



AAMA 506-08 IMPACT, CYCLIC, AND PERFORMANCE TESTING
SHOWCASE CUSTOM VINYL WINDOW AND DOORS
A PRODUCT OF ENLIGHT INDUSTRIES
 SERIES 200 PVC TILT SINGLE HUNG WINDOW
 REPORT #CCLI-09-163

August 28, 2009
 Expires: August 25, 2013

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APPENDIX

APPENDIX A: SERIES 200 PVC TILT SINGLE HUNG WINDOW DRAWINGS

Refer to Mock-Up drawings in **Appendix A**, this report is not complete unless this drawing is stamped and initialed by **CCLI** as illustrated below.

DRAWING	PART #	DATE	STAMPED AS ILLUSTRATED
Layout Detail			 CONSTRUCTION CONSULTING LABORATORY, INTERNATIONAL 1601 Luna Road Carrollton, Texas 75006 Phone (972) 242-0556
Bill of Materials			
Installation			
Frame Members	601-0002	5/31/07	
Fixed Interlock	601-0001	5/25/07	
Sash Top Rail	601-0006	6/5/07	
Sash Stile	601-0003	5/31/07	
Sash Bottom Rail	601-0004	5/31/07	
Fixed Interlock Reinforcement	602-0001	5/31/07	
Sash Reinforcement	602-0007	5/2/08	
Sill Filler Profile	601-0010-R1	5/31/07	
Sill Filler Profile	601-0010-R2	5/31/07	



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1. PROJECT DATA

Project: AAMA/WDMA/CSA 101/I.S.2/A440-05 Performance Testing

Date of Testing: August 25, 2009

Tested For: Enlight Industries Office: (713) 926-8500
 4902 Gulf Frwy
 Houston, TX 77023

Witnessed By: (All or Partial Viewing)

Ron Harmon Enlightenment Industries
 Chevis Wilson Construction Consulting Laboratory, *International*

2. SCOPE

This report presents the performance results of Enlightenment Industries Series 200 PVC Tilt Single Hung Window. Tests were conducted at Construction Consulting Laboratory, *International* (CCLI) testing facility in Carrollton, TX. Tests were conducted in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-05 test specification and the specimen achieved a Design H R50.

3. SUMMARY

Series	Product Type	Test Size	Material	Positive DP	Negative DP
(1)-200	Single Hung	3'-8 ³ / ₈ " x 7'-0"	PVC	2400 Pa (50.12 Psf)	2400 Pa (50.12 Psf)
(2)-200	Single Hung	3'-1 ¹ / ₂ " x 6'-11 ³ / ₈ "*	PVC		

Specimen 1 (Impact and AAMA)

Product Type: PVC Tilt Single Hung Window, **Product Drawings, Appendix A.**

Series Model: Series 200 / 275

Specification: AAMA/WDMA/CSA 101/I.S.2/A440-05 H-R50 1127 x 2134 (44 x 84)

Specification: AAMA 506-2008 ASTM E 1886/1996 DP +/-50 Large missile Type D

Frame Size: 1127 x 2134 (3'-8³/₈" x 7'-0") (44.375" x 84.0")

Sash Size: 1067 x 889 (3'-6" x 2'-11") (42.0" x 35.0")

Fixed DLO: 1003 x 1137 (3'-3¹/₂" x 3'-8³/₄") (39.500" x 44.750")

Sash DLO: 995 x 819 (3'-3¹/₈" x 2'-8¹/₄") (39.187" x 32.250")

Configuration: O/X



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Specimen 2 (AAMA)

Product Type: PVC Tilt Single Hung Window, **Product Drawings, Appendix A.**
Series Model: Series 200
Specification: AAMA/WDMA/CSA 101/I.S.2/A440-05 H-R50 926 x 2108* (38 x 83*)
Frame Size: 926 x 2108 (3'-1½" x 6'-11³/₈") (37.500" x 83.375")
Sash Size: 902 x 1041 (2'-11½" x 3'-5") (35.500" x 41.0")
Fixed DLO: 838 x 984 (3'-3½" x 3'-8¾") (33.0" x 38.750")
Sash DLO: 830 x 970 (2'-8⁵/₈" x 3'-2³/₁₆") (32.675" x 38.187")
Configuration: O/X

* Frame test size smaller than Gateway unit Test Specimen #1

Weather-Stripping: Pile weather strip with felt center fin 5.59mm (0.220" x .270" backed) at the interior face of fixed interlock. Pile weather strip with plastic center fin 6.60mm (0.260" x .270" backed) at the exterior face of sash top rail, stiles and bottom rail, interior lateral face of sash stiles, and bottom of sash bottom rail. Pile weather strip with plastic center fin 6.60mm (0.287" x .270" backed) at the interior face of frame sill interior leg.

Weep Arrangement: Weep slot 27mm x 6.35mm (1¹/₁₆" x ¼") at the sill exterior and internal center leg spaced 4" from each end, external with weep cover. Sash pockets open at each end inside jamb balance pocket. Screen track weeped by oval 9.53mm x 4.76mm (3³/₈" x 3³/₁₆") weep spaced 39.69mm (1⁹/₁₆") from each end. Sash bottom rail's glass pocket is weeped with one (1) 9.53mm x 4.76mm (3³/₈" x 3³/₁₆") punched weep through both legs spaced 68.2mm (2¹¹/₁₆") from each end.

Hardware: Metallic cam action locks 171.4mm (6¾") from each end of sash top rail, attached by two (2) #8 x 25.4mm (1") PFH screws with keepers at fixed interlock attached with two (2) #8 x 25.4mm (11") PFH screws. PVC spring loaded tilt latch at each end of sash top rail, inserted into routed groove. Metallic pivot bar at each end of sash bottom rail attached with one (1) #8 x 25.4mm (1") screw per bar.

Reinforcement: 6063-T5 aluminum extrusion part #602-0001 in fixed interlock full span. 6063-T5 aluminum extrusion part # 602-0007 in sash top rail, bottom rail, and stiles.

Impact / AAMA Specimen 1

Impact Glass: Glass thickness is 19.05mm (¾") overall. Laminated exterior lite 3.18mm (1¹/₈" double strength annealed, Solutia 2.29mm (.090") interlayer, and 3.18mm (1¹/₈" double strength annealed, 7.94mm (5⁵/₁₆") Tru-seal Duraseal air spacer, and 3.18mm (1¹/₈" annealed interior lite. .

AAMA Specimen 2

Glass: Glass thickness is 19.05mm (¾") overall. 2 pcs, 3.18mm (1¹/₈") double strength annealed 12.7mm (½") Tru-seal Duraseal air spacer.



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Impact / AAMA Specimen 1

Glazing: Sash lite is exterior glazed with Sika Flex 552 polyurethane back bedding compound at interior and heel of glass, full perimeter and rigid vinyl snap-in glazing bead at exterior of glass. Fixed lite is interior glazed with Sika Flex 552 polyurethane back bedding compound at exterior and heel of glass, full perimeter and rigid vinyl snap-in glazing bead at interior of glass.

AAMA Specimen 2

Glazing: Sash lite is exterior glazed with silicone back bedding compound at interior, full perimeter and rigid vinyl snap-in glazing bead at exterior of glass. Fixed lite is interior glazed with silicone back bedding compound at exterior, full perimeter and rigid vinyl snap-in glazing bead at interior of glass.

Installation Features: Frame nail fin was sealed with silicone and attached to a #2, nominal 50.8mm x 152.4mm (2" x 6") SPF test buck with #8 x 31.75mm (1 1/4") screws through fin spaced 50.8mm (2") from each end and approximately on 304.8mm (12") centers, full perimeter.

Other Features: Frame and sash corners are mitered and welded. Fixed interlock rail attached to frame jambs with one (1) (1 3/4") roofing nail at each end into the reinforcement. Sill extender was added to test specimen to increase water performance. Snap-In sill filler is sealed to frame sill full span.

Impact / AAMA Specimen 1

Sill extended 30.16mm (1.1875") above extruded height (part #601-0010-R1).

AAMA Specimen 2

Sill extended 42.86mm (1.6875") above extruded height (part #601-0010-R2).

4. PERFORMANCE RESULTS

Specimen 1

<u>No.</u>	<u>Title of Test</u>	<u>Test Method</u>	<u>Measured</u>	<u>Allowed</u>
5.3.1.1	Operating Force			
	Open		125N (28.0 lbs)	135N (30 lbs)
	Close		98N (22.0 lbs)	135N (30 lbs)
5.3.1.1.3	Latching Devices		4.4N (1.0 lbs)	100N (22.5 lbs)
5.3.2	Air Infiltration	ASTM E 283-04		
	@ 75 Pa (1.60 psf)		.60 L/s•m ² (.12 cfm/ft ²)	1.5 L/s•m ² (0.30 cfm/ft ²)

(The tested specimen exceeds the performance levels in AAMA/WDMA/CSA 101/I.S.2/A440-05 for Air Infiltration, air values were reported at the request of the manufacturer.)



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<u>No.</u>	<u>Title of Test</u>	<u>Test Method</u>	<u>Measured</u>	<u>Allowed</u>
5.3.3	Water Resistance @ 360 Pa (7.50 psf) with screen @ 360 Pa (7.50 psf) without screen	ASTM E 547-00	No Leakage No Leakage	No Leakage No Leakage
5.3.4.2	Deflections @ Interlock 2400 Pa (50.00 psf) Positive Negative	Max Center Max Center	13.5mm (.53") 15.2mm (.60")	reported reported
5.3.4.3	Uniform Load Structural @ 3600 Pa (75.00 psf) Positive @ 3600 Pa (75.00 psf) Negative -Permanent Set	ASTM E 330-02	No Damage No Damage 1.52mm (.06")	No Damage No Damage 4.26mm (0.168")
5.3.5	Forced Entry Resistance Grade 10	ASTM F 588-07	No Entry	No Entry
5.3.6.3	Deglazing Test Top Rail @ 311N (70 lbs) Bottom Rail @ 311N (70 lbs) Lock Stile @ 222 N (50 lbs) Jamb Stile @ 222 N (50 lbs)		.1% .1% .1% .1%	100% 100% 100% 100%
5.3.6.2	Corner Weld Test No Clean break allowed over Entire Weld		Passed	Passed

Specification: ASTM E 1996-05b Missile Level Type 2

Test Specimen 1

Par No	Speed	Rotation	Title of Test	Measured	Allowable
5.3.1.1	50.2fps	0°	Center of Sash	No Penetration	No Penetration
5.3.1.1	50.0fps	0°	Center of Fixed	No Penetration	No Penetration

Test Specimen 2

Par No	Speed	Rotation	Title of Test	Measured	Allowable
5.3.1.2	50.3fps	0°	Sash Bt Left Corner	No Penetration	No Penetration
5.3.1.2	50.1fps	0°	Fixed Bt Left Corner	No Penetration	No Penetration

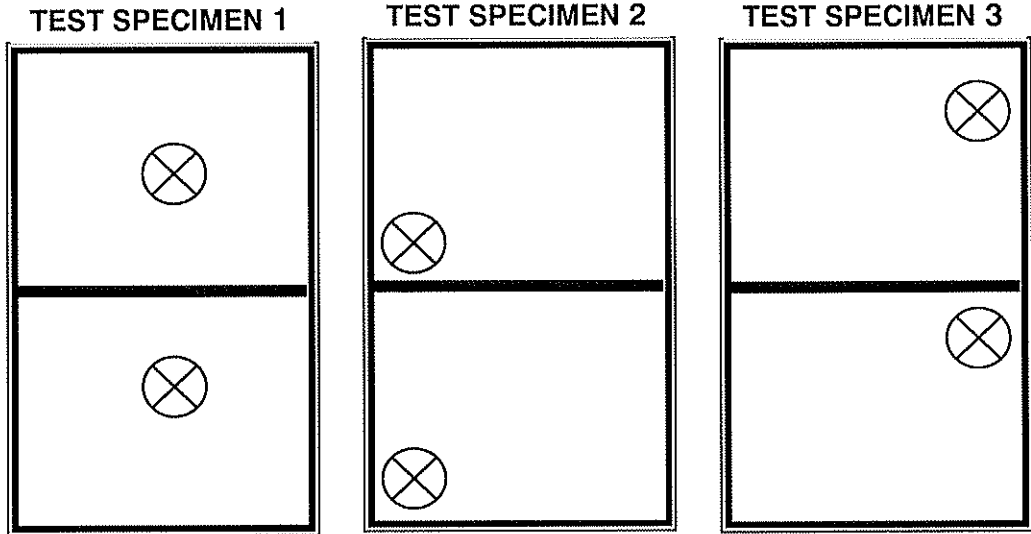
Test Specimen 3

Par No	Speed	Rotation	Title of Test	Measured	Allowable
5.3.1.3	51.2fps	0°	Sash Upper Rt Corner	No Penetration	No Penetration
5.3.1.3	50.3fps	0°	Fixed Upper Rt Corner	No Penetration	No Penetration



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The laboratory temperature was recorded at 80° F for testing. Test specimens were stored in the lab prior to testing and the skin temperature was recorded at 80° F.

Visual inspections performed on the test specimens revealed there were no penetrations through the laminate and no separation of vision-to-frame glazing at the conclusion of the large missile impact tests.

Specification: ASTM E 1886-05

Test Specimen 1

Load Direction	Sequence	Range	Cycle Time	Cycles	Damage
50 PSF Positive	Cycle 1	0.2 P to 0.5 P	< 3 seconds	3500	None
	Cycle 2	0 to 0.6 P	< 3 seconds	300	None
	Cycle 3	0.5 P to 0.8 P	< 3 seconds	600	None
	Cycle 4	0.3 P to 1.0 P	< 3 seconds	100	None

Load Direction	Sequence	Range	Cycle Time	Cycles	Damage
50 PSF Negative	Cycle 1	0.3 P to 1.0 P	< 3 seconds	50	None
	Cycle 2	0.5 to 0.8 P	< 3 seconds	1050	None
	Cycle 3	0 to 0.6 P	< 3 seconds	50	None
	Cycle 4	0.2 P to 0.5 P	< 3 seconds	3350	None

Visual inspections performed on the test specimens revealed there were no penetrations through the laminate and no separation of vision-to-frame glazing at the conclusion of the cyclic pressure differentials.



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Specimen 2

<u>No.</u>	<u>Title of Test</u>	<u>Test Method</u>	<u>Measured</u>	<u>Allowed</u>
5.3.1.1	Operating Force Open Close		98N (22.0 lbs) 67N (15.0 lbs)	135N (30 lbs) 135N (30 lbs)
5.3.1.1.3	Latching Devices		4.4N (1.0 lbs)	100N (22.5 lbs)
5.3.2	Air Infiltration @ 75 Pa (1.60 psf)	ASTM E 283-04	1.10 L/s·m ² (.22 cfm/ft ²)	1.5 L/s·m ² (0.30 cfm/ft ²)
(The tested specimen exceeds the performance levels in AAMA/WDMA/CSA 101/I.S.2/A440-05 for Air Infiltration, air values were reported at the request of the manufacturer.)				
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5.3.4.2	Deflections @ Interlock 2400 Pa (50psf) Positive Negative	Max Center Max Center	13.7mm (.54") 15.2mm (.60")	reported reported
5.3.4.3	Uniform Load Structural @ 3600 Pa (75.0 psf) Positive @ 3600 Pa (75.0 psf) Negative -Permanent Set	ASTM E 330-02	No Damage No Damage 1.52mm (.06")	No Damage No Damage 3.61mm (0.142")
5.3.5	Forced Entry Resistance Grade 10	ASTM F 588-07	No Entry	No Entry
5.3.6.3	Deglazing Test Top Rail @ 311N (70 lbs) Bottom Rail @ 311N (70 lbs) Lock Stile @ 222 N (50 lbs) Jamb Stile @ 222 N (50 lbs)		.1% .1% .1% .1%	100% 100% 100% 100%
5.3.6.2	Corner Weld Test No Clean break allowed over Entire Weld		Passed	Passed



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Detailed extrusion and assembly drawings indicating measured wall thickness and corner construction are on file and have been compared to the test sample submitted. These records will be retained at **CCLI** for a period of four years.

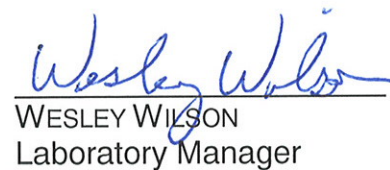
5. DISCLAIMER

The above results were achieved by using the designated test methods and indicate compliance with the above specification. This report does not constitute certification of this product.

Respectfully submitted,

CONSTRUCTION CONSULTING LABORATORY, *INTERNATIONAL*


JEFFREY CRUMP
Testing Manager


WESLEY WILSON
Laboratory Manager



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APPENDIX A

DRAWINGS

DRAWING	PART / DIE #	DATE
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Bill of Materials		
Installation		
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Sill Filler	601-0010	5/31/07
Fixed Interlock	601-0001	5/25/07
Sash Top Rail	601-0006	6/5/07
Sash Stile	601-0003	5/31/07
Sash Bottom Rail	601-0004	5/31/07
Fixed Interlock Reinforcement	602-0001	5/31/07
Sash Reinforcement	602-0007	5/2/08
Sill Filler	601-0100-R1	5/31/07
Sill Filler	601-0100-R2	5/31/07



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