rubber gasket and secured with a snap-fit aluminum glazing bead with a hollow rubber gasket against the glass.

Frame Construction: The frame was constructed from thermally improved extruded aluminum. The corners were coped, butted, sealed, and secured with three #10 x 1" pan head screws per corner.

Drainage:

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
1" wide by 3/16" high weepslot	2	4" from ends of sill face

Reinforcement: No reinforcement was utilized.

Installation: The window was installed into a Spruce-Pine-Fir wood buck. The window was secured through the head, sill, and jambs with #10 x 3" flat head screws, located 4" from all corners and spaced 24" on center through the jambs and spaced 17" on center through the head and sill. The sill was set onto an aluminum sill receptor. The exterior perimeter was sealed with Grace Vycor® flashing tape.

Test Results: The following results have been recorded:

ASTM E 1886, *Large Missile Impact*

Conditioning Temperature: 20.6°C (69°F)

Missile Weight: 4196 g (9.25 lbs)

Missile Length: 2.4 m (7' 10-1/16")

Muzzle Distance from Test Specimen: 5.2 m (17 ft.)

Test Unit #1

Impact #1: Missile Velocity: 15.5 m/s (50.8 fps); orientation within $\pm 5^\circ$ of horizontal

Impact Area: Center of glass

Observations: Missile hit target area, fractured glass, no penetration.

Results: Pass

Test Unit #2

Impact #1: Missile Velocity: 15.2 m/s (50.0 fps); orientation within $\pm 5^\circ$ of horizontal

Impact Area: Lower left corner of glass

Observations: Missile hit target area, fractured glass, no penetration.

Results: Pass

Test Unit #3

Impact #1: Missile Velocity: 15.3 m/s (50.1 fps); orientation within $\pm 5^\circ$ of horizontal

Impact Area: Top right corner of glass

Observations: Missile hit target area, fractured 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: ± 2393 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
479 to 1196 (10.0 to 25.0)	3500	2.41	1.0 (0.04)	1.3 (0.05)	1.0 (0.04)
0 to 1435 (0 to 30.0)	300	2.56	1.3 (0.05)	1.5 (0.06)	1.3 (0.05)
1196 to 1914 (25.0 to 40.0)	600	2.52	1.5 (0.06)	1.5 (0.06)	1.8 (0.07)
717 to 2393 (15.0 to 50.0)	100	2.77	1.8 (0.07)	2.0 (0.08)	1.8 (0.07)
			Permanent Set		
			0.3 (0.01)	0.8 (0.03)	0.5 (0.02)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
717 to 2393 (15.0 to 50.0)	50	2.68	2.5 (0.10)	2.5 (0.10)	2.3 (0.09)
1196 to 1914 (25.0 to 40.0)	1050	3.17	2.3 (0.09)	2.3 (0.09)	2.3 (0.09)
0 to 1435 (0 to 30.0)	50	2.72	2.0 (0.08)	2.0 (0.08)	2.0 (0.08)
479 to 1196 (10.0 to 25.0)	3350	2.32	2.8 (0.11)	2.8 (0.11)	2.0 (0.08)
			Permanent Set		
			1.5 (0.06)	1.5 (0.06)	1.3 (0.05)

Observations: After cycling, no additional damage or penetration was observed.

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: ± 2393 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
479 to 1196 (10.0 to 25.0)	3500	2.41	1.0 (0.04)	1.0 (0.04)	1.0 (0.04)
0 to 1435 (0 to 30.0)	300	2.56	1.3 (0.05)	1.3 (0.05)	1.0 (0.04)
1196 to 1914 (25.0 to 40.0)	600	2.52	1.8 (0.07)	1.5 (0.06)	1.5 (0.06)
717 to 2393 (15.0 to 50.0)	100	2.77	1.8 (0.07)	1.8 (0.07)	1.8 (0.07)
			Permanent Set		
			0.5 (0.02)	0.5 (0.02)	0.5 (0.02)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
717 to 2393 (15.0 to 50.0)	50	2.68	2.0 (0.08)	2.5 (0.10)	2.5 (0.10)
1196 to 1914 (25.0 to 40.0)	1050	3.13	1.8 (0.07)	2.3 (0.09)	2.3 (0.09)
0 to 1435 (0 to 30.0)	50	2.72	1.3 (0.05)	2.0 (0.08)	2.0 (0.08)
479 to 1196 (10.0 to 25.0)	3350	2.32	1.0 (0.04)	2.0 (0.08)	1.0 (0.04)
			Permanent Set		
			1.0 (0.04)	1.5 (0.06)	1.0 (0.04)

Observations: After cycling, no additional damage or penetration was observed.

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: ± 2393 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
479 to 1196 (10.0 to 25.0)	3500	2.26	1.3 (0.05)	1.5 (0.06)	1.5 (0.06)
0 to 1435 (0 to 30.0)	300	2.77	1.8 (0.07)	1.8 (0.07)	2.0 (0.08)
1196 to 1914 (25.0 to 40.0)	600	2.39	2.0 (0.08)	2.3 (0.09)	2.0 (0.08)
717 to 2393 (15.0 to 50.0)	100	2.87	3.0 (0.12)	3.3 (0.13)	3.3 (0.13)
			Permanent Set		
			1.5 (0.06)	1.8 (0.07)	1.5 (0.06)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inch)		
			#1	#2	#3
717 to 2393 (15.0 to 50.0)	50	2.08	2.5 (0.10)	2.5 (0.10)	2.3 (0.09)
1196 to 1914 (25.0 to 40.0)	1050	2.15	2.3 (0.09)	2.3 (0.09)	2.0 (0.08)
0 to 1435 (0 to 30.0)	50	2.92	2.0 (0.08)	2.0 (0.08)	1.8 (0.07)
479 to 1196 (10.0 to 25.0)	3350	1.27	1.8 (0.07)	1.5 (0.06)	1.5 (0.06)
			Permanent Set		
			1.0 (0.04)	1.0 (0.04)	1.0 (0.04)

Observations: After cycling, no additional damage or penetration was observed.

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:

Canon: 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: 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.
Jeremy R. Bender

Architectural Testing, Inc.
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 87278.01-109-44.

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.

Jeremy R. Bender
Technician

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

JRB:vlm/dem

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

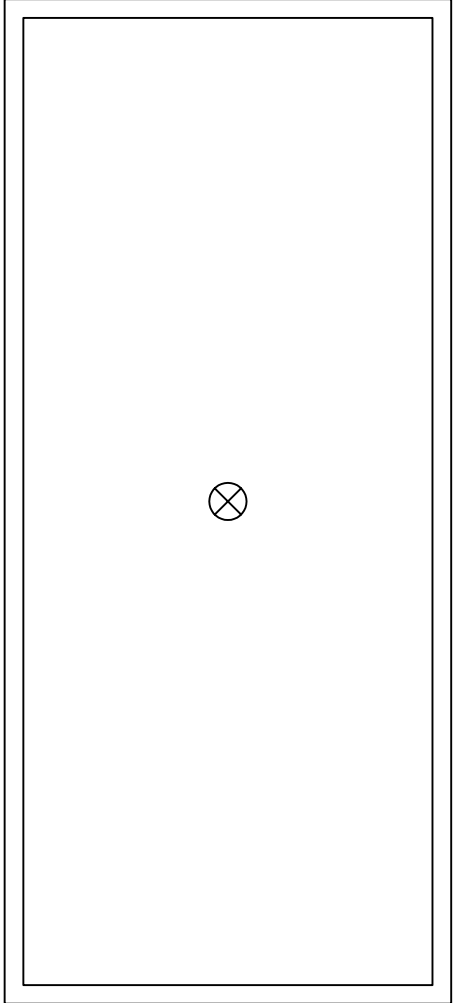
Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	04/03/09	N/A	Original report issue – Reissued Report No. 87278.01-109-44 in the name of Fleetwood Windows and Doors

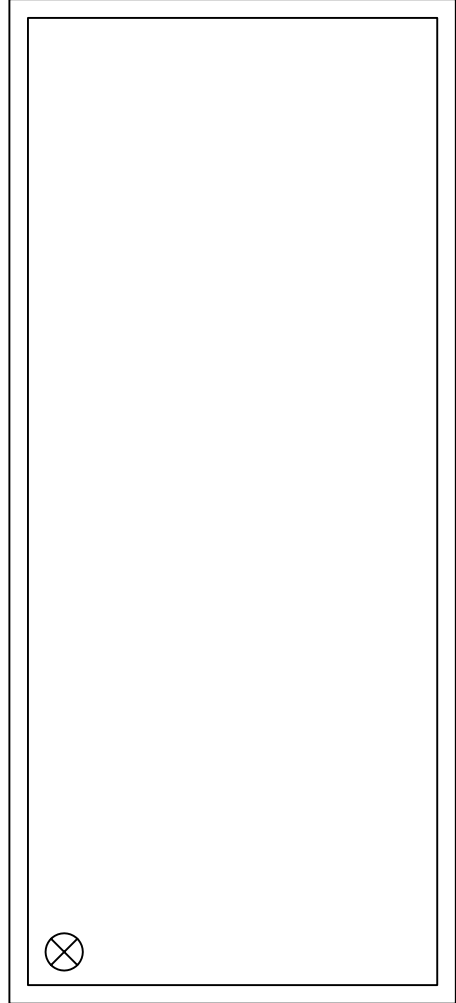
Appendix A

Sketches

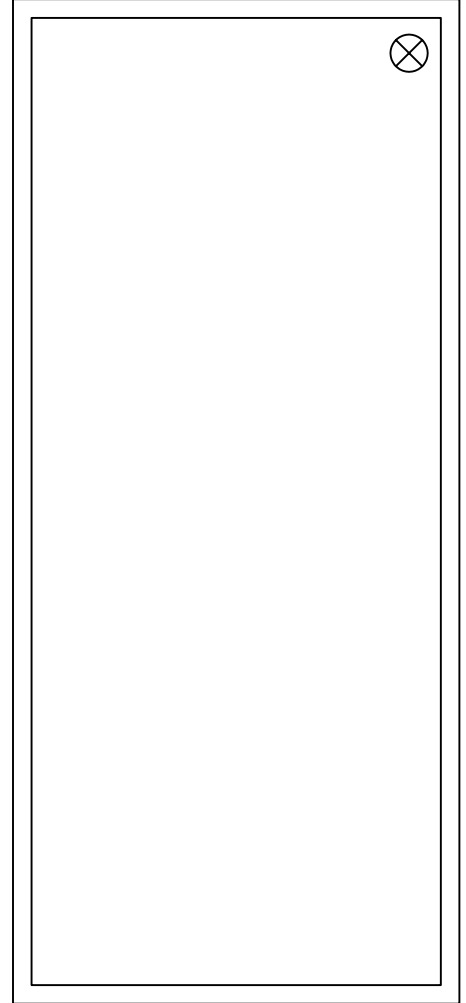
REV	DATE	DESCRIPTION	BY



Specimen #1



Specimen #2



Specimen #3

⊗ - Denotes Impact Location

PROJECT NO.
87278.01
109-44

PROJECT NAME: Kona 3800 Fixed Window
CLIENT: Northshore Window and Door

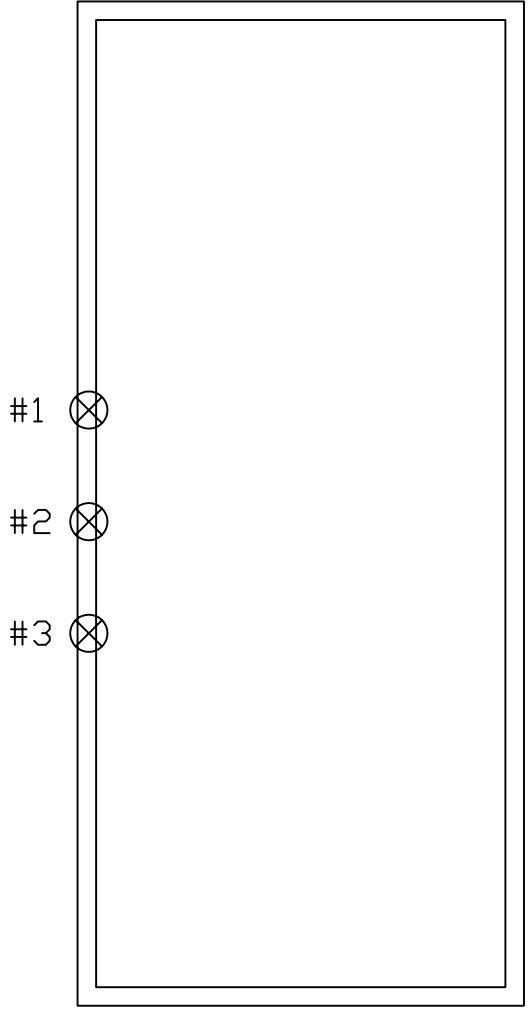


DRAWING
Sketch #1 - Impact Locations

DWG. BY:
MDS
DATE:
02/11/09

SHEET
1 OF
1

REV	DATE	DESCRIPTION	BY



⊗ - Denotes Indicator Location

PROJECT NO.
87278.01
109-44

PROJECT NAME: Kona 3800 Fixed Window
CLIENT: Northshore Window and Door



DRAWING
Sketch #2 - Indicator Locations

DWG. BY:
MDS
DATE:
02/11/09

SHEET
1 OF
1