



## 1. PROJECT DATA

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

**Date(s) of Testing:** March 7-17, 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 (Vanceva). Tests were conducted in accordance with Testing Application Standard, Protocol 201, 202, 203 and ASTM E 1886 & 1996. Specimens were impacted with a 94", 9 lb. large missile in accordance with TAS 201 and ASTM E 1996, cycled at a Design load of 120 PSF positive and 140 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 210 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**

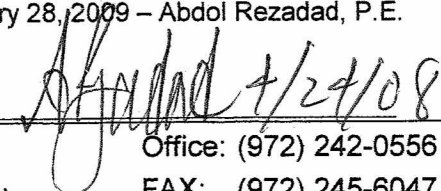
**SERIES/MODEL:** Series 5FXT Fixed Window (Vanceva)

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

**FRAME SIZE:** 4'-5<sup>3</sup>/<sub>4</sub>" x 9'-2<sup>3</sup>/<sub>8</sub>" (with sub-head and sub-sill)  
4'-5<sup>3</sup>/<sub>4</sub>" 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



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<sup>3</sup>/<sub>16</sub>" Nominal Insulated Unit: Exterior 1/4" tempered, 3/8" air space, 9/16" Viracon (Vanceva) laminated glass, 1/4" heat strengthened glass, .075" interlayer, and 1/4" heat strengthened glass.

**GLAZING:** Interior glazed with silicone at the exterior of glass and aluminum glazing stop (part #18AO) at the interior of glass. Glazing stop is attached with #8 x 3/4" tek screws, on 12" centers with drive in gasket (part #WNE1) wedged between glass and glazing stop.

**WEEP ARRANGEMENT:** None.

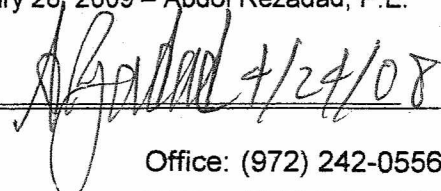
**SEALANT:** Foam gasket at the frame intersections. Arrow shim (part #WNA1) sealed in place with silicone at frame subhead and subsill, at the interior face of frame. Subhead sealed to frame head at exterior face.

**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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Signature:  4/24/08

**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<br>Anchors   | ASTM E 330-02       |                          |                          |
| -120.00 PSF Positive            |                     | 0.01"                    | 0.068"                   |
| -140.00 PSF Negative            |                     | 0.015"                   | 0.068"                   |
| Air Infiltration<br>@ 6.24 PSF  | ASTM E 283-04       | 0.01 cfm/ft <sup>2</sup> | 0.30 cfm/ft <sup>2</sup> |
| Water Resistance<br>@ 33.00 PSF | ASTM E 547 & 331-00 | No Leakage               | No Leakage               |
| Uniform Deflection<br>Anchors   | ASTM E 330-02       |                          |                          |
| -120.00 PSF Positive            |                     | 0.01"                    | 0.057"                   |
| -140.00 PSF Negative            |                     | 0.025"                   | 0.057"                   |
| Uniform Structural              | ASTM E 330-02       |                          |                          |
| -Positive 30 second load        |                     | 180.00 PSF               | 180.00 PSF               |
| -Negative 30 second load        |                     | 210.00 PSF               | 210.00 PSF               |
| -Permanent Set                  |                     | 0.01"                    | 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     |
|----------|----------|--------------------|----------------|---------------|
| 50.2 fps | 0°       | Center of Panel    | No Penetration | See Section 5 |
| 50.9 fps | 0°       | Upper Right Corner | No Penetration | See Section 5 |

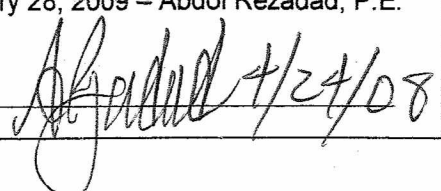
**Test Specimen 2**

| Speed    | Rotation | Title of Test     | Measured       | Allowable     |
|----------|----------|-------------------|----------------|---------------|
| 49.8 fps | 0°       | Lower Left Corner | No Penetration | See Section 5 |
| 50.4 fps | 0°       | Center of Panel   | No Penetration | See Section 5 |

**Test Specimen 3**

| Speed    | Rotation | Title of Test      | Measured       | Allowable     |
|----------|----------|--------------------|----------------|---------------|
| 51.1 fps | 0°       | Upper Right Corner | No Penetration | See Section 5 |
| 50.7 fps | 0°       | Center of Panel    | No Penetration | See Section 5 |

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**EFCO SERIES 5FXT FIXED WINDOW (VANCEVA)**

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The Laboratory temperature was maintained at 66° 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 68° 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.

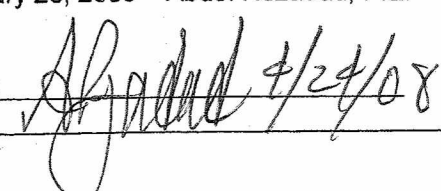
**Specification: Testing Application Standard, Protocol 203 and ASTM E 1886  
Test Specimens 1-3**

| Load                             | Sequence | Range          | Cycle Time  | Cycles | Damage |
|----------------------------------|----------|----------------|-------------|--------|--------|
| Direction<br>120 PSF<br>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<br>140 PSF<br>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<br>120 PSF<br>Positive | Cycle 1  | 0.2 P to 0.5 P | .005"      | .068"   |
|                                  | Cycle 2  | 0 to 0.6 P     | .02"       | .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<br>140 PSF<br>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 | .01"       | .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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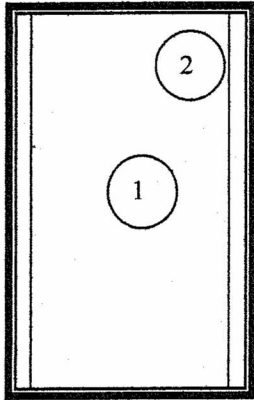
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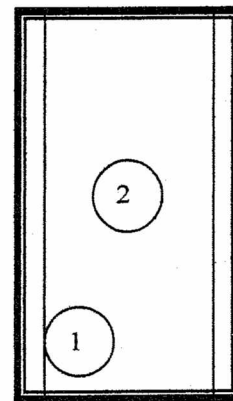
## APPENDIX A

### IMPACT DIAGRAM

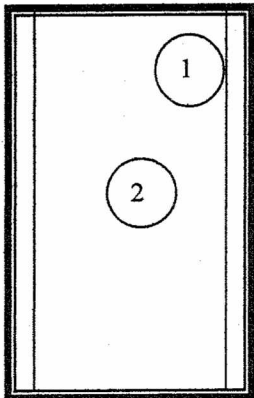
SPECIMEN 1



SPECIMEN 2



SPECIMEN 3





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

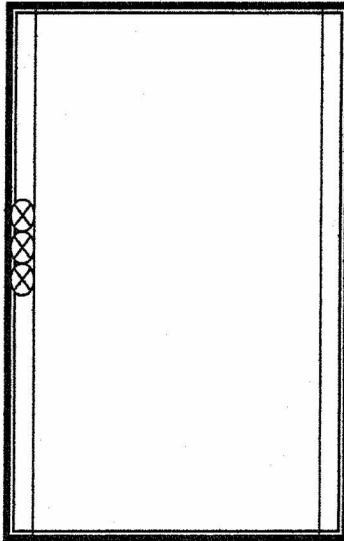
## **EFCO SERIES 5FXT FIXED WINDOW (VANCEVA)**

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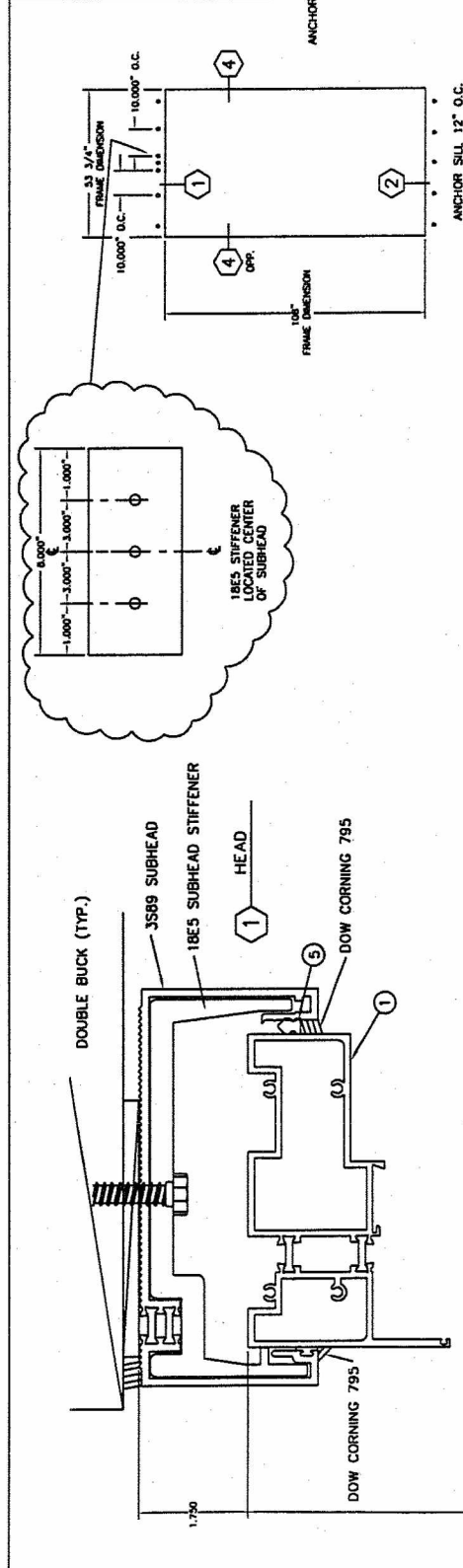
April 18, 2008

### **APPENDIX B**

#### **DEFLECTION DIAGRAM**

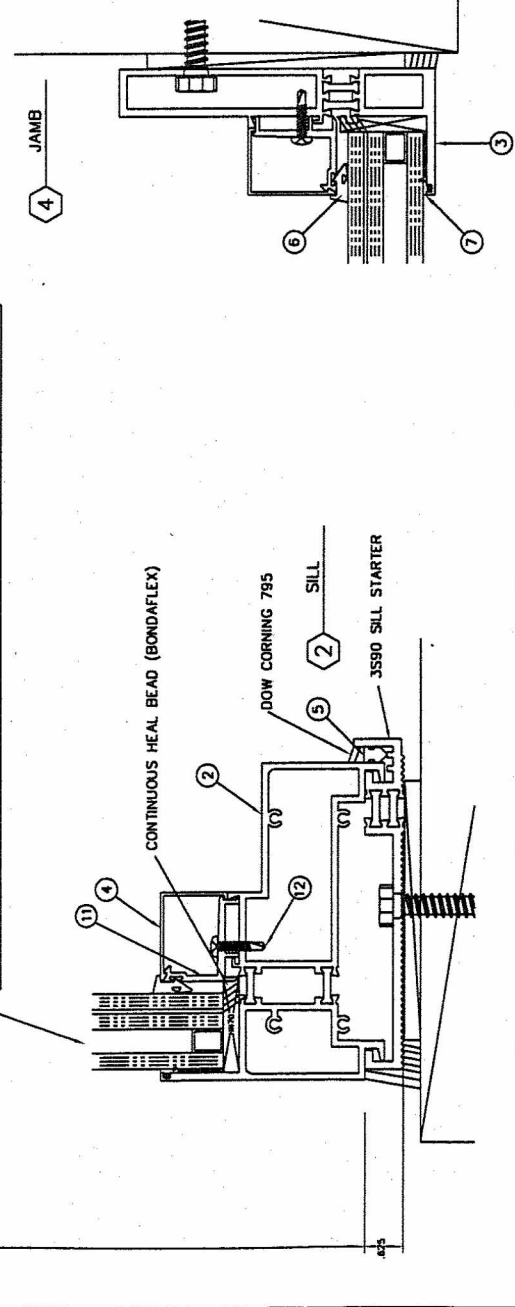


| ITEM # | REC'D   | PART # | DESCRIPTION         | MFG.             |
|--------|---------|--------|---------------------|------------------|
| 1      | 1       | 1889   | HEAD                | EFCO             |
| 2      | 1       | 1890   | SILL                | EFCO             |
| 3      | 2       | 1891   | JAMB                | EFCO             |
| 4      | 4       | 18A1   | GLAZING BEAD        | EFCO             |
| 5      | AS REQD | WNA1   | ARROW SHIM          | GENERAL PLASTICS |
| 6      | AS REQD | WNE1   | DRIVE-IN            | GENERAL PLASTICS |
| 7      | AS REQD | WS05   | SEALANT DAM         | GENERAL PLASTICS |
| 8      | 16      | SLO9   | ASSEMBLY SCREWS     | REC'D            |
| 9      | 4       | H10G   | CORNER GASKET       | REC'D            |
| 11     | 4       | 18A0   | GLAZING STOP        | EFCO             |
| 12     | 30      | STKO   | GLAZING STOP SCREWS | EFCO             |



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

**INSULATED UNIT DESCRIPTION**  
 1 3/16" NOMINAL INSULATED UNIT  
 1/4" TEMPERED CLEAR  
 3/8" AIRSPACE  
 9/16" VIRACON VANCEVA LAMINATED GLASS (.075 INTERLAYER) HEAT STRENGTHENED



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

**CE**  
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 Reviewed BY *[Signature]*

LARGE MISSILE IMPACT