

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

**Rendered to:**

**VEKA INC.**

**SERIES/MODEL: Softline 70 mm  
PRODUCT TYPE: PVC Tilt-Turn with  
Fixed Lite Window**

**Report No.: 66080.02-109-44  
Revision 1: 07/13/07  
Test Date: 06/28/06  
And: 06/29/06  
Report Date: 01/26/07  
Expiration Date: 06/29/10**

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

Rendered to:

VEKA INC.  
100 Veka Drive  
P.O. Box 250  
Fombell, Pennsylvania 16123-0250

Report No.: 66080.02-109-44  
Revision 1: 07/13/07  
Test Date: 06/28/06  
And: 06/29/06  
Report Date: 01/26/07  
Expiration Date: 06/29/10

**Project Summary:** Architectural Testing, Inc. (ATI) was contracted by Veka Inc. to perform testing on three Series/Model Softline 70 mm, tilt-turn with fixed lite windows. The samples tested met the performance requirements set forth in the referenced test procedures for a  $\pm 50.0$  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:** Softline 70 mm

**Product Type:** PVC Tilt-Turn with Fixed Lite Window

**Overall Size:** 2007 mm (79") wide by 1296 mm (51") high

**Sash Size:** 775 mm (30-1/2") wide by 1029 mm (40-1/2") high

**Fixed Daylight Opening Size:** 876 mm (34-1/2") wide by 1130 mm (44-1/2") high

**Finish:** All PVC was white.

**Test Specimen Description:** (Continued)

**Glazing Details:** The unit was glazed with 27 mm (1-1/16") thick insulating glass constructed of a sheet of 4 mm (5/32") thick clear annealed glass outboard, a sheet of 14 mm (1/2") thick laminated glass inboard and an aluminum spacer system. The laminated glass was comprised of two sheets 6 mm (1/4") annealed glass and a 2 mm (0.090") thick PVB interlayer. The glass was set from the interior onto a vinyl bulb and was secured with PVC snap-in glazing beads with a vinyl dual fin weatherstrip against the glass. In addition, a 102 mm (4") long aluminum, foam covered, pressure plate was secured at each corner and at the center of each stile and rail with two 4 mm (#M4) by 22 mm (7/8") screws.

**Weatherstripping:**

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
Kerf mounted 6 mm (0.230") high vinyl hollow bulb seal	1 Row	Vent stiles and rails, head, sill jamb and intermediate jamb
Kerf mounted 5 mm (0.200") high vinyl hollow bulb seal	1 Row	Vent stiles and rails, head, sill jamb and intermediate jamb glazing leg
Kerf mounted dual fin vinyl bulb seal	1 Row	Glazing bead

**Frame Construction:** Frame members were constructed of extruded PVC with mitered and welded corners. The intermediate jamb was secured to the head and sill utilizing steel "L" shaped brackets on each side. The brackets were secured using two (2) 4 mm (#M4) by 22 mm (7/8") screws into the head and sill and one (1) 4 mm (#M4) by 22 mm (7/8") screw in the intermediate jamb.

**Vent Construction:** Vent members were constructed of extruded PVC members with mitered and welded corners.

**Hardware:**

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
Multi-point lock with handle	1	Center of lock stile
Locks with adjacent keepers	8	One each end of the top and bottom rails and one 8" from each end of both stiles with keepers aligned opposite. Keepers were secured using three (3) 4 mm (#M4) by 22 mm (7/8") screws

**Test Specimen Description:** (Continued)

**Drainage:**

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
32 mm (1-1/4") long by 5 mm (3/16") high weepslot	4	64 mm (2-1/2") from each end of the vent bottom rail in the glazing channel, draining to the exterior hollow below
32 mm (1-1/4") long by 5 mm (3/16") high weepslot	4	127 mm (5") from each end of the vent bottom rail, draining the exterior hollow
32 mm (1-1/4") long by 5 mm (3/16") high weepslot	4	Sill, 64 mm (2-1/2") from each end and one on each side 64 mm (2-1/2") from the intermediate jamb, draining to the exterior center hollow
32 mm (1-1/4") long by 5 mm (3/16") high weepslot	4	Sill, 127 mm (5") from each end and one on each side 127 mm (5") of the intermediate jamb, draining the center hollow

**Reinforcement:** Custom shaped steel reinforcement was utilized in the head, sill, and jambs (Drawing #113.271), intermediate jamb (Drawing #113.271.4) and all vent stiles and rails (Drawing #113.292). All reinforcing was secured at each end and spaced 305 mm (12") apart using a 4 mm (#M4) by 13 mm (1/2") screw.

**Installation:** The window was installed in a Spruce-Pine-Fir wood buck. Frame was set into the buck and secured using 5 mm (#M5) by 76 mm (3") screws 152 mm (6") from each end and spaced 406 mm (16") on center. The exterior perimeter was sealed with silicone.

**Test Results:** The following results have been recorded:

**ASTM E 1886, *Large Missile Impact***

**Conditioning Temperature:** 77°F

**Missile Weight:** 9.4 lbs

**Missile Length:** 8' 3"

**Muzzle Distance from Test Specimen:** 17.0 ft.

**Test Unit #1**

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

**Impact Area:** Operable vent, top right corner of glass

**Observations:** Impacted target area, broke the exterior annealed lite of glass, fractured the interior laminated lite of glass

**Results:** Pass

**Test Unit #2**

**Impact #1:** Missile Velocity: 49.4 fps; orientation within  $\pm 5^\circ$  of vertical

**Impact Area:** Operable vent, lower left corner of glass

**Observations:** Impacted target area, broke the exterior annealed lite of glass, fractured the interior laminated lite of glass

**Results:** Pass

**Test Unit #3**

**Impact #1:** Missile Velocity: 50.1 fps; orientation within  $\pm 5^\circ$  of vertical

**Impact Area:** Operable vent, center of glass

**Observations:** Impacted target area, broke the exterior annealed lite of glass, fractured the interior laminated lite of 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	2.10	0.12	0.18	0.09
0.0 to 30.0	300	2.91	0.17	0.24	0.14
25.0 to 40.0	600	2.59	0.21	0.28	0.14
15.0 to 50.0	100	2.93	0.24	0.38	0.17
			Permanent Set		
			0.05	0.09	0.03

**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	0.53	0.31	0.25
25.0 to 40.0	1050	1.86	0.35	0.29	0.10
0.0 to 30.0	50	1.86	0.29	0.21	0.07
10.0 to 25.0	3350	2.19	0.28	0.20	0.05
			Permanent Set		
			<0.01	<0.01	<0.01

*Observations:* No sign of failure

**Result:** Pass

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

**Test Results:** (Continued)

**ASTM E 1886-02, 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	2.34	0.12	0.20	0.04
0.0 to 30.0	300	2.78	0.12	0.29	0.08
25.0 to 40.0	600	2.52	0.15	0.30	0.11
15.0 to 50.0	100	2.67	0.22	0.45	0.13
			Permanent Set		
			0.06	0.08	0.02

**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	3.68	0.30	0.30	0.16
25.0 to 40.0	1050	2.57	0.10	0.45	0.11
0.0 to 30.0	50	2.90	0.11	0.45	0.16
10.0 to 25.0	3350	2.29	0.11	0.45	0.16
			Permanent Set		
			0.02	0.02	0.01

**Observations:** *No sign of failure*

**Result:** Pass

**Note:** *See ATI Sketch #2 for indicator locations. Test units #2 and #3 were cycled in a common chamber.*

**Test Results:** (Continued)

**ASTM E 1886-02, 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	2.34	0.08	0.14	0.01
0.0 to 30.0	300	2.78	0.11	0.10	0.08
25.0 to 40.0	600	2.52	0.12	0.21	0.07
15.0 to 50.0	100	2.67	0.15	0.24	0.09
			Permanent Set		
			0.06	0.06	0.01

**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	3.68	0.26	0.29	0.21
25.0 to 40.0	1050	2.57	0.21	0.30	0.13
0.0 to 30.0	50	2.90	0.22	0.30	0.15
10.0 to 25.0	3350	2.26	0.22	0.30	0.15
			Permanent Set		
			0.02	0.03	0.01

**Observations:** *No sign of failure*

**Result:** Pass

**Note:** See ATI Sketch #2 for indicator locations. Test units #2 and #3 were cycled in a common chamber.



**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(s)

**Missile(s):** 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.

**List of Official Observers:**

<u>Name</u>	<u>Company</u>
Aaron M. Shultz	Architectural Testing, Inc.
Nicholas R. Loughran	Architectural Testing, Inc.
Michael D. Stremmel, P.E.	Architectural Testing, inc.
Scott Gill	Architectural Testing, Inc.

**Drawing Reference:** The test specimen drawings have been checked by Architectural Testing, Inc. and are representative of the samples tested.

Drawing details, 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.

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Scott Gill  
Technician

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

SG:vlm/cmd

Attachments (pages):

Appendix-A: Sketches (2)

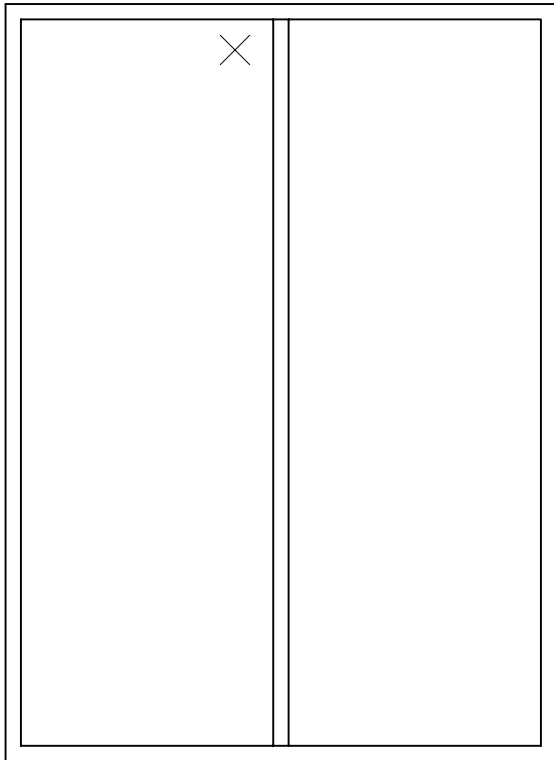
Appendix-B: Drawings (6)

### Revision Log

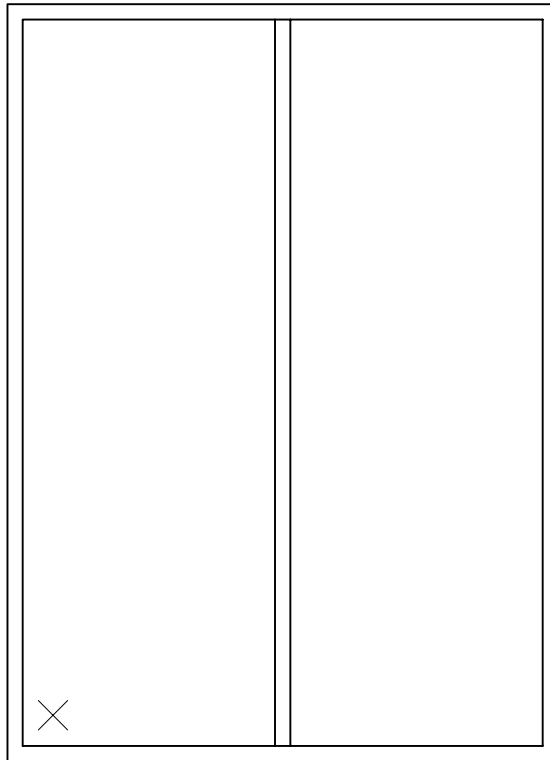
<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	01/26/07	N/A	Original report issue
1	07/13/07	Appendix B	Corrected Drawing # PchartV

**Appendix A**  
**Sketches**

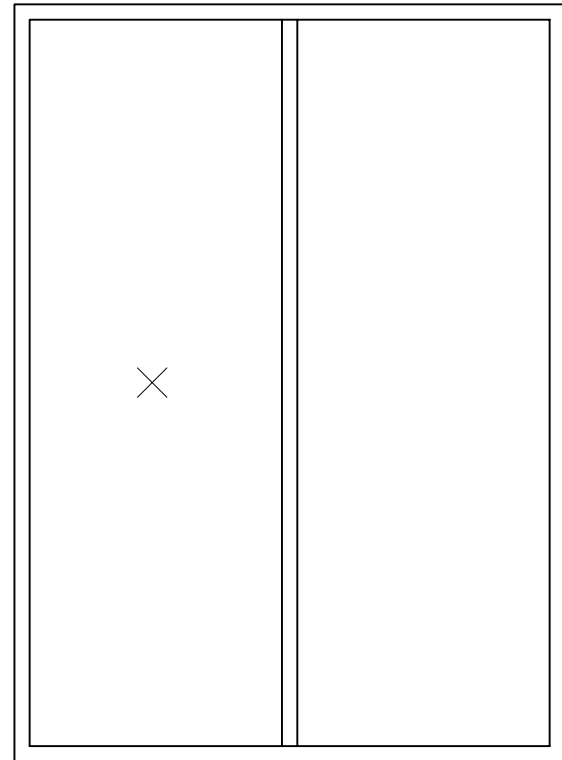
REV	DATE	DESCRIPTION	BY



Specimen #1



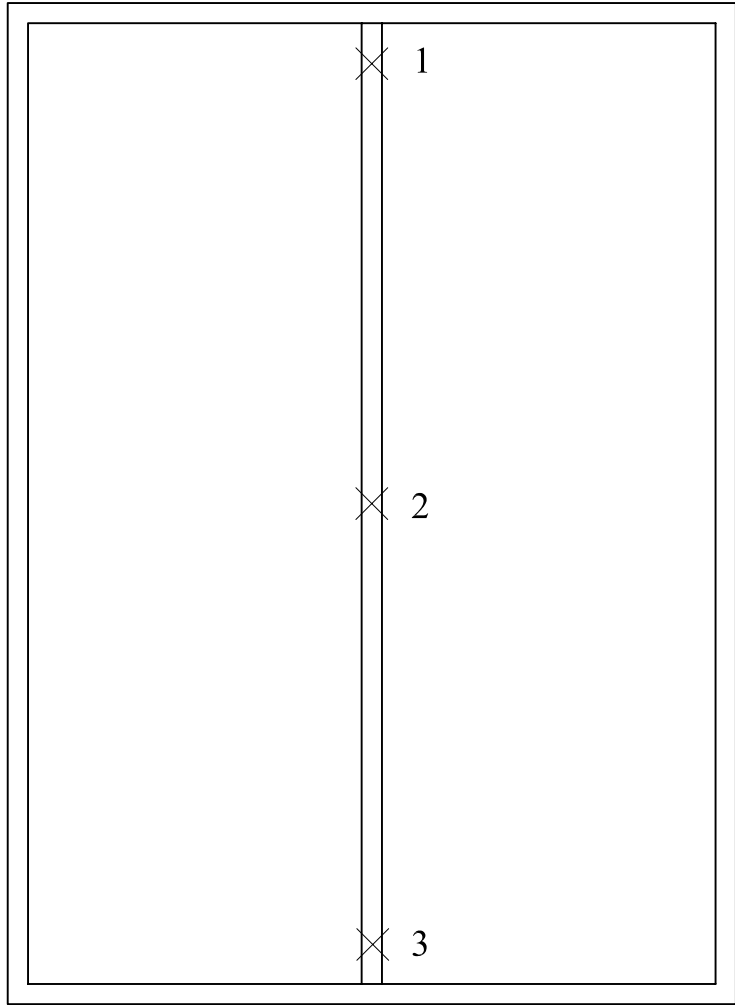
Specimen #2



Specimen #3

✕ - Denotes Impact Locations

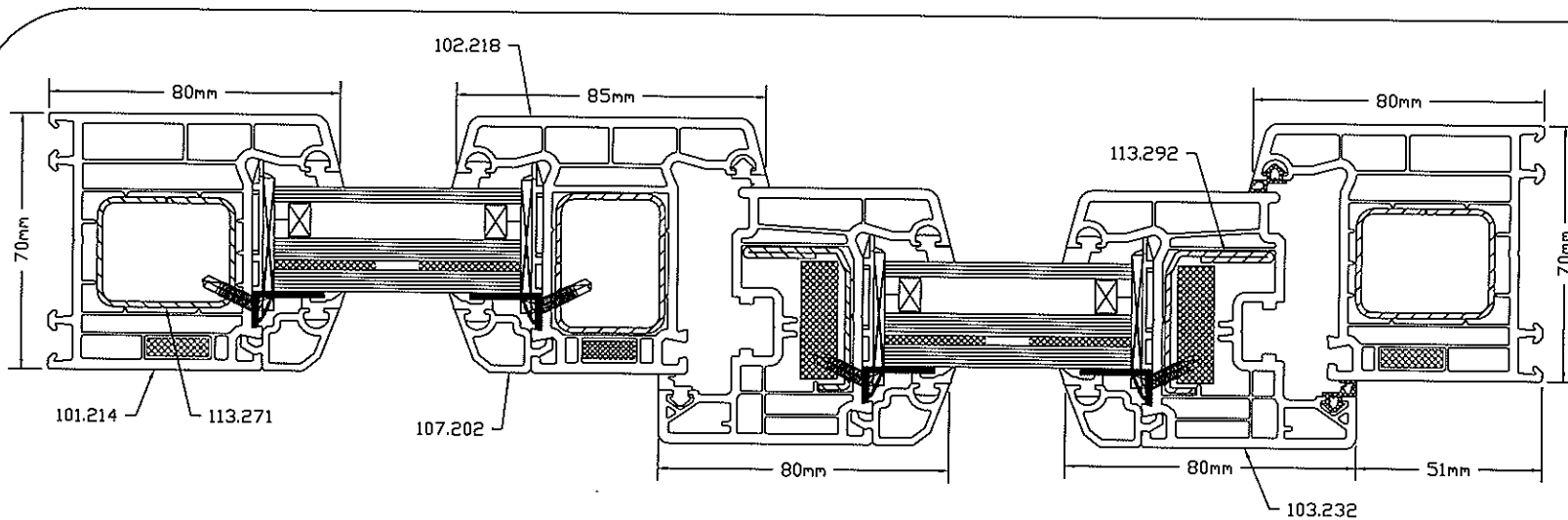
REV	DATE	DESCRIPTION	BY



✕ - Denotes Indicator Locations

## **Appendix B**

### **Drawings**



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**BILL OF MATERIALS**

DESCRIPTION	PART #	SUPPLIER
FRAME	101.214	
SASH	103.232	
FIXED POST	102.218	
GLAZING BEAD	107.202	
PVC INSERT 10 X 30	304.100.2	
PVC INSERT 6 X 17	307.060.2	
GLAZING BLOCK (GREEN/RED)	5513/5515	
GLAZING SPACER	109.201	
REINFORCEMENT FRAME	113.271	
REINFORCEMENT SASH	113.292	
POST CONNECTOR INC. SEAT	106.200.1	
ALUMINUM CLIP	104.209	
INSULATED GLASS IG		
GLASS BUILD UP		
6mm FLOAT-FOIL-6mm FLOAT/LZR 10mm/4mm FLOAT		NOWAK
FOIL SALFLEX PVB - FOIL NACH DIN EN 10204-2.1		SOLUTIA
SELF TAPPING SCREW 3.9mm X 25mm		WURTH
SCREW 4.1mm X 30mm		WURTH
SELF TAPPING SCREW 3.9mm X 32mm		WURTH
WINDOW HANDLE SECUSTIC 099/US 952 (8106577)		HOPPE
HARDWARE CONFIGURATION 500 PLUS		ROTO

**Architectural Testing**  
 Test sample complies with these details.  
 Deviations are noted.  
 Report# 66080  
 Date 12/15/06 Tech S.G.ink

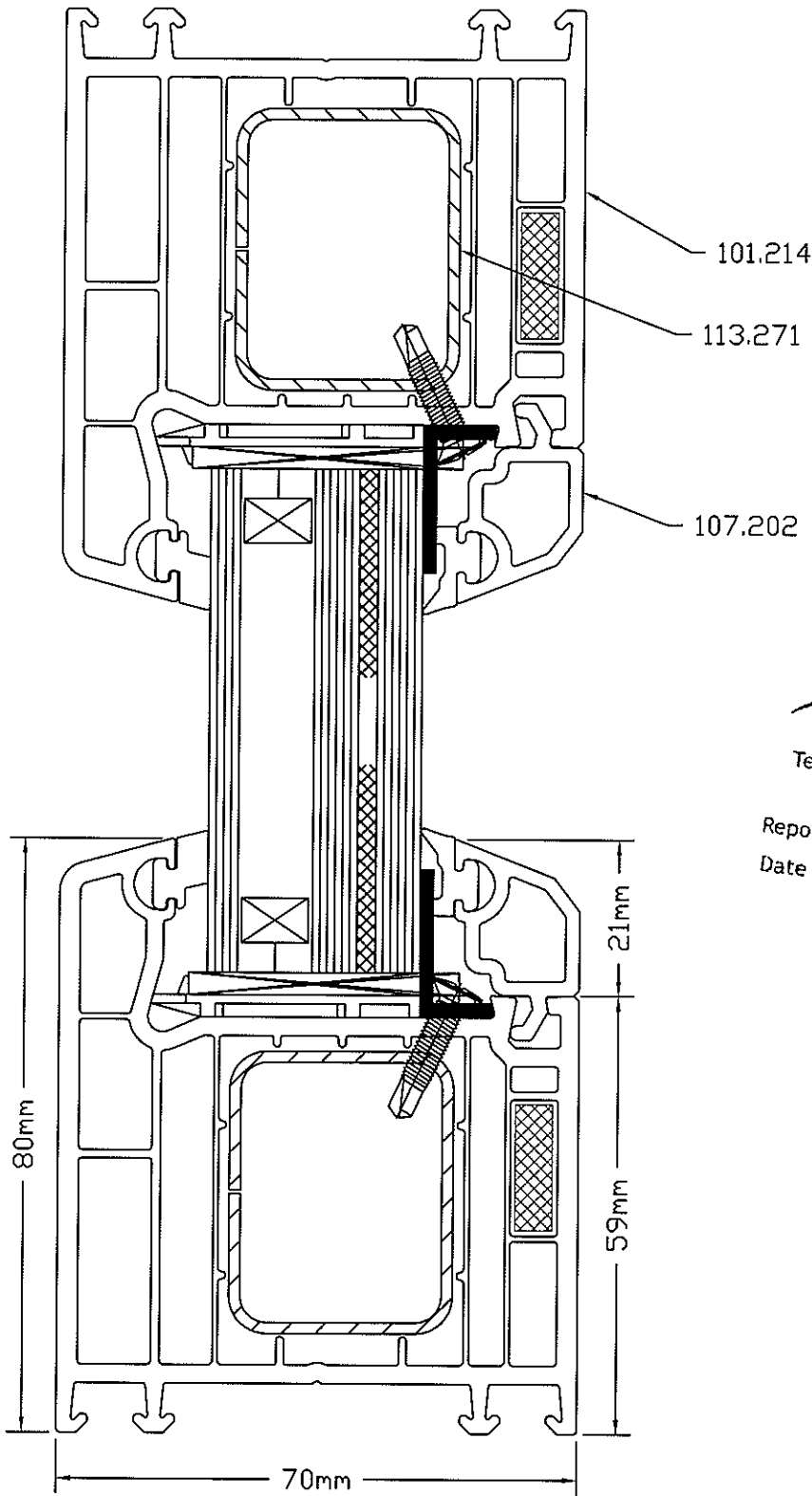
**NOTE:**  
 FOR OTHER PROFILE, GLAZING BEAD,  
 & GLASS OPTIONS, PLEASE SEE THE  
 LINEAL PROFILE CHARTS FOR THIS  
 SYSTEM.



**VEKA COMMERCIAL WINDOW DIVISION**  
 100 VEKA DRIVE  
 FOMBELL, PA 16123

DRAWN: JLB	DATE: 10/31/06	SCALE: 3/4
CHK'D:	DATE:	APPV'D:
TITLE: SOFTLINE 70 TILE TURN WITH FIXED UNIT & FIXED POST		DWG. # SECTION A-A V

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**Architectural Testing**

Test sample complies with these details.  
Deviations are noted.

Report# 66080

Date 12/15/06 Tech S. G. 122

**NOTE:**  
FOR OTHER PROFILE, GLAZING BEAD,  
& GLASS OPTIONS, PLEASE SEE THE  
LINEAL PROFILE CHARTS FOR THIS  
SYSTEM.



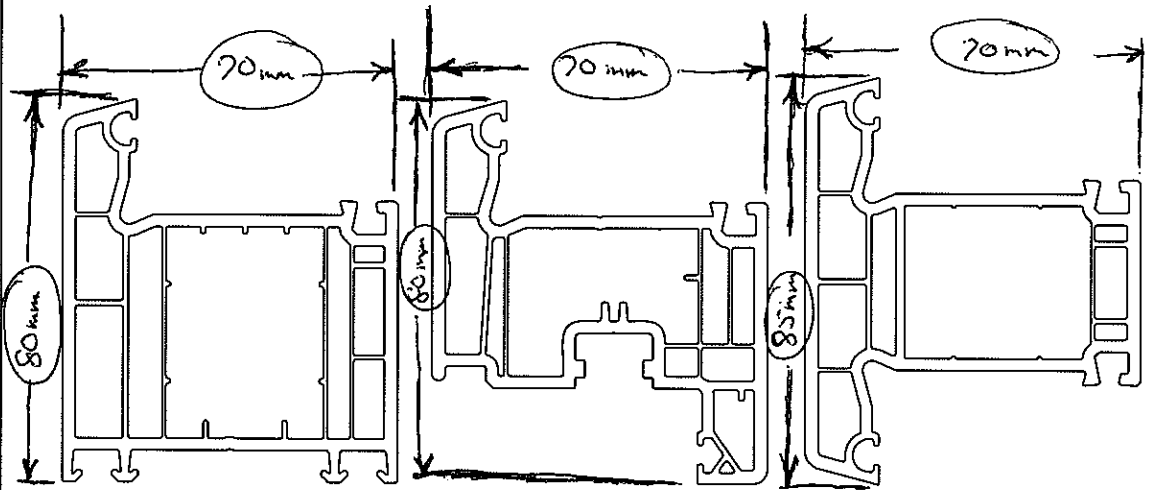
**VEKA COMMERCIAL  
WINDOW DIVISION**

100 VEKA DRIVE  
FOMBELL, PA 16123

DRAWN: JLB	DATE: 10/31/06	SCALE: FULL	
CHK'D:	DATE:	APPV'D:	PAPER SIZE: A
TITLE: SOFTLINE 70 TILT TURN WITH FIXED UNIT & FIXED POST			DWG. # SECTION B-B V



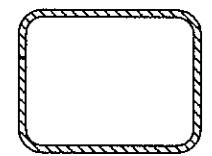
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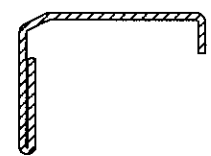
101.214 - FRAME

103.232 - SASH

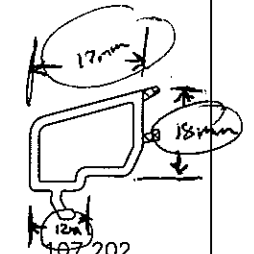
102.218 - MULLION



113.271  
FRAME & MULL REFO



113.292  
SASH REFO



107.202  
GLAZING BEAD

**Architectural Testing**

Test sample complies with these details.  
Deviations are noted.

Report# 66080

Date 07/12/07 Tech S. Gilk

**NOTE:**  
FOR OTHER PROFILE, GLAZING BEAD,  
& GLASS OPTIONS, PLEASE SEE THE  
LINEAL PROFILE CHARTS FOR THIS  
SYSTEM.

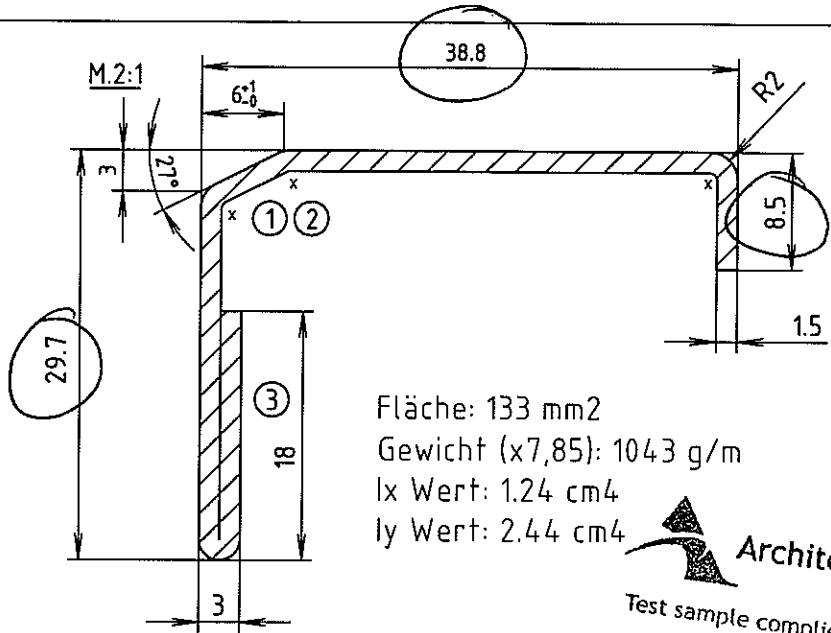
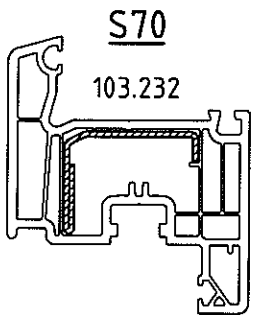
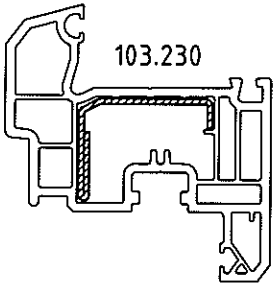
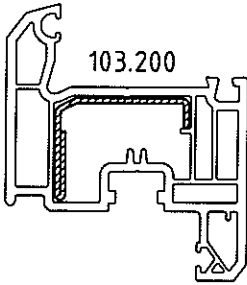
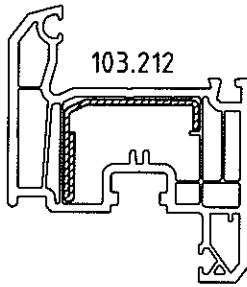


**VEKA COMMERCIAL  
WINDOW DIVISION**

100 VEKA DRIVE  
FOMBELL, PA 16123

DRAWN: JLB		DATE: 23 APR 07	SCALE: FULL
CHK'D:	DATE:	APP'VD:	PAPER SIZE: B
TITLE: 1212x2212 70mm TILT TURN W/FIXED SIDE PROFILE CHART			DWG. # PCHARTY

**TOPLINE AD**

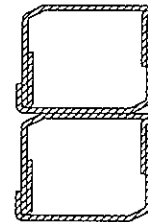
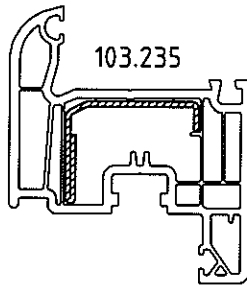


Fläche: 133 mm<sup>2</sup>  
 Gewicht (x7,85): 1043 g/m  
 Ix Wert: 1.24 cm<sup>4</sup>  
 Iy Wert: 2.44 cm<sup>4</sup>

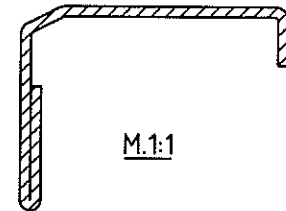
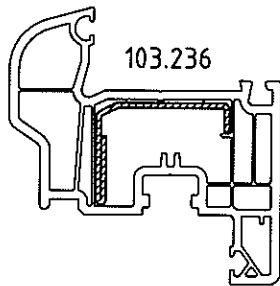
**Architectural Testing**  
 Test sample complies with these details.  
 Deviations are noted.

M.1:2 Report# 66080  
 Date 12/15/06 Tech S. GILL

**AD 70**



Bündelung:  
 In Kleinbündeln zu je 4 Stangen,  
 die zu Kranbündeln von max. 1 to.  
 gebündelt werden.



Material: DX51D+275NA

3	Schenkel verkürzt von 20mm auf 18mm. Ix- und Iy-Wert neu gerechnet.	2004-11-23	Wagner
2	Fase 4mm x 45° abgeändert in 6mmx3mm	2002-09-20	Drees
1	Radius 6mm abgeändert in Fase 4mm x 45°	2002-08-19	Schmidt

Index	Aenderung	Datum	Name
Fläche:	133mm <sup>2</sup>	Datum:	Name:
Gewicht: (x7,85)	1043q/m	gez.	16.07.2002
Aussenwandung:	1.5mm	ges.	Drees
Freimass:	±0,2	Bemerkung:	
unbem.Radien:	w=0,3mm; x=0,5mm; y=0,75mm; z=1,0mm	Massstab: M.1:2;1:1;2:1	



**Profil Systeme**

Benennung:  
 Stahlverstärkung für TOP AD / S70 / AD70  
 103.200 / .212 / .230 / .232 / .235 / .236  
 29.7/38.8/8.5/1.5mm

**VEKA AG**  
 -Ein Unternehmen der Laumann Gruppe-  
 Dieselstrasse 8, 48324 Sendenhorst

System: TOP AD / S70 / AD 70 Art.Nr.: 113.292

Zeichnungsnr.: **113.292.1W/3**

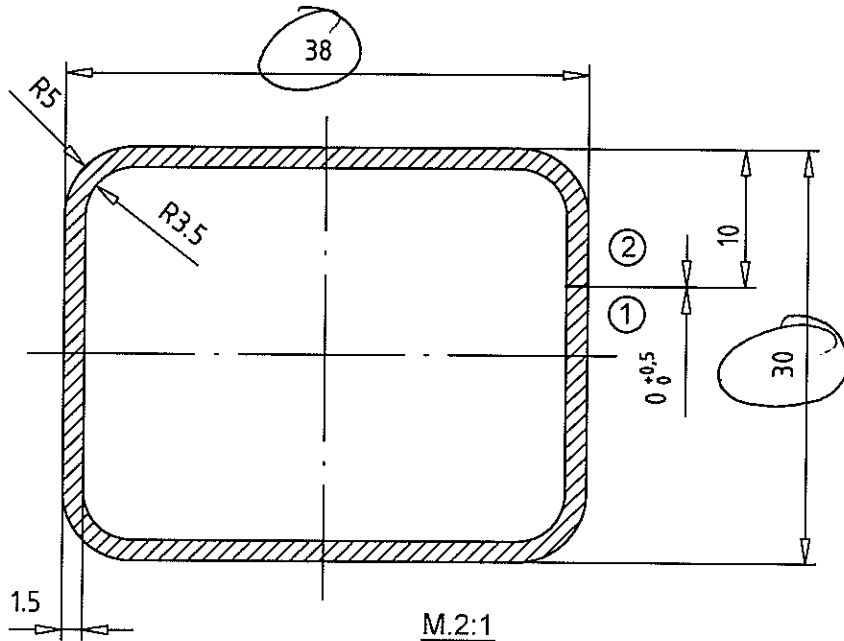
DIN-A4

**Architectural Testing**  
 Test sample complies with these details.  
 Deviations are noted.

Report#

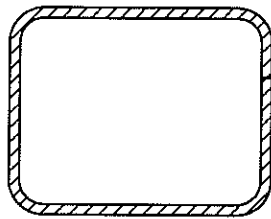
Date

66080  
 Tech. S. G. L.

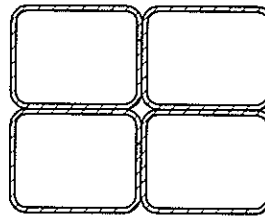


M.2:1

$I_x = 2,55\text{cm}^4$   
 $I_y = 3,68\text{cm}^4$




M.1:1

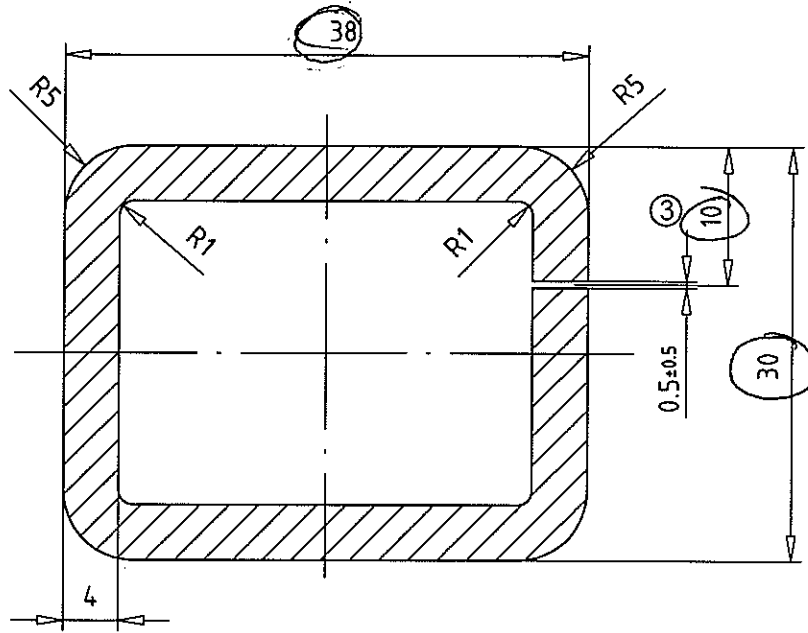


M.1:2

**Bündelung:**  
 In Kleinbunden zu je 4 Stangen,  
 die zu Kranbunden von max. 1 to.  
 gebündelt werden.

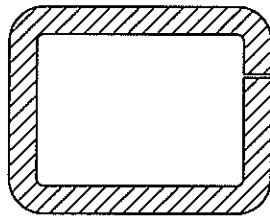
Material: St 02 Z -275 MA

2	Schlitz auf 10mm verlegt	2003-12-16	Drees
1	Trennschlitz von 38er Seite auf 30er Seite verlegt	2003.11.24	Drees
Index	Aenderung	Datum	Name
Fläche:	183mm <sup>2</sup>	Datum:	Name:
Gewicht: (x7,85)	14,37g/m	gez.	07.10.97
Aussenwandung:	1.5mm	ges.	Schmidt
Freimass:	±0,2	Bemerkung:	
unbem.Radien:w=0,3mm; x=0,5mm; y=0,75mm; z=1,0mm	Diese Zeichnung ist unser geistiges Eigentum. Sie darf ohne unsere Genehmigung weder kopiert noch Driften zugänglich gemacht werden. VEKA AG; 48324 Sendenhorst		Massstab: M.1:2;1:1;2:1
 <b>Profil Systeme</b>	Benennung:	Stahlverstärkung für 70mm Systeme 30/38/1.5 mm	
	System: 70mm Systeme	Art.Nr.: 113.271	
<b>VEKA AG</b> -Ein Unternehmen der Laumann Gruppe- Dieselstrasse 8, 48324 Sendenhorst		Zeichnungsnr.: <b>113.271.1W/2</b>	DIN-A4



M.2:1

$I_x = 5.48 \text{ cm}^4$   
 $I_y = 8.10 \text{ cm}^4$



M.1:1



Architectural Testing

Test sample complies with these details.  
 Deviations are noted.

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Material: St 02 Z -275 NA

3	Schlitz auf 10mm verlegt	2003-12-16	Drees
2	Schlitz auf Grund von Reklamationen auf kurze Seite verlegt	2003-06-10	Schmidt
1	Stahl wird geschlossen geliefert	18.01.2000	Schmidt
Index	Aenderung	Datum	Name

Flaeche: 457mm <sup>2</sup>	Prueflehre	Diese Zeichnung ist unser geistiges Eigentum. Sie darf ohne unsere Genehmigung weder kopiert noch Dritten zuganglich gemacht werden. VEKA AG ; 48324 Sendenhorst	Datum:	Name:
Gewicht: (x7,85) 3587g/m	Die Prueflehre ist umlaufend mit +0,3mm zu fertigen!		gez. 17.01.00	Schmidt
Aussenwandung: 4mm			ges.	
Freimass: ±0,2				
unbem.Radien:w=0,3mm; x=0,5mm; y=0,75mm; z=1,0mm			Bemerkung: Statikverstaerkung	
			Massstab: M.1:2;1:1;2:1	



**Profil Systeme**

**VEKA AG**

-Ein Unternehmen der Laumann Gruppe-  
 Dieselstrasse 8, 48324 Sendenhorst

Benennung:	Stahlverstaerkung fuer 70mm Systeme 30/38/4mm fuer Statikelemente
System: TOP / SWING / SOFT	Art.Nr.: 113.271.4
Zeichnungsnr.: <b>113.271.4W / 3</b>	DIN-A4