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Through: June 22, 2012

STRUCTURAL PERFORMANCE TEST REPORT

Test Requested By: Deceuninck North America, LLC
351 North Garver Road
Monroe, Ohio 45050

Product Type and Series: Series 143.191CA-008 Vinyl NC (Fin) Frame Impact Casement Window (37" x 76")

Tests Conducted: TAS 201 (Large Missile), TAS 202, and TAS 203

TEST SPECIMEN

Design Pressure: All Specimens- Vinyl NC (Fin) Frame Casement Window + 70.0 psf. - 70.0 psf

Overall Size: All Specimens- 37" wide x 76" high

Configuration: All Specimens- One (1) Operable Sash (X)

No. & Size of Sash: All Specimens- (1) Active Sash 35.250" wide x 74.250" high

Frame and Sash Material: Extruded vinyl
All Specimens

Frame Construction: The extruded vinyl NC (fin) frame measured 37" wide x 76" high buck opening overall with a 1.000" integral fin. The NC (Fin) frame head, sill and jambs were constructed of extruded vinyl and utilized mitered and welded corner construction. The vinyl frame head and sill measured 3.250" wide x 2.461" high. The vinyl frame jambs measured 3.250" wide x 2.461" high. Reference drawing # (10008052-SH).
All Specimens

Sash Construction: One (1) active sash measured 35.250" wide x 74.250" high overall. The sash was constructed of extruded vinyl and utilized mitered and welded corner construction. The vinyl sash stiles and rails measured 2.647" wide x 1.627" high. Reference drawing # (10005491-SH).
All Specimens



Glazing: 3/4" overall laminated glass consisting of the following: One (1) exterior piece of .156" annealed glass / one (1) .270" spacer system (as stated by manufacturer) One (1) interior piece of .125" annealed glass / .075" laminate by Solutia / One (1) interior piece of .125" annealed glass. (reference drawing #3/4" I.G, ANN, .075" LAMI, 5/32 SAC.). Exterior glazed with an adhesive back bedding compound Sikaflex-552® as stated by the manufacturer. The glazing utilized an extruded vinyl slide-in glazing bead around the exterior perimeter measuring .195" wide x .570" high overall with a .625" glass bite. (refer to drawing #10005470-SH).

Daylight Opening: All Specimens Operable sash- (32.062" wide x 71.062" high)

Weather-stripping: All Specimens

Description	Quantity	Location
0.190" diameter vinyl bulb	Four (4) rows	One (1) per sash stiles and rails interior perimeter
0.395" high vinyl flap	Eight (8) rows	Two (2) per sash stiles and rails exterior perimeter

Hardware: All Specimens

Description	Quantity	Location
Truth Hinged Dual Arm Operator Right hand operator	One (1)	9.000" c/l from corner of frame sill
Maxim Multi-point lock bar with four (4) Keeper locking points Lock assy. Part #24-33 Keeper part# 32687.92/LH Tie bar guide part# 32933.00.001	One (1)	9.000" c/l from corner of frame lock jamb. Keepers located on sash lock stile at 4", 24", 45" and 65" measuring from sash bottom rail to sash top rail.
(1.500") long aluminum impact snubber. Sash snubber dwg.# 10300094. Frame snubber dwg. # 10300095.	Four (4)	Located at 14", 29", 45 and 60" on frame hinge jamb with adjacent snubbers on hinge stile.

Weep-holes: N/A

Reinforcement: Two (2) free floating 6063-T5 extruded aluminum reinforcements were utilized in the active sash stiles and rails. One (1) located at the exterior leg of the sash stiles and rails and measured .718" wide x .915" high. Reference drawing # (10500006-A). One (1) located at the interior leg of the sash stiles and measured .820" wide x .320" high. Reference drawing # (10300091). One (1) extruded aluminum reinforcement was utilized at each frame jamb and measured .734" wide x .327" high. Each reinforcement was free floating/inserted into the cavity of the stiles, rails and frame jambs. Reference drawing # (10300091).

Sealant: 100% Silicone (as stated by the manufacturer) caulking was used to seal the test units to the wood bucks.



Additional Description: Tested in a 2” x 10” S.P.F. wood test buck with a 2” x 4” wood sub frame.
 All Specimens

Installation: The windows were installed in wood test buck as described above utilizing
 All Specimens eighteen (18) #8 x 1.500” Phillips P.H. S.M.S. Six (6) in each frame jamb located
 at 6.500”, 19.250”, 31.000”, 45.250”, 58.250” and 70.000” measuring from frame
 sill to frame head. Three (3) in each frame head and sill located at 6.000”, 18.000”
 and 31.000” measuring from left jamb to right jamb.

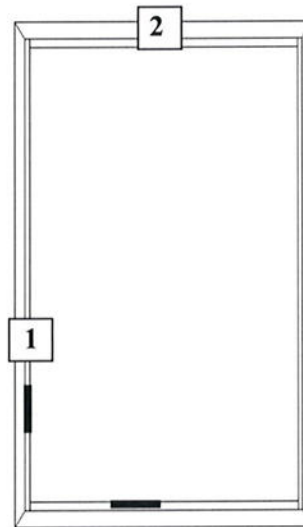
Performance Test Results

Specimen 1

Test Sequence TAS 202-94

1. Air Infiltration
2. Water Infiltration
3. ½ Test Pressure Positive
4. ½ Test Pressure Negative
5. Design Pressure Positive
6. Design Pressure Negative
7. Full Test pressure Positive
8. Full Test Pressure Negative
9. Forced Entry Resistance

Measurement Locations



Deflection / Permanent Set were measured with two (2) Mitutoyo dial indicators SN- mky019, and SN - mtj695
 Measurements were taken at:

- Location 1 Longest unsupported span between the keepers on the sash side like stile
 (18” x 0.004” = 0.072”allowable)
- Location 2 Longest unsupported span between the keepers on the sash bottom rail.
 (35.25” x 0.004” = 0.141”allowable)

Air Infiltration Test: Specimen 1

Air Infiltration Tests were conducted in accordance with **DCBCCD TAS 202-94**

@ 1.57 psf	<u>Actual</u>	<u>Allowable</u>
	0.06 CFM/FT ²	0.34 CFM/FT ²

Water Infiltration Test: Specimen 1

Water Infiltration Test was conducted in accordance with **DCBCCD TAS 202-94**

Water @ 12 psf. 15 min. duration Result: Passed

No water penetration was observed

The specimen was tested with and without an insect screen installed.



Performance Test Results: Cont.
Specimen 1

<u>Paragraph #</u>	<u>Title of Test</u>	<u>Test Method</u>	<u>Measured</u>
10.2.2	Forced Entry Resistance Type "B" Window	ASTM F588-97 10.2.2. Test B	Passed
10.1	Lock Manipulation Test: Type "B" Window	ASTM F588-97 T ₁ = 10 minutes	Passed

Uniform Structural Load Test
Static Tests were conducted in accordance with DCBCCD TAS 202-94
Specimen 1

<u>Range of Test</u>	<u>Time</u>	<u>Actual Load (psf.)</u>	<u>Deflection</u>	<u>Perm. Set</u>	<u>Allowable</u>
Positive loads +70psf					
1/2 Test	30 (seconds)	52.5			
Design	30 (seconds)	70.0	Loc 1	0.242"	0.011"
			Loc 2	0.278"	0.032"
Test	30 (seconds)	105.0	Loc 1	0.019"	0.072"
			Loc 2	0.066"	0.141"
Negative loads -70psf					
1/2 Test	30 (seconds)	52.5			
Design	30 (seconds)	70.0	Loc 1	0.570"	0.042"
			Loc 2	0.680"	0.016"
Test	30 (seconds)	105.0	Loc 1	0.071"	0.072"
			Loc 2	0.044"	0.141"

Location (1) - Max. Allowable Perm. Set after test load at the longest unsupported span between the keepers on the sash side lock stile (0.4% of 530mm (18.000") span) = 2.1mm (0.072")

Location (2) - Max. Allowable Perm. Set after test load at the longest unsupported span between the keepers on the sash top lock rail (0.4% of 584mm (35.250") span) = 2.3mm (0.141")



Performance Test Results: Cont.

Impact Test: Large Missile

Impact tests were conducted in accordance with **DCBCCD TAS 201-94**

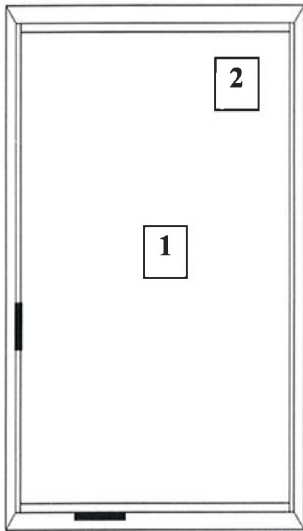
Each specimen was impacted with an 8 ft., 9 lb. Southern yellow pine 50mm x 100mm (2" x 4") at the following locations:

Note: Specimens 2, 3, & 4

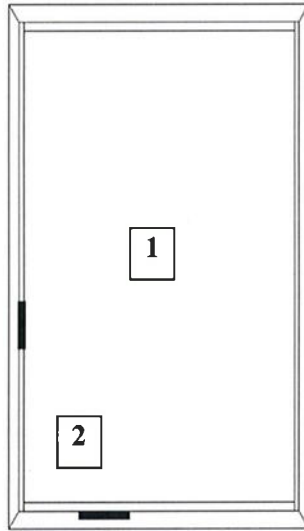
X measurement from left edge of specimen.

Y measurement from top edge of test specimen.

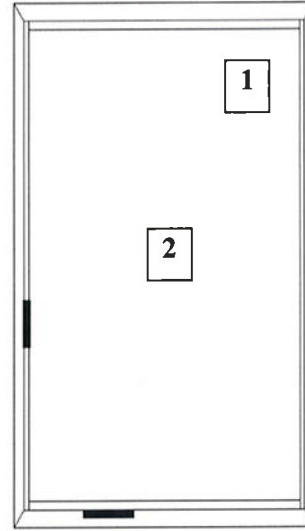
Specimen 2



Specimen 3



Specimen 4



Large Missile Impact Test Results TAS-201 :

Specimen 2

Impact No.	Speed ft/sec.	X Meas.	Y Meas.
1.	50.2	17.500"	37.500"
2.	50.3	28.000"	9.500"

Specimen 3

Impact No.	Speed ft/sec.	X Meas.	Y Meas.
1.	50.1	18.000"	37.000"
2.	50.0	10.000"	67.000"

Specimen 4

Impact No.	Speed ft/sec.	X Meas.	Y Meas.
1.	50.3	28.500"	9.000"
2.	50.1	17.000"	36.500"



Results: All specimens tested resisted the large missile impact, without penetration of the inner plane of the glazing. With no tear forming longer than 5" or no opening through which a 3" diameter solid sphere could freely pass.

Performance Test Results: Cont.
Fatigue Loading Test (TAS 203)
Specimen 2, 3, and 4:

Cycle tests were conducted in accordance with DCBCCD TAS 203-94

Specimen 2:

(Design Pressure) +70.0 psf., - 70.0 psf.

Positive loads

<u>Range of Test</u>	<u>Actual Load (psf.)</u>		<u># of Cycles</u>	<u>Cycles/min.</u>
0.2 – 0.5	14.0	35.0	3500	55
0.0 – 0.6	0.0	42.0	300	55
0.5 – 0.8	35.0	56.0	600	55
0.3 – 1.0	21.0	70.0	100	55

Deflection taken center mid-span

Deflection
 1.125"

Set
 0.125"

Negative loads

<u>Range of Test</u>	<u>Actual Load (psf.)</u>		<u># of Cycles</u>	<u>Cycles/min.</u>
0.3 – 1.0	21.0	70.0	50	55
0.5 – 0.8	35.0	56.0	1050	55
0.0 – 0.6	0.0	42.0	50	55
0.2 – 0.5	14.0	35.0	3350	55

Deflection taken center mid-span

Deflection
 2.750"

Set
 0.250"

9000 cycles completed

Specimen showed no resultant failure after cycle test.

Specimen 3:

(Design Pressure) +70.0 psf., - 70.0 psf.

Positive loads

<u>Range of Test</u>	<u>Actual Load (psf.)</u>		<u># of Cycles</u>	<u>Cycles/min.</u>
0.2 – 0.5	14.0	35.0	3500	55
0.0 – 0.6	0.0	42.0	300	55
0.5 – 0.8	35.0	56.0	600	55
0.3 – 1.0	21.0	70.0	100	55

Deflection taken center mid-span

Deflection
 1.250"

Set
 0.250"

Negative loads

<u>Range of Test</u>	<u>Actual Load (psf.)</u>		<u># of Cycles</u>	<u>Cycles/min.</u>
0.3 – 1.0	21.0	70.0	50	55
0.5 – 0.8	35.0	56.0	1050	55
0.0 – 0.6	0.0	42.0	50	55
0.2 – 0.5	14.0	35.0	3350	55

Deflection taken center mid-span

Deflection
 2.500"

Set
 0.375"

9000 cycles completed

Specimen showed no resultant failure after cycle test.



Performance Test Results: Cont.

Fatigue Loading Test (TAS 203)

Specimen 4:

(Design Pressure) +70.0 psf., - 70.0 psf.

Positive loads

<u>Range of Test</u>	<u>Actual Load (psf.)</u>		<u># of Cycles</u>	<u>Cycles/min.</u>
0.2 – 0.5	14.0	35.0	3500	55
0.0 – 0.6	0.0	42.0	300	55
0.5 – 0.8	35.0	56.0	600	55
0.3 – 1.0	21.0	70.0	100	55

Deflection taken center mid-span

<u>Deflection</u>	<u>Set</u>
1.125"	0.125"

Negative loads

<u>Range of Test</u>	<u>Actual Load (psf.)</u>		<u># of Cycles</u>	<u>Cycles/min.</u>
0.3 – 1.0	21.0	70.0	50	55
0.5 – 0.8	35.0	56.0	1050	55
0.0 – 0.6	0.0	42.0	50	55
0.2 – 0.5	14.0	35.0	3350	55

Deflection taken center mid-span

<u>Deflection</u>	<u>Set</u>
2.625"	0.250"

9000 cycles completed

Specimen showed no resultant failure after cycle test.

Results: All specimens tested resisted the large missile impact, without penetration of the inner plane of the glazing. With no tear forming longer than 5" or no opening through which a 3" diameter solid sphere could freely pass.

Comment: Nominal 2-mil polyethylene film was used to seal against air leakage during structural loads. The film was used in a manner that did not influence the test results.

Note: The windows were operable at the end of cycle test.



Remarks: Detail drawings were available for laboratory records and comparison to the test specimen at the time of this report. A copy of this report along with representative sections of the test specimen will be retained by Element Materials Technology for a period of ten (10) years. The results obtained apply only to the specimen tested.

This test report does not constitute certification of this product, but only the above test results were obtained using the designated test methods and they indicate compliance with the performance requirements (paragraphs as listed) of the above referenced specifications.

Element Materials Technology assumed that all information provided by the client is accurate and that the physical and chemical properties of the components are as stated by the manufacturer.

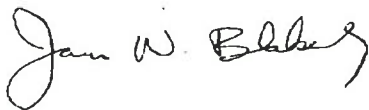
Element Materials Technology

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Washington Romero Element Materials Technology

Client Present:

Dennis Cox Deceuninck NA



James Blakely
Operations Manager
Element Materials Technology

cc: Deceuninck NA (2)
Dade Co (2)
Ramesh Patel P.E. (1)
File (1)

