



ASTM E 1886 and ASTM E 1996
TEST REPORT

Rendered to:

VEKA INC.

SERIES/MODEL: DH30, DH31, DH32, DH34, DH35
DH36, DH56 and DH72
PRODUCT TYPE: PVC Double Hung Window

Report No.: 65638-01-109-44
Revision 1: 09/29/06
Test Dates: 06/12/06
Through: 08/08/06
Report Date: 09/06/06
Expiration Date: 08/08/10

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
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www.archtest.com



Architectural Testing

ASTM E 1886 and ASTM E 1996 TEST REPORT

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VEKA INC.
100 Veka Drive
P.O. Box 250
Fombell, Pennsylvania 16123

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Project Summary: Architectural Testing, Inc. (ATI) was contracted by Veka Inc. to perform testing on three Series/Model DH30, DH31, DH32, DH34, DH35, DH36, DH56, DH72, PVC double hung windows. The samples tested met the performance requirements set forth in the referenced test procedures for a ± 50.0 psf Design Pressure with missile impacts corresponding to Missile Level D and Wind Zone 3. Test specimen description and results are reported herein.

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

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: DH30, DH31, DH32, DH34, DH35, DH36, DH56 and DH72

Product Type: PVC Double Hung Window

Overall Size: 54" wide by 76" high

Sash Size: 52" wide by 38" high

Finish: All PVC was white.

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Test Specimen Description: (Continued)

Glazing Details: The unit was glazed with 1" insulating glass fabricated from one sheet of 1/8" thick clear annealed glass outboard, a sheet of 3/8" laminated glass inboard and an aluminum spacer system. The laminated glass was comprised of two sheets of 1/8" thick clear annealed glass and a 0.090" thick PVB Solutia Saflex glass interlayer. The glass was set from the exterior onto a bed of silicone and secured with PVC snap-in glazing beads.

Weatherstripping:

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
0.187" backed by 0.280" high pile with center fin	2 Rows	All stiles, top rail and bottom rail
0.187" backed by 0.280" high pile with center fin	1 Row	Interior and exterior meeting rails

Frame Construction: The PVC frame was constructed using mitered and welded corner construction. A snap-in rigid PVC adapter was located at the head. The sill utilized an extruded aluminum sill extender, secured with three #10 x 2" pan head screws, 3" from each end and midspan.

Sash Construction: The PVC sash was assembled utilizing mitered and welded corner construction.

Hardware:

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
Metal cam locks with metal keepers	2	Interior meeting rail, 8" from each end, keepers on the exterior meeting rail
Plastic spring loaded tilt latches	2	Each end of top rail
Metal spring loaded tilt latches	2	Each end of interior meeting rail
Metal sash tilt pins	4	Bottom corners of each sash

Reinforcement: Custom shaped steel reinforcement was utilized in the exterior sash stiles, top rail, and the exterior meeting rail (Drawing #RF 3001 SO M), interior sash stiles and interior meeting rail (Drawing #RF 3101 SO M).

Test Specimen Description: (Continued)

Installation: The unit was installed into a Spruce-Pine-Fir wood buck. The unit was secured through the jambs, head, and sill with #8 x 1-1/4" pan head screws 8" on center. The perimeter was sealed with silicone.

Test Results: The following results have been recorded:

ASTM E 1886, Large Missile Impact

Conditioning Temperature: 82°F
Missile Weight: 17.0 lbs.
Missile Length: 8 ft.
Muzzle Distance from Test Specimen: 17 ft.

Test Unit #1

Impact #1: Missile Velocity: 49.9 fps; orientation within $\pm 5^\circ$ of vertical

Impact Area: Center of glass, bottom sash

Observations: Impacted target area, fractured interior laminated lite, broke exterior annealed glass.

Results: Pass

Test Unit #2

Impact #1: Missile Velocity: 50.6 fps; orientation within $\pm 5^\circ$ of vertical

Impact Area: Top right corner of bottom sash

Observations: Impacted target area, fractured interior laminated lite, broke exterior annealed glass.

Results: Pass

Test Unit #3

Impact #1: Missile Velocity: 50.0 fps; orientation within $\pm 5^\circ$ of vertical

Impact Area: Lower left corner of bottom sash

Observations: Impacted target area, fractured interior laminated lite, broke exterior annealed glass.

Results: Pass

Note: See ATI Sketch #1 for impact locations

Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #1

Design Pressure: ± 50.0 psf

POSITIVE PRESSURE

Pressure Range (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator (inch)		
			#1	#2	#3
10.0 to 25.0	3500	1.95	0.31	0.72	0.28
0.0 to 30.0	300	2.94	0.35	0.75	0.32
25.0 to 40.0	600	2.81	0.55	0.85	0.81
15.0 to 50.0	100	2.24	0.68	1.09	0.83
			Permanent Set		
			0.08	0.32	0.10

NEGATIVE PRESSURE

Pressure Range (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator (inch)		
			#1	#2	#3
15.0 to 50.0	50	2.19	0.62	1.02	0.50
25.0 to 40.0	1050	2.12	0.58	0.87	0.48
0.0 to 30.0	50	2.01	0.48	0.62	0.38
10.0 to 25.0	3350	1.92	0.43	0.53	0.35
			Permanent Set		
			0.20	0.07	0.20

Observations: *No damage to unit.*

Result: Pass

Note: *See ATI Sketch #2 for indicator locations.*

Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #2

Design Pressure: ± 50.0 psf

POSITIVE PRESSURE

Pressure Range (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator (inch)		
			#1	#2	#3
10.0 to 25.0	3500	1.92	0.29	0.64	0.27
0.0 to 30.0	300	2.41	0.31	0.70	0.29
25.0 to 40.0	600	2.19	0.40	0.88	0.36
15.0 to 50.0	100	2.15	0.48	1.12	0.43
			Permanent Set		
			0.13	0.19	0.13

NEGATIVE PRESSURE

Pressure Range (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator (inch)		
			#1	#2	#3
15.0 to 50.0	50	2.21	0.62	1.25	0.59
25.0 to 40.0	1050	2.12	0.55	1.00	0.54
0.0 to 30.0	50	2.20	0.48	0.78	0.45
10.0 to 25.0	3350	2.05	0.43	0.68	0.41
			Permanent Set		
			0.21	0.20	0.24

Observations: *No damage to unit.*

Result: Pass

Note: *See ATI Sketch #2 for indicator locations.*

Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #3

Design Pressure: ± 50.0 psf

POSITIVE PRESSURE

Pressure Range (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator (inch)		
			#1	#2	#3
10.0 to 25.0	3500	2.01	0.50	0.50	0.70
0.0 to 30.0	300	2.73	0.41	0.72	0.72
25.0 to 40.0	600	2.01	0.49	0.81	0.79
15.0 to 50.0	100	2.11	0.57	0.98	0.88
			Permanent Set		
			0.14	0.06	0.08

NEGATIVE PRESSURE

Pressure Range (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator (inch)		
			#1	#2	#3
15.0 to 50.0	50	2.16	0.68	1.10	0.77
25.0 to 40.0	1050	2.09	0.62	0.85	0.54
0.0 to 30.0	50	2.08	0.54	0.67	0.49
10.0 to 25.0	3350	2.01	0.41	0.52	0.32
			Permanent Set		
			0.28	0.12	0.27

Observations: No damage to unit.

Result: Pass

Note: See ATI 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 missiles

Missiles: 2x4 Southern Pine

Timing Device: Electronic Beam Type

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

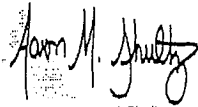
Deflection Measuring Device: 1" dial indicators

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 attached drawings have been checked by ATI, and are representative of the samples tested.

Detailed drawings, representative samples of the test specimen, and a copy of this report will be retained by ATI for a period of four years from the original test date. This report is the exclusive property of the client so named herein and is applicable to the sample tested. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report may not be reproduced, except in full, without the approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.



Digitally Signed by: Aaron M. Shultz

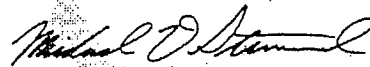
Aaron M. Shultz
Technician

AMS:vlm/tla

Attachments (pages):

Appendix-A: ATI Sketches (2)

Appendix-B: Drawings (14)



Digitally Signed by: Michael D. Stremmel

Michael D. Stremmel, P.E.
Senior Project Engineer

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	09/06/06	N/A	Original report issue
1	09/29/06	Cover Page, Page 1	Change Series/Model