



TAS 201, 202 AND 203 AND ASTM E 1886 & 1996 PERFORMANCE TEST
EFCO, a PELLA COMPANY SERIES 5XPT SLIDING GLASS DOOR
REPORT #CCLI-08-082

May 12, 2008
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1. PROJECT DATA

Series Tested: EFCO Series 5XPT Sliding Glass Door (Saflex)
TAS 201, 202, 203 and ASTM E 1886 & 1996
Small Missile Impact

Date(s) of Testing: April 14 – April 17, 2008

Tested For: EFCO, a Pella Company
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 5XPT Sliding Glass Door. 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 85 PSF positive and 85 PSF negative in accordance with TAS 203 and ASTM E 1886 and achieved a positive test load of 127.5 PSF and a negative test load of 127.5 PSF in accordance with TAS 202. Tests were conducted at Construction Consulting Laboratory, *International* (CCLI) in Carrollton, TX.

3. TEST SPECIMEN

Product Type: Aluminum Sliding Glass Door, **Product Drawings, Appendix A**

Series / Model: Series 5XPT Sliding Glass Door

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

Frame Size: 3657.6 x 2813 (12'-0" x 9'-2 $\frac{3}{4}$ ")

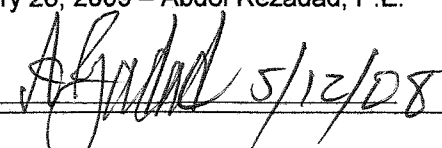
Active Panel Size: 1238.25 x 2660.65 (4'- $\frac{3}{4}$ " x 8'-8 $\frac{3}{4}$ ")

In-Active Panel Size: 1241.42 x 2692.4 (4'- $\frac{7}{8}$ " x 8'-10")

Fixed Panel Size: 1219.2 x 2692.4 (4'-0" x 8'-10")

Configuration: O.X.O

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Signature:  5/12/08



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WEATHER-STRIP: One (1) row of wool pile (part #WW78) at the interior face of frame head exterior leg. One (1) row of wool pile (part # WW98) at the exterior leg, interior face of in-active panel lock stile. One (1) row of Q-Lon bulb (part #WQO6) located at the exterior face of frame snap-in head filler, snap-in sill threshold, exterior face of fixed interlock stile, interior face of operable panel interlock stile, and the exterior face of in-active panel lock stile.

GLASS: 1³/₁₆" Nominal Insulated Unit: Exterior 1/4" tempered, 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.

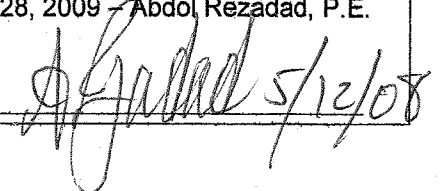
GLAZING: Interior glazed with Bondaflex® silicone at the exterior face of glass and heel bead at lateral perimeter of glass with rubber sealant dam part # (WS05) at exterior face of glass and aluminum glazing bead with drive in gasket at the interior of the glass.

WEEP ARRANGEMENT: Water weeps out from under operable panel over and around the sill wind load adaptor.

SEALANT: Fixed panel sealed in place with Bondaflex® silicone at the exterior perimeter of the panel top and bottom rail and at the jamb stile. Foam gasket at the frame and panel corner intersections with Bondaflex® silicone applied to the thermal break behind the gasket in all corner joinery locations. Arrow shim at the interior face between frame, subhead and sill starter capped with Bondaflex® silicone. Threshold and head filler (part #14N6) sealed to head and sill with Bondaflex® silicone at the exterior leg.

HARDWARE: Amesbury Lock double throw hardware attached to pull stile with two (2) # 10 x 25.4mm (1") machine screws per lock and handle attached to active panel stile with two (2) x 8 x 25.4mm (1") screws located approximately 1041.4mm (41") from the bottom. Stainless steel keeper attached to inactive panel lock stile with four (4) # 10 x 19.05mm (3/4") screws. Stainless steel tandem roller assembly located at each end of operable panel bottom rail attached with two (2) #10 x 9.52mm (3/8") screws. Wind load adapter (part #14B2) located at the sill track under the operable panel. The wind load adaptor is a reinforcement that fits into frame sill and is secured with two (2) set screws. Head spacer (part #14B1) located at the fixed panel top rail and frame head cavity.

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REINFORCEMENT: Extruded aluminum stiffener part # (18E3) located inside the fixed interlock attached at each end with one (1) #8 x 19.05mm ($\frac{3}{4}$ ") screw. Extruded aluminum stiffener part # (18E4) located inside the inactive panel lock stile attached at each end with one (1) #8 x 19.05mm ($\frac{3}{4}$ ") screw. 11" long aluminum channel shaped sub-head stiffener part # (18E5) above each integral vertical member inside the sub-head.

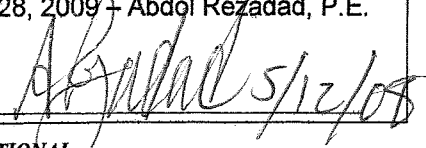
OTHER FEATURES: Frame corners are coped, butted, and connected with four (4) #10 x $1\frac{1}{4}$ " pilot point screws. Panel corners are coped, butted and connected with two (2) #10 x $1\frac{1}{4}$ " pilot point screws. Aluminum corner keys 63.5mm x 63.5mm x 19.05mm wide x 4.19mm thick ($2\frac{1}{2}$ " x $2\frac{1}{2}$ " x $\frac{3}{4}$ " wide x .165" thick) inserted into internal slots on each panel member. Panel and frame members are thermally broken with a double thermal strut.

INSTALLATION FEATURES: Test specimen was installed in a double #2 (2" x 10") yellow pine wood test buck. Sub-head, sill starter, and frame jamb attached to test buck with 15.9 mm x 101.6mm ($\frac{3}{8}$ " x 4") lag bolts. Sub-head anchor bolts located 508mm (20") from each vertical member along with the sub-head stiffener part # (18E5) with eight (8) $\frac{3}{8}$ " x 4" lag bolts per stiffener. Sill starter anchor bolts located 508mm (20") from each vertical member and five (5), 50.8mm (2") O.C. about centerline of meeting rail. Frame is inserted into sub-head and positioned and shimmed into sill starter with an interior applied rigid vinyl arrow shim (part #WNA1). Frame jamb anchor bolts spaced 152.4mm (6") from each end and on 304.8mm (12") centers.

4. PERFORMANCE RESULTS

<u>Title of Test</u>	<u>Test Method</u>	<u>Measured</u>	<u>Allowed</u>
Uniform Deflection	ASTM E 330-02		
Astragal Meeting Rail			
-4069.82Pa (85.00 PSF) Interior		8.38mm (.330")	15.18mm (.598")
-4069.82Pa (85.00 PSF) Exterior		8.763mm (.345")	15.18mm (.598")
Air Infiltration	ASTM E 283-04		
@ 300 Pa (6.24 psf)		<.5 L/s·m ² (<.1 cfm/sf)	1.5 L/s·m ² (0.30 cfm/sf)
Water Resistance	ASTM E 547 & 331-00		
@ 2394 Pa (33.00 PSF) without Screen		No Leakage	No Leakage
@ 2394 Pa (33.00 PSF) with Screen		No Leakage	No Leakage

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Specification: Testing Application Standard, Protocol 202.

<u>Title of Test</u>	<u>Test Method</u>	<u>Measured</u>	<u>Allowed</u>
Uniform Deflection	ASTM E 330-02		
Interlock			
-4069.82Pa (85.00 PSF) Interior		8.76mm (.345")	15.18mm (.598")
-4069.82Pa (85.00 PSF) Exterior		8.50mm (.335")	15.18mm (.598")
Uniform Deflection	ASTM E 330-02		
Astragal Meeting Rail			
-4069.82Pa (85.00 PSF) Interior		9.01mm (.355")	15.18mm (.598")
-4069.82Pa (85.00 PSF) Exterior		8.63mm (.340")	15.18mm (.598")
Uniform Deflection	ASTM E 330-02		
Subhead Reinforcements and Anchors			
-4069.82Pa (85.00 PSF) Interior		1.016mm (.04")	5.35mm (.211")
-4069.82Pa (85.00 PSF) Exterior		1.016mm (.04")	5.35mm (.211")
Uniform Structural	ASTM E 330-02		
Interior 30 second load		6104.73Pa (127.50 PSF)	6104.73Pa (127.50 PSF)
Interlock Permanent Set		2.667mm (.105")	5.28mm (.208")
Astragal Permanent Set		2.921mm (.115")	5.28mm (.208")
Subhead Permanent Set		1.016mm (.04")	1.8796 (.074")
Exterior 30 second load		6104.73Pa (127.50 PSF)	6104.73Pa (127.50 PSF)
Interlock Permanent Set		2.921mm (.115")	5.28mm (.208")
Astragal Permanent Set		2.794mm (.110")	5.28mm (.208")
Subhead Permanent Set		1.016mm (.04")	1.8796 (.074")

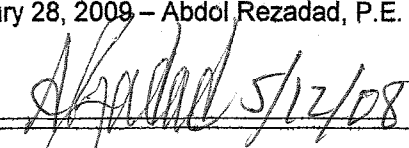
Specification: Testing Application Standard, Protocol 201 and ASTM E 1996
Test Specimen 1, Appendix B

Speed	Rotation	Title of Test	Measured	Allowable
130.1 fps	0°	Top Left Corner	No Penetration	See Section 5
130.5 fps	0°	Right Center of Panel	No Penetration	See Section 5
130.3 fps	0°	Lower Left Corner of Panel	No Penetration	See Section 5

Test Specimen 2

Speed	Rotation	Title of Test	Measured	Allowable
131 fps	0°	Top Rt Corner of Panel	No Penetration	See Section 5
129.5 fps	0°	Left/Center of Panel	No Penetration	See Section 5
130.2 fps	0°	Lower Right Corner	No Penetration	See Section 5

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Test Specimen 3

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

The Laboratory temperature was maintained at 62° 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 63° 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 large missile impact test.

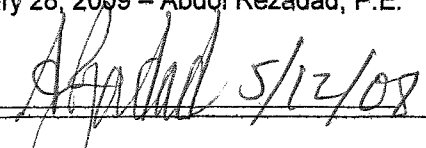
Specification: Testing Application Standard, Protocol 203 and ASTM E 1886
Test Specimens 1-3

Load	Sequence	Range	Cycle Time	Cycles	Damage
Direction 127.5 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 127.5 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

Interlock Deflections

Load	Sequence	Range	Deflect.	Allowed
Direction 127.5 PSF Positive	Cycle 1	0.2 P to 0.5 P	.215"	.598"
	Cycle 2	0 to 0.6 P	.240"	.598"
	Cycle 3	0.5 P to 0.8 P	.315"	.598"
	Cycle 4	0.3 P to 1.0 P	.340"	.598"
Load	Sequence	Range	Deflect.	Allowed
Direction 127.5 PSF Negative	Cycle 1	0.3 P to 1.0 P	.320"	.598"
	Cycle 2	0.5 to 0.8 P	.285"	.598"
	Cycle 3	0 to 0.6 P	.265"	.598"
	Cycle 4	0.2 P to 0.5 P	.240"	.598"

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Astragal Deflections

Load Direction	Sequence	Range	Deflect.	Allowed
127.5 PSF Positive	Cycle 1	0.2 P to 0.5 P	.250"	.598"
	Cycle 2	0 to 0.6 P	.275"	.598"
	Cycle 3	0.5 P to 0.8 P	.320"	.598"
	Cycle 4	0.3 P to 1.0 P	.365"	.598"
Load Direction	Sequence	Range	Deflect.	Allowed
127.5 PSF Negative	Cycle 1	0.3 P to 1.0 P	.370"	.598"
	Cycle 2	0.5 to 0.8 P	.360"	.598"
	Cycle 3	0 to 0.6 P	.300"	.598"
	Cycle 4	0.2 P to 0.5 P	.280"	.598"

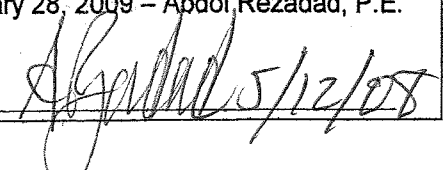
Anchor Deflections

Load Direction	Sequence	Range	Deflect.	Allowed
127.5 PSF Positive	Cycle 1	0.2 P to 0.5 P	.002"	.211"
	Cycle 2	0 to 0.6 P	.002"	.211"
	Cycle 3	0.5 P to 0.8 P	.004"	.211"
	Cycle 4	0.3 P to 1.0 P	.007"	.211"
Load Direction	Sequence	Range	Deflect.	Allowed
127.5 PSF Negative	Cycle 1	0.3 P to 1.0 P	.008"	.211"
	Cycle 2	0.5 to 0.8 P	.007"	.211"
	Cycle 3	0 to 0.6 P	.004"	.211"
	Cycle 4	0.2 P to 0.5 P	.003"	.211"

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.

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Signature: 



5. IMPACT ACCEPTANCE CRITERIA

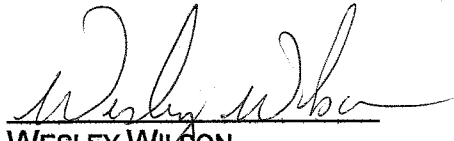
The test specimen shall resist the large missile impact with no tear formed longer than 5" (130mm) and wider than $\frac{1}{16}$ " (1.5875mm) through which air can pass or no opening formed through which a 3" (76mm) diameter solid sphere can freely pass when evaluated upon completion of missile impacts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

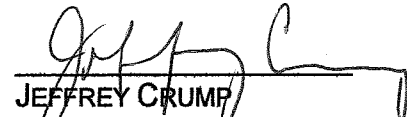
6. CONCLUSION

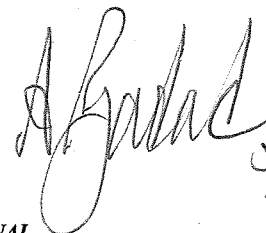
EFCO Corporation Series 5XPT Sliding Glass Door was tested in accordance with Testing Application Standard, Protocol 201, 202, 203 and ASTM E 1996-05b and ASTM 1886-05. Results are noted in Section 4 of this report.

Respectfully submitted,

CONSTRUCTION CONSULTING LABORATORY, *INTERNATIONAL*


WESLEY WILSON
LABORATORY MANAGER


JEFFREY CRUMP
TESTING MANAGER

 5/12/08

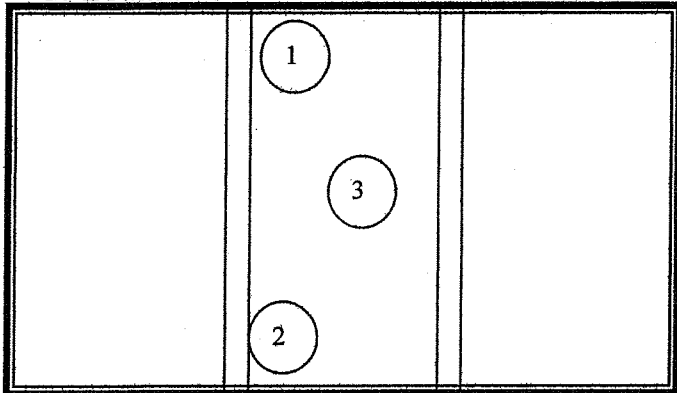


May 12, 2008

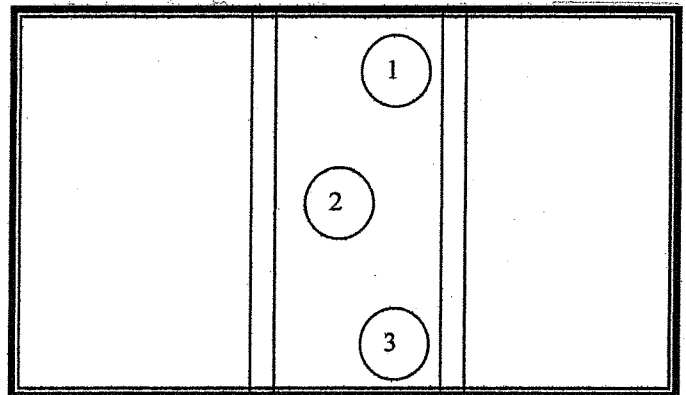
APPENDIX B

IMPACT DIAGRAM

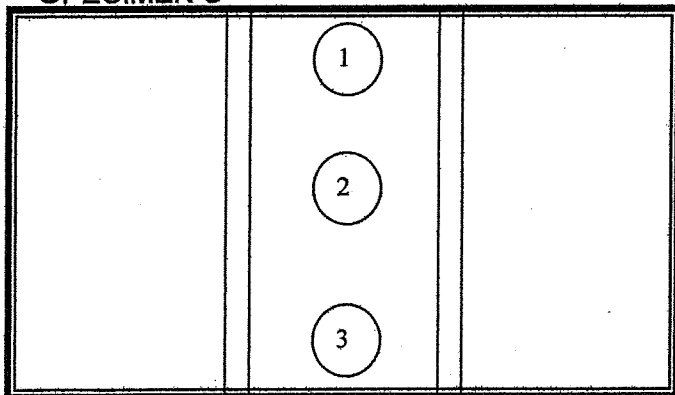
SPECIMEN 1



SPECIMEN 2



SPECIMEN 3

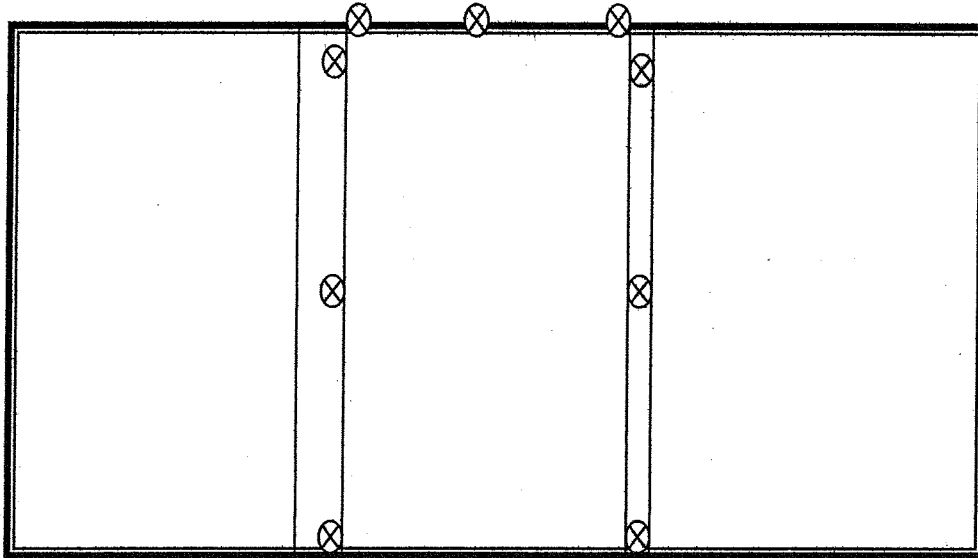




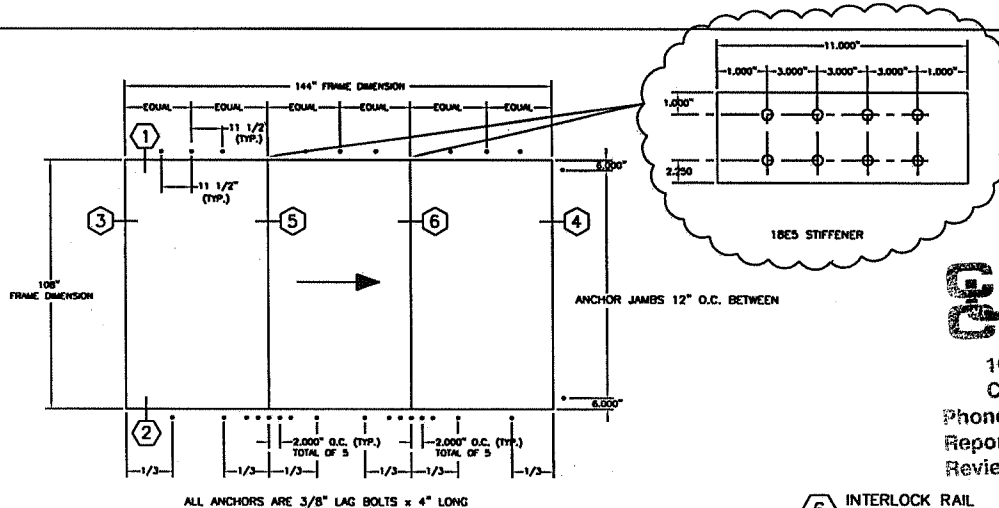
April 18, 2008

APPENDIX C

DEFLECTION DIAGRAM



- END OF REPORT -



E CONSTRUCTION
CONSULTING
LABORATORY,
INTERNATIONAL

1601 Luna Road
Carrollton, Texas 75006

Phone (972) 242-0556

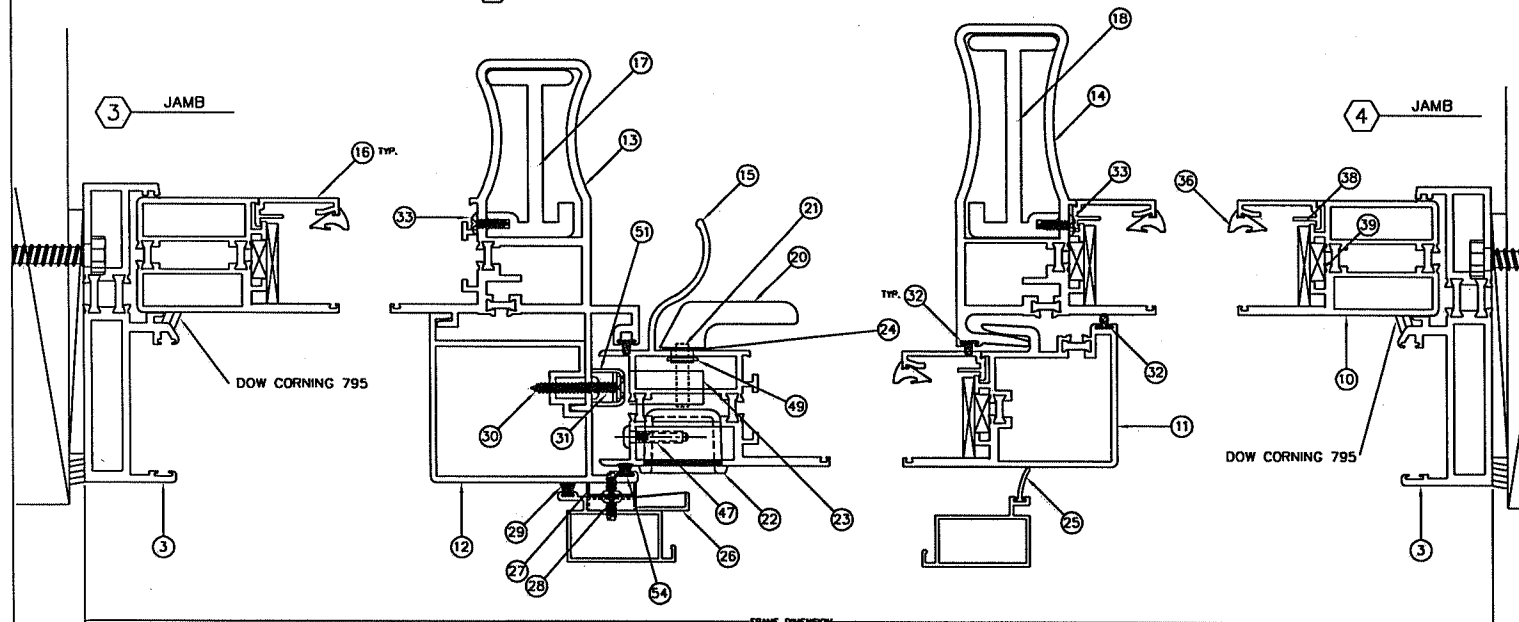
Report# 08-012, Date 5/11/08

Reviewed BY *[Signature]*

ALL ANCHORS ARE 3/8" LAG BOLTS x 4" LONG

5 OXO MEETING RAIL

6 INTERLOCK RAIL

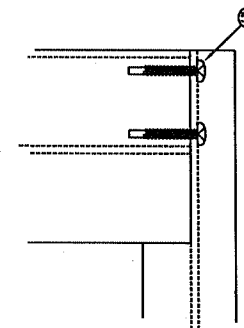
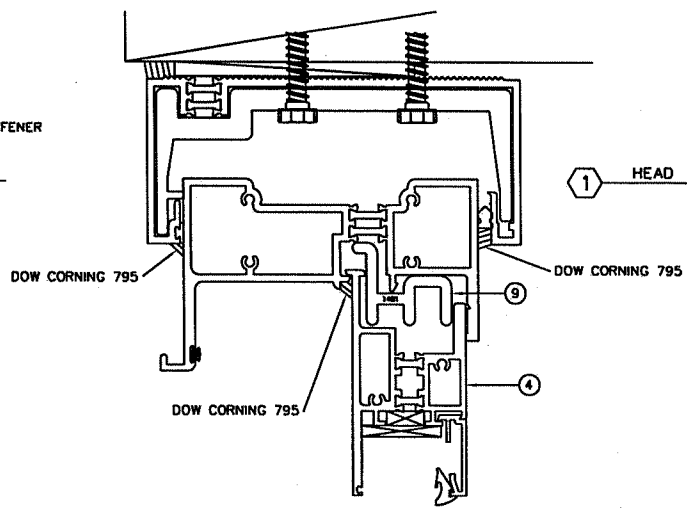
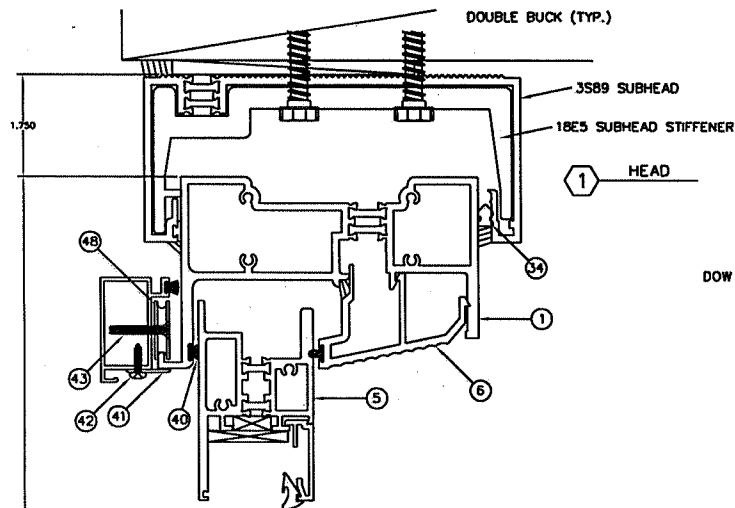


ITEM	#	RECD	PART #	DESCRIPTION	MFG.
1	1		1D04	HEAD	EFCO
2	1		1D05	SILL	EFCO
3	2		1D06	JAMB	EFCO
4	2		1D07	FIXED PANEL HORIZ.	EFCO
5	2		1D08	OPERABLE PANEL HORIZ.	EFCO
6	1		14N6	HEAD FILLER	EFCO
7	1		14N6	THRESHOLD	EFCO
8	1		14B2	WINDLOAD ADAPTER	EFCO
9	2		14B1	HEAD SPACER	EFCO
10	2		1D10	FIXED PANEL SIDE RAIL	EFCO
11	1		1D11	OPERABLE MEETING RAIL	EFCO
12	1		14E8	OXO MEETING RAIL	EFCO
13	1		1D15	OXO MEETING RAIL	EFCO
14	1		1D14	FIXED PANEL MEETING RAIL	EFCO
15	1		1D09	OPERABLE HARDWARE RAIL	EFCO
16	12		14M9	GLAZING BEAD	EFCO
17	1		18E4	OXO MEETING RAIL STIFFENER	EFCO
18	1		18E3	MEETING RAIL STIFFENER	EFCO
19	4		14F3	SCREEN FRAME	EFCO
20	1		HS27	THUMBTURN	BROOK CRAFT
21	1		HSA1	THUMBTURN SPINDLE	BROOK CRAFT
22	1		HS26	FLUSH PULL	BROOK CRAFT
23	1		HSV3	DEADLOCK	BROOK CRAFT
24	1		IGK8	NYLON WASHER	BROOK CRAFT
25	1		WS07	BUG FLAP	BROOK CRAFT
26	1		HB58	SCREEN LATCH	BROOK CRAFT
27	1		HB59	SCREEN KEEPER	BROOK CRAFT
28	6		STU8	LATCH, KEEPER FASTENER	BROOK CRAFT
29	3		WF18	SCREEN WOOL PILE	BROOK CRAFT
30	AS REQ'D		ST17	OXO MEETING RAIL FASTENER	BROOK CRAFT
31	1		STD3	KEEPER FASTENER	BROOK CRAFT
32	AS REQ'D		WQ06	O-LON WEATHERSTRIP	BROOK CRAFT
33	AS REQ'D		SFP6	STIFFENER FASTENERS	BROOK CRAFT
34	2		WNA1	ARROW SHIM	BROOK CRAFT
35	AS REQ'D		WS05	SEALANT DAM	BROOK CRAFT
36	AS REQ'D		WA04	BULB VINYL	BROOK CRAFT
37	3		WF18	SCREEN WOOL PILE	BROOK CRAFT
38	AS REQ'D		HN13	SIDE BLOCKS (EPDM)	BROOK CRAFT
39	AS REQ'D		HEP8	SIDE BLOCKS (EPDM)	BROOK CRAFT
40	AS REQ'D		WW78	WOOL PILE	BROOK CRAFT
41	2		1990	SCREEN ANTI-TAKEOUT	BROOK CRAFT
42	4		SPP7	ANTI-TAKEOUT FASTENER	BROOK CRAFT
43	2		ST11	SCREEN ROLLER FASTENER	BROOK CRAFT
44	2		HNE1	SETTING BLOCK	BROOK CRAFT
45	AS REQ'D			SILICONE BACKBED	BROOK CRAFT
46	1		LA1A	ROLLER TRACK	BROOK CRAFT
47	2		MT26	FLUSH PULL FASTENER	BROOK CRAFT
48	2		HR38	SCREEN ROLLER	BROOK CRAFT
49	1		HL95	RETAINER RING	BROOK CRAFT
50	36		SLO9	ASSEMBLY SCREWS	BROOK CRAFT
51	1		HST0	KEEPER	BROOK CRAFT
52	2		HR41	TANDOM ROLLER	BROOK CRAFT
53	4		ST15	ROLLER FASTENER	BROOK CRAFT
54	1		WW98	WOOL PILE	BROOK CRAFT

SMALL MISSILE IMPACT

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DRAWN BY	SCC	CHECKED BY	SCALE	REV.	EFCO CORPORATION	5XPT SLIDING GLASS DOOR	REPORT#	SHEET
DATE	6/22/07	DATE	FULL		1000 County Road - Monett, Missouri 65708	D.P. ??? PSF - O.L. ???PSF - AIR-WATER-STRUC	##-####-##	1 of 2

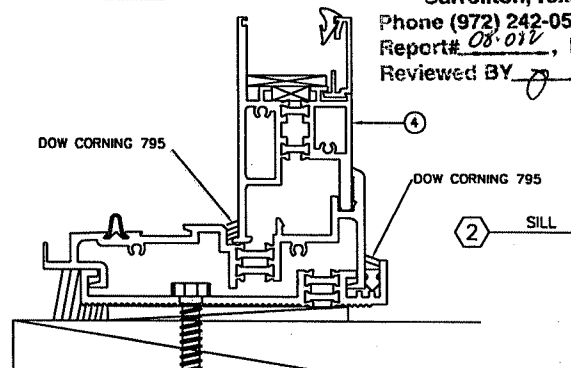
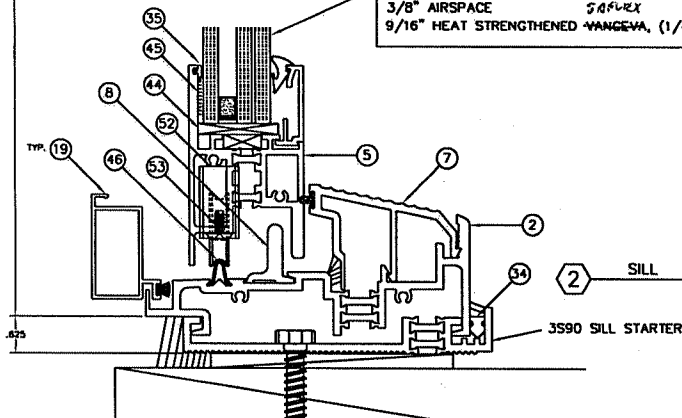


FRAME CORNER ASSEMBLY -
SQR. CUT, END COPED, AND MECH. FASTENED.

INSULATED UNIT DESCRIPTION

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

FRAME DIMENSION



SASH CORNER ASSEMBLY -
SQR. CUT, END COPED, AND MECH. FASTENED.

CONSTRUCTION
CONSULTING
LABORATORY,
INTERNATIONAL

1601 Luna Road
Carrollton, Texas 75006

Phone (972) 242-0556

Report# 08-012, Date 5/14/08

Reviewed BY [Signature]

SMALL MISSILE IMPACT

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DRAWN BY	SCC	CHECKED BY		SCALE	FULL	REV.	
DATE	6/22/07	DATE					

EFCO CORPORATION
1000 County Road - Monett, Missouri 65708

5XPT SLIDING GLASS DOOR
D.P. ??? PSF - O.L. ???PSF - AIR-WATER-STRUC

REPORT#
##-####-##

SHEET
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