



TAS 201, 202 AND 203 AND ASTM E 1886 & 1996 PERFORMANCE TEST
EFCO SERIES 5FXT FIXED WINDOW (SAFLEX)
REPORT #CCLI-08-054

April 18, 2008
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1. PROJECT DATA

Project: EFCO Series 5FXT Fixed Window (Saflex)
TAS 201, 202, 203 and ASTM E 1886 & 1996

Date(s) of Testing: March 14-17, 2008

Tested For: EFCO Corporation
1000 County Road
Monett, MO 65708

Witnessed By: (All or Partial Viewing)
Abdol H. Rezadad, P.E. Construction Consulting Laboratory, *International*
Jeffrey Crump Construction Consulting Laboratory *International*
Wesley Wilson Construction Consulting Laboratory *International*

2. SUMMARY

This report presents the performance results of EFCO Series 5FXT Fixed Window (Saflex). Tests were conducted in accordance with Testing Application Standard, Protocol 201, 202, 203 and ASTM E 1886 & 1996. Specimens were multi-point impacted with ten (10) $\frac{5}{16}$ " 2 gram small missiles in accordance with TAS 201 and ASTM E 1996, cycled at a Design load of 120 PSF positive and 150 PSF negative in accordance with TAS 203 and ASTM E 1886 and achieved a positive test load of 180 PSF and a negative test load of 225 PSF in accordance with TAS 202. Tests were conducted at Construction Consulting Laboratory, *International* (CCLI) in Carrollton, TX.

3. TEST SPECIMEN

PRODUCT TYPE: Aluminum Fixed Window, **Impact Diagram, Appendix A; Deflection Diagram, Appendix B; Product Drawings, Appendix C**

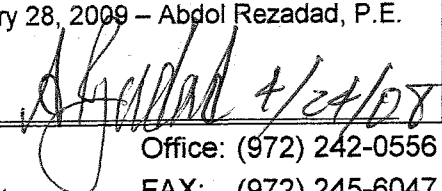
SERIES/MODEL: Series 5FXT Fixed Window (Saflex)

SPECIFICATION: Testing Application Standard, Protocol 201, 202, 203 and ASTM E 1886-05 and 1996-05b

FRAME SIZE: 4'-5 $\frac{3}{4}$ " x 9'-2 $\frac{3}{8}$ " (with sub-head and sub-sill)
4'-5 $\frac{3}{4}$ " x 9'-0" (window frame)

CONFIGURATION: O

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Signature: 

1601 Luna Road
Carrollton, Texas 75006

S-UNITED, INC.
A Quality Control Company

Office: (972) 242-0556
FAX: (972) 245-6047

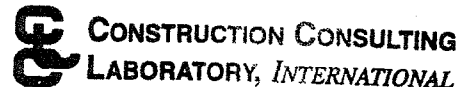
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Refer to Mock-Up drawing in **Appendix A**. This report is not complete unless this drawing is stamped and initialed by CCLI as illustrated below.

**CONSTRUCTION CONSULTING
LABORATORY, INTERNATIONAL**

1601 Luna Road

Carrollton, Texas 75006

Phone (972) 242-0556

WEATHER-STRIP: None.

GLASS: 1^{3/16}" Nominal Insulated Unit: Exterior 1/4" tempered glass, 3/8" air space, 9/16" laminated glass, 1/4" heat strengthened glass, .060" PVB Solutia Saflex Interlayer, 1/4" clear heat strengthened glass at interior.

GLAZING: Interior glazed with silicone at the exterior of glass and aluminum glazing bead with glazing bead vinyl at the interior of the glass.

WEEP ARRANGEMENT: None.

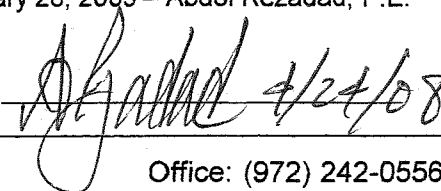
SEALANT: Foam gasket at the frame intersections. Arrow shim (part #WNA1) sealed in place with silicone at frame subhead and subsill, at the interior face of frame. Subhead sealed to frame head at exterior face.

REINFORCEMENT: 6063 T-6 Aluminum stiffener (part #18E5) located at center of subhead.

OTHER FEATURES: All frame and vent members are thermally broken using thermal struts. Frame head and sill corners are coped, butted, and mechanically assembled with four (4) #10 frame assembly screws at each corner.

INSTALLATION FEATURES: Test specimen was installed in a double #2 50.8mm x 254mm (2" x 10") yellow pine wood test buck with 9.525mm (3/8") lag screws with a 76.2mm (3") embedment located 152.4mm (6") from each end and 254mm (10") O.C. with subhead stiffener (part #18E5), 203.2mm (8") long and 152.4mm (6") wide, attached with subhead by 9.525mm (3/8") x 101.6mm (4") lag screws, with screws 25.4mm (1") from each end and 76.2mm (3") apart. Frame sill starter attached by 9.525mm (3/8") lag screws with a 76.2mm (3") embedment located 152.4mm (6") from each end and 304.8mm (12") O.C. Jambs attached with 9.525mm (3/8") lag screws with a 76.2mm (3") embedment located 152.4mm (6") from each end and 304.8mm (12") on center.

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4. PERFORMANCE RESULTS

Specification: Testing Application Standard, Protocol 202.

<u>Title of Test</u>	<u>Test Method</u>	<u>Measured</u>	<u>Allowed</u>
Uniform Deflection Anchors	ASTM E 330-02		
-120.00 PSF Positive		0.01"	0.068"
-150.00 PSF Negative		0.03"	0.068"
Air Infiltration @ 6.24 PSF	ASTM E 283-04	0.01 cfm/ft ²	0.30 cfm/ ft ²
Water Resistance @ 33.00 PSF	ASTM E 547 & 331-00	No Leakage	No Leakage
Uniform Deflection Anchors	ASTM E 330-02		
-120.00 PSF Positive		0.02"	0.068"
-150.00 PSF Negative		0.05"	0.068"
Uniform Structural	ASTM E 330-02		
-Positive 30 second load		180.00 PSF	180.00 PSF
-Negative 30 second load		225.00 PSF	225.00 PSF
-Permanent Set		0.02"	0.024"
-Subhead Permanent Set		0.01"	0.02"

Specification: Testing Application Standard, Protocol 201 and ASTM E 1996
Test Specimen 1, Appendix B

Speed	Rotation	Title of Test	Measured	Allowable
130.2 fps	0°	Top Right Corner	No Penetration	See Section 5
130.1 fps	0°	Bottom Right Corner	No Penetration	See Section 5
130.8 fps	0°	Center of Panel	No Penetration	See Section 5

Test Specimen 2

Speed	Rotation	Title of Test	Measured	Allowable
131 fps	0°	Top Left Corner	No Penetration	See Section 5
130.7 fps	0°	Bottom Left Corner	No Penetration	See Section 5
130.1 fps	0°	Center of Panel	No Penetration	See Section 5

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Abdol Rezadad 4/24/08

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Test Specimen 3

Speed	Rotation	Title of Test	Measured	Allowable
129.9 fps	0°	Top Center Corner of Panel	No Penetration	See Section 5
130.2 fps	0°	Midspan/Center of Panel	No Penetration	See Section 5
130.6 fps	0°	Bottom Center of Panel	No Penetration	See Section 5

The Laboratory temperature was maintained at 71° F for the duration of testing. Test specimens were stored in the lab prior to testing and the skin temperature of the glass was recorded at 70° F. Visual inspections performed on the test specimen revealed there were no penetrations through the laminate and no separation of vision-to-frame glazing at the conclusion of each missile impact test.

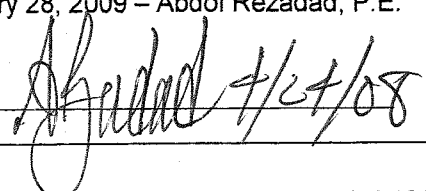
**Specification: Testing Application Standard, Protocol 203 and ASTM E 1886
Test Specimens 1-3**

Load	Sequence	Range	Cycle Time	Cycles	Damage
Direction 120 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	Sequence	Range	Cycle Time	Cycles	Damage
Direction 150 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

Anchor Deflections

Load	Sequence	Range	Deflection	Allowed
Direction 120 PSF Positive	Cycle 1	0.2 P to 0.5 P	.01"	.068"
	Cycle 2	0 to 0.6 P	.01"	.068"
	Cycle 3	0.5 P to 0.8 P	.03"	.068"
	Cycle 4	0.3 P to 1.0 P	.05"	.068"
Load	Sequence	Range	Deflection	Allowed
Direction 150 PSF Negative	Cycle 1	0.3 P to 1.0 P	.05"	.068"
	Cycle 2	0.5 to 0.8 P	.045"	.068"
	Cycle 3	0 to 0.6 P	.03"	.068"
	Cycle 4	0.2 P to 0.5 P	.015"	.068"

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Signature: 



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

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

5. IMPACT ACCEPTANCE CRITERIA

The test specimen shall resist the large missile impact with no tear formed longer than 5" (130mm) and wider than $\frac{1}{16}$ " (1.5875mm) through which air can pass or no opening formed through which a 3" (76mm) diameter solid sphere can freely pass when evaluated upon completion of missile impacts and test loading program.

6. CONCLUSION

EFCO Corporation Series 5FXT Fixed Window was tested in accordance with Testing Application Standard, Protocol 201, 202, 203 and ASTM E 1996-05b and ASTM 1886-05. Results are noted in Section 4 of this report.

Respectfully submitted,

CONSTRUCTION CONSULTING LABORATORY, INTERNATIONAL

WESLEY WILSON
LABORATORY MANAGER

JEFFREY CRUMP
TESTING MANAGER

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Signature:



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APPENDIXES



TAS 201, 202 AND 203 AND ASTM E 1886 & 1996 PERFORMANCE TEST

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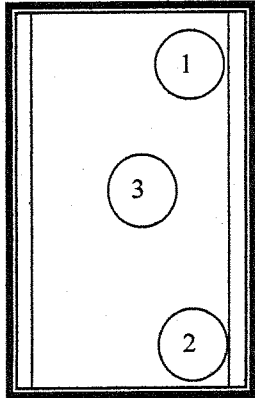
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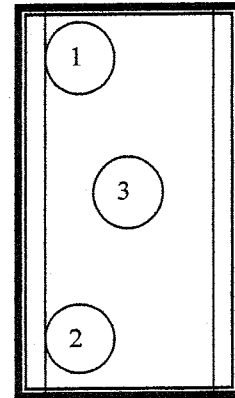
APPENDIX A

IMPACT DIAGRAM

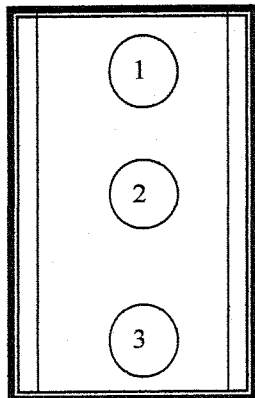
SPECIMEN 1



SPECIMEN 2



SPECIMEN 3





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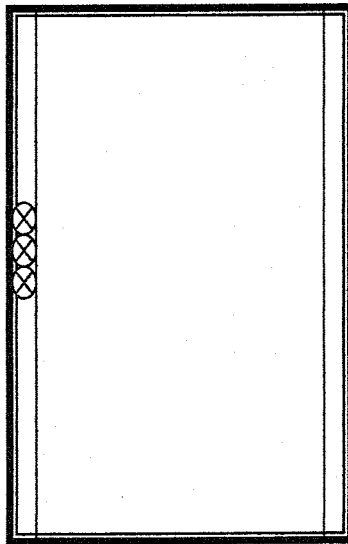
EFCO SERIES 5FXT FIXED WINDOW (SAFLEX)

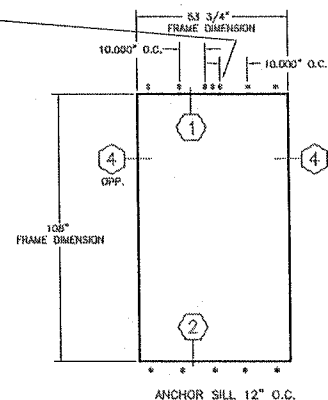
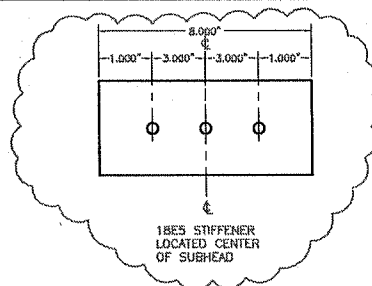
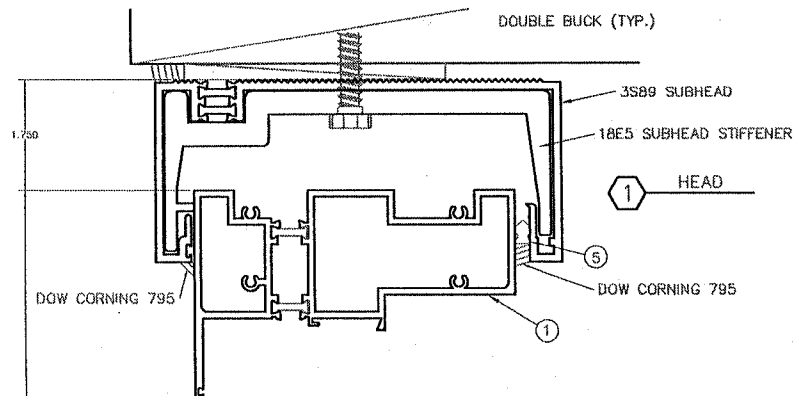
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APPENDIX B

DEFLECTION DIAGRAM

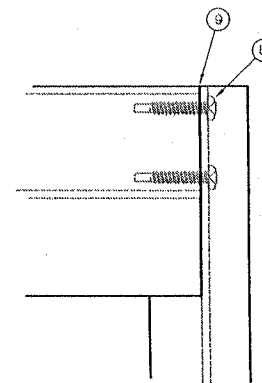
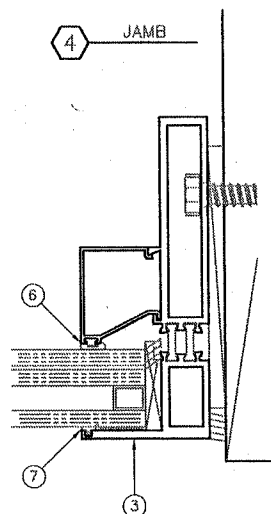
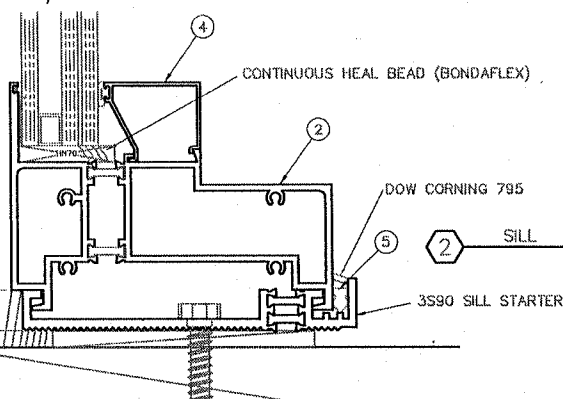




ITEM	# REQD	PART #	DESCRIPTION	MFG.
1	1	1889	HEAD	EFCO
2	1	1890	SILL	EFCO
3	2	1891	JAMB	EFCO
4	4	EW44	GLAZING BEAD	EFCO
5	AS REQD	WNA1	ARROW SHIM	
6	AS REQD	WAO4	BULB VINYL	CENTRAL PLASTICS
7	AS REQD	WS05	SEALANT DAM	CENTRAL PLASTICS
8	16	SLQ9	ASSEMBLY SCREWS	
9	4	H100	CORNER GASKET	REED RUBBER

INSULATED UNIT DESCRIPTION

1 3/16" NOMINAL INSULATED UNIT
 1/4" TEMPERED CLEAR
 3/8" AIRSPACE
 9/16" HEAT STRENGTHENED LAMINATED, (1/4" CLEAR, .060 SAFLEX, 1/4" CLEAR)



FRAME CORNER ASSEMBLY -
 SQR. CUT, END COPE, AND MECH. FASTENED.



CONSTRUCTION
 CONSULTING
 LABORATORY,
 INTERNATIONAL

1601 Luna Road
 Carrollton, Texas 75006
 Phone (972) 242-0556
 Report# 8350 Date 4/14/08
 Reviewed BY [Signature]

SMALL MISSILE IMPACT

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DRAWN BY SCC CHECKED BY
 DATE 8/6/07 DATE
 SCALE FULL REV.

EFCO CORPORATION
 1000 County Road - Monett, Missouri 65708

5FXT FIXED WINDOW
 D.P. ??? PSF - O.L. ???PSF - AIR-WATER-STRUC

REPORT#
 SHEET
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Small Missile 2 gpm