Force Engineering & Testing Inc.
19530 Ramblewood Drive
Humble, Texas 77338
Phone: (281) 540-6603
Fax: (281) 540-9966

Project Number : 13-0459T-08G-I

Test Report Date : March 3, 2009

Test Material : 8" x 2.5" ZEE w/ Tophat

Test Procedure : AISI Uplift Load Base Test

Test Location : Force Engineering & Testing Inc.
19530 Ramblewood Drive
Humble, Texas 77338

Maimi Dade County Lab Certification No: 05-1122.13

14 GA. REG STRENGTH TOPHAT UPLIFT TEST

Report Prepared by:

Brandon Jasek, P.E.

Report Reviewed by:

Terrence E. Wolfe, P.E.

Project Number : 13-0459T-08G-I

PURPOSE:

The purpose of this test was to analyze the bracing effects on the purlins that the Tophat adds to a through fastened panel system when subjected to a uplift load.

TEST DATES:

December - January 2009

TEST ASSEMBLY:

Panel & Purlin Manufacturer

Manufacturer: Whirlwind Steel Buildings, Inc.
8234 Hansen Road
Houston, TX 77075
Roof Panel: 26 Ga. Super Span X, 36" Coverage, 1 ¼" tall Corrugations.
Panel Fastener: #12-14 x 1" HWH @ 12"-12"-12" Fastener Pattern
¼-14 x 7/8" Lap Tek @ 20" O.C. in panel side lap
Panel Length: 7'-0"
Purlin: 8" x 2.5" ZEE 16 Ga.
Purlin Length: 25'-7 ½", Span = 25'-0"

Tophat Manufacturer

Manufacturer: TopHat Framing Systems
8660 Lambright
Houston, TX 77075
Tophat: 14 Ga. Regular Strength, 3 ½" Tall Hat section w/ R Panel punch out pattern, 0.072" Material Thickness, Fy = 50.6 ksi (Per Tensile Test See Appendix)
Tophat Fastener: (2) #12-14 x 1-1/4" HWH per foot
Tophat Length: 25'-0", No Splice

TESTING APPARATUS:

High Pressure Blower:	New York Blower, 15 hp, 900 cfm.
Test Chamber:	26' x 8' steel chamber.
Mounting Frame:	W8x10 Steel Beams
Pressure Indicator:	Heise Digital Pressure Indicator Model #901B, (+/-) 300-psf range, with max./min. hold features.
Deflection Indicators:	aluminum rulers calibrated to 1/64".

Project Number : 13-0459T-08G-I

INTRODUCTION:

The purpose of this test series was to obtain the moment reduction factor used in determining the nominal flexural strength of a purlin in negative bending supporting a through fastened panel system with a tophat added. The moment reduction factor reflects the ability of existing through fastened panel system with the added tophat to provide lateral and torsional bracing to the purlins to which it is attached. This test is based on the base test procedure provided by the 1996 AISI COLD-FORMED STEEL SPECIFICATION SUPPLEMENT NO. 1 APPENDIX A, JULY 30, 1999. This publication contains all variables, definitions, requirements and calculations for The Base Test Method.

PROCEDURE:

1. The purlins were installed at 5'-0" O.C. upon the steel supporting frames within the pressure chamber simulating recommended field attachment. The purlin clips were slotted on one end to eliminate any centenary forces that might be induced due to the connection.
2. With purlin installation complete, the Super Span X panels were installed.
3. Tophats were then installed over the panels over each purlin.
4. With construction complete, vertical deflection indicators were placed at mid-span of both purlins. A horizontal deflection indicator was placed at the seam nearest to the purlins' mid-span.
5. The test was set at 5 psf and held for minute. After the initial set, a zero reading was taken then positive pressure applied in the increments shown on the data sheets until failure. Deflection readings were taken at each increment and are shown on the data sheets.
6. The above steps were used for three purlins.

RESULTS/CONCLUSIONS:

The 8x2.5 x 16 Ga. Zee failed at 34.85 psf, 33.10 psf and 32.93 psf. The mode of failure was buckling of the purlin bottom stiffener lip in all three test. From the calculation page, the modification factor R = 0.900.

Note: During this test, tape and plastic were used to seal against air leakage. The tape and plastic had no restrictive influence on the test.

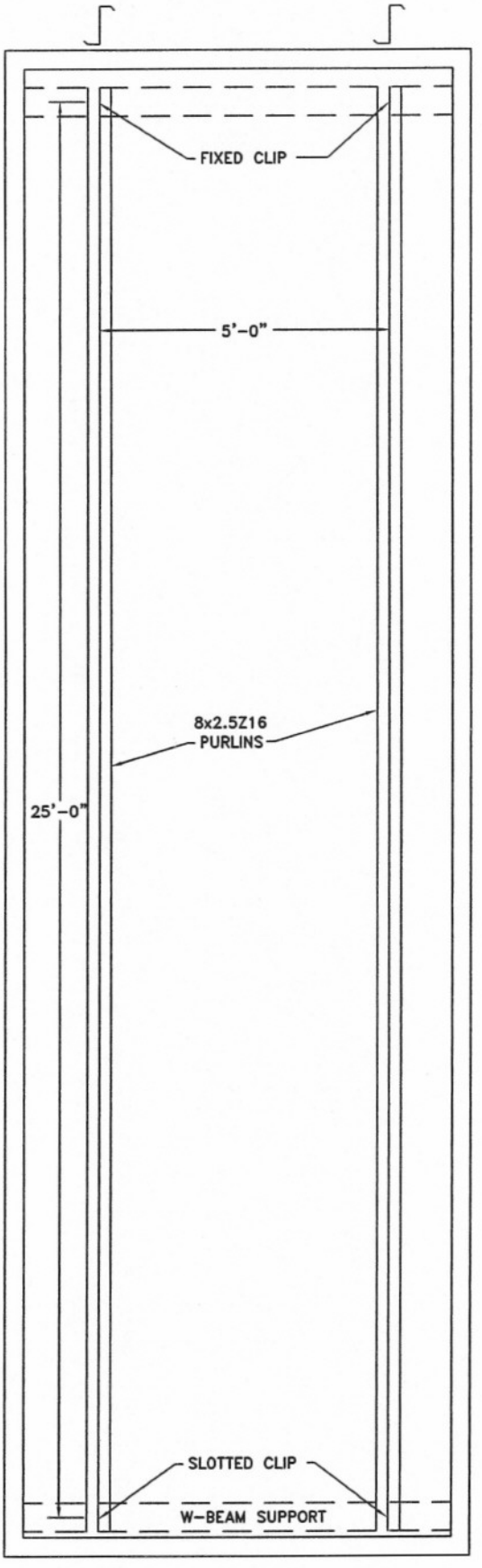
STATEMENT OF INDEPENDENCE:

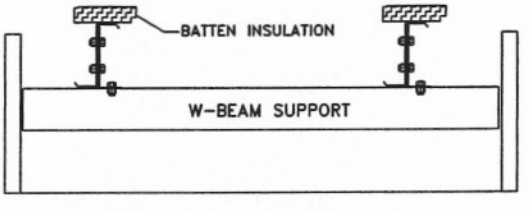
Force Engineering & Testing, Inc. or any persons employed by them do not have any financial interest in Whirlwind or TopHat Framing Systems.

Force Engineering & Testing, Inc. is not owned, operated or controlled by Whirlwind or TopHat Framing Systems.

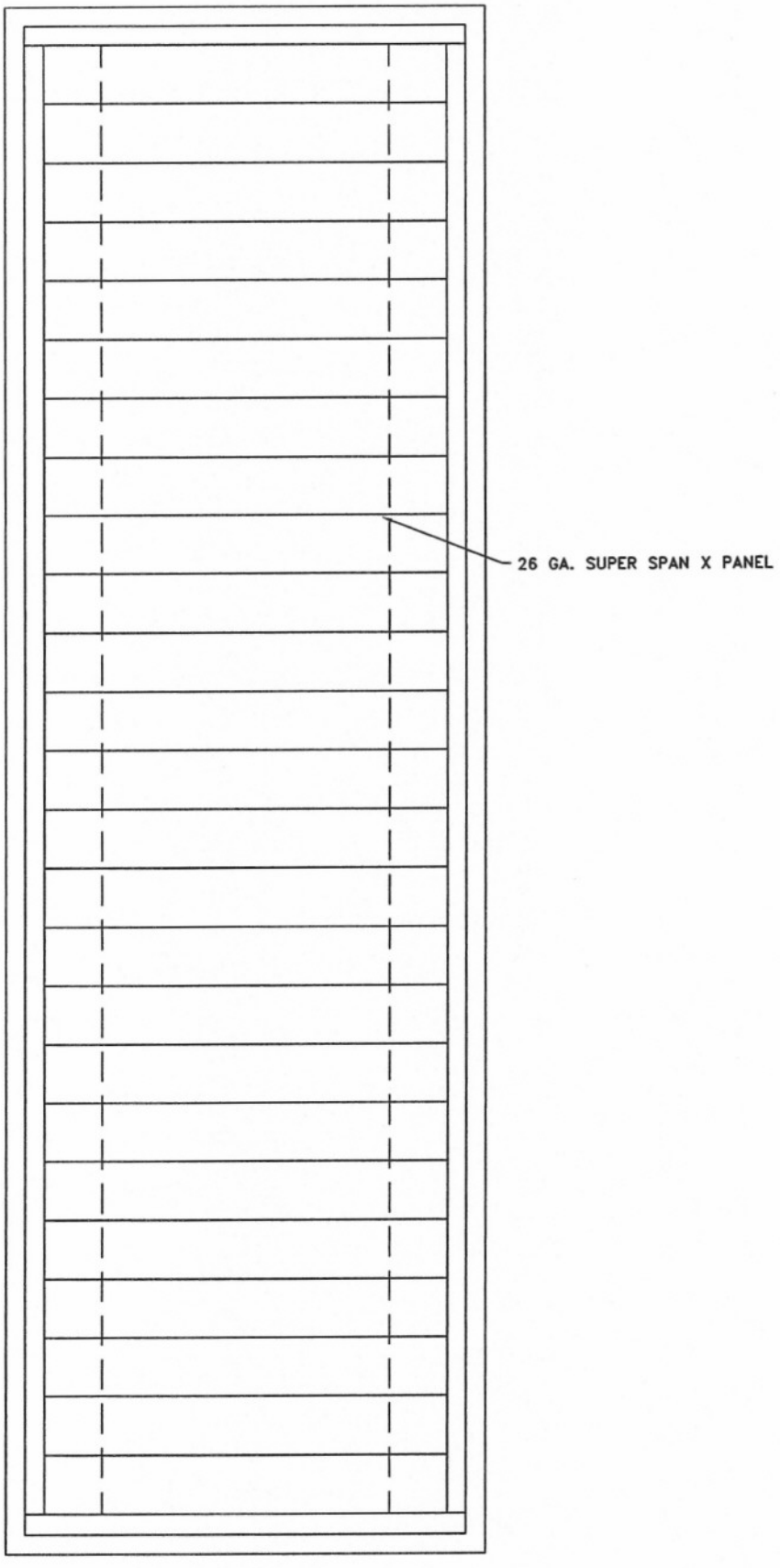
Appendix

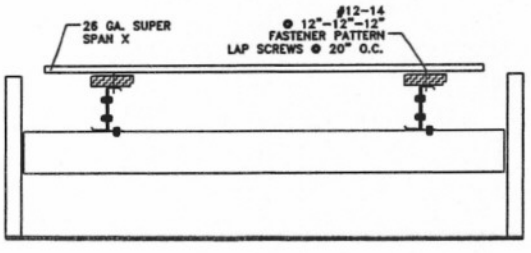
PURLIN LAYOUT



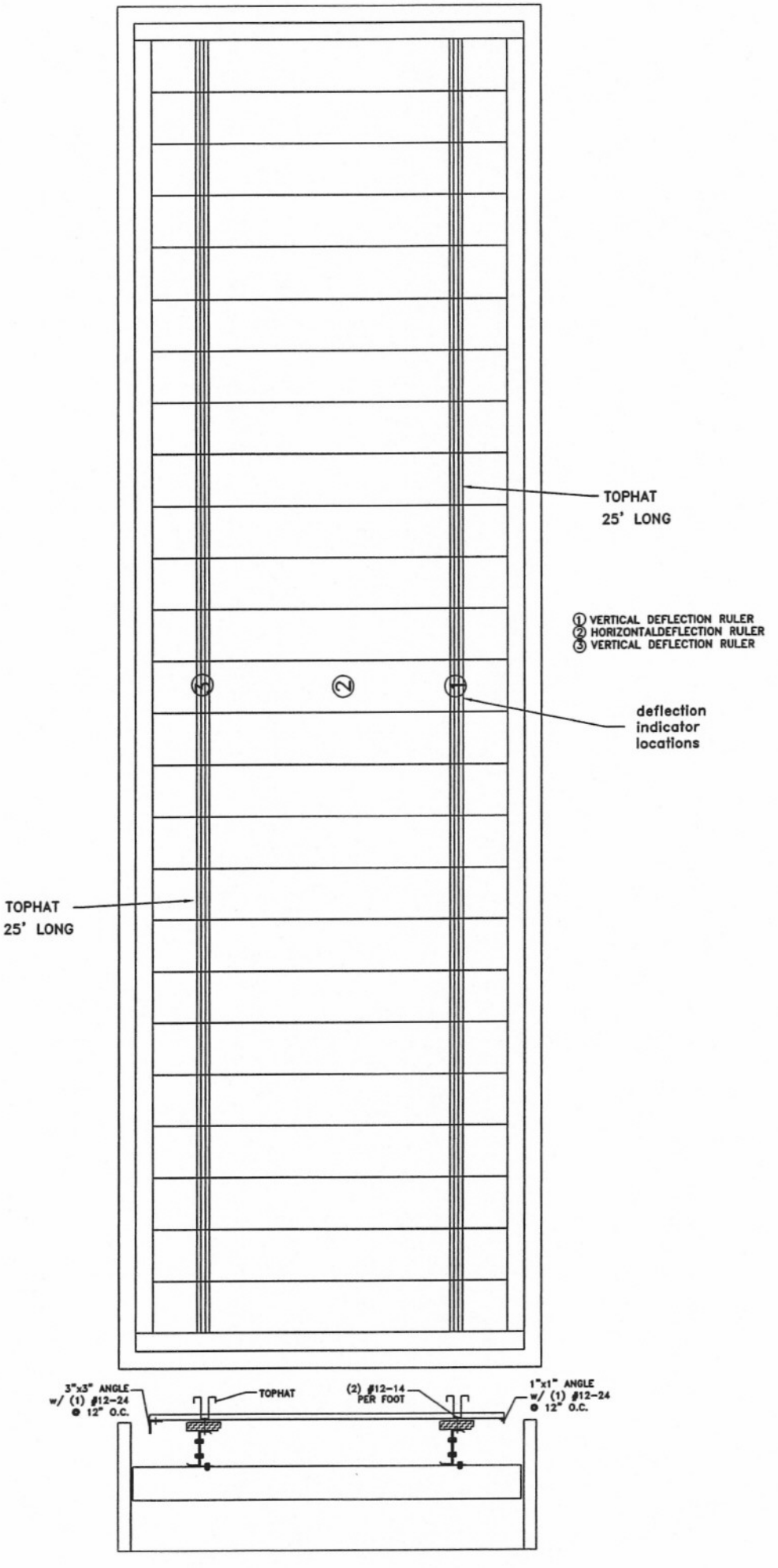


PANEL LAYOUT





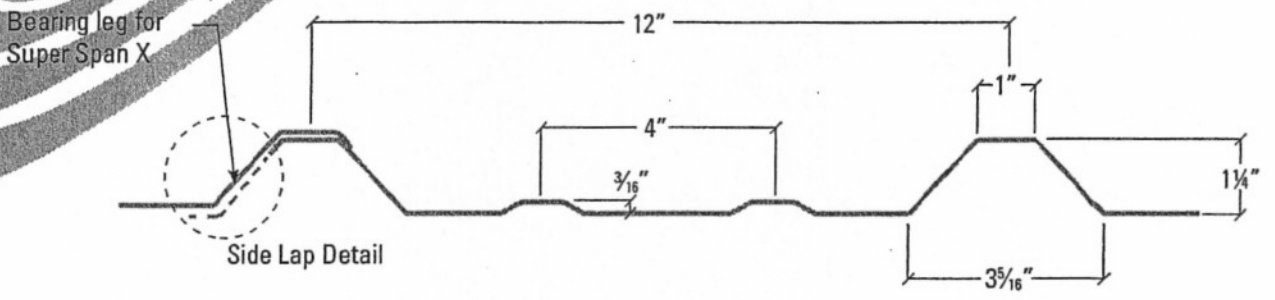
TOPHAT LAYOUT

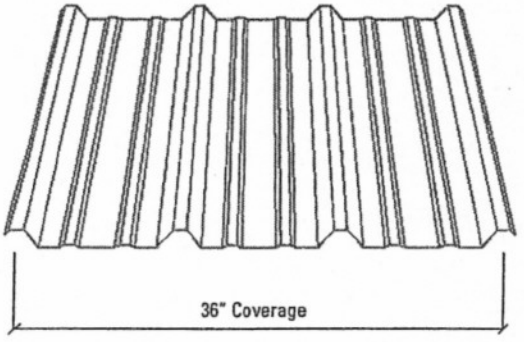


WHIRLWIND BUILDING COMPONENTS
Corporate Headquarters • 8234 Hansen Rd, Houston, TX 77075
(Phone) 713.946.7140 | (Fax) 832.553.4700 | (US Wats) 800.324.9992

Metal Construction Association

SUPER SPAN-X





SUPER SPAN-X DESIGN PROPERTIES						
			TOP IN COMPRESSION		BOTTOM IN COMPRESSION	
GAUGE/ THICKNESS	F_y (KSI)	F_b (KSI)	I_x (In^4-Ft)	M_a (Kip-In/Ft)	I_x (In^4-Ft)	M_a (Kip-In/Ft)
26 (t=.0170")	60*	0.83	0.0370	1.2697	0.0323	1.6610
26 (t=.0176")	60*	0.86	0.0380	1.4057	0.0337	1.7230
24	50	1.09	0.0570	1.7500	0.0467	1.8633

* Fy is 80-ksi reduced to 60-ksi in accordance with the 2001 edition of the *North American Specification For Design Of Cold-Formed Steel Structural Members - A2.3.2.*

NOTES:
1. All section properties are calculated in accordance with the 2001 edition of the *North American Specification For Design Of Cold-Formed Steel Structural Members.*
2. Ix is for deflection determination.
3. Mx is allowable bending moment.

MATERIALS
Unless otherwise specified, the exposed surfaces of all panels shall be either clear acrylic coated or factory painted GALVALUME®. GALVALUME® is a zinc-aluminum alloy coating that is applied to the base steel material. Acrylic coated GALVALUME® shall have a Coating Class AZ55 (0.55 ounces (combined total of both sides) per square foot). Factory painted GALVALUME® shall have a minimum Coating Class AZ50 (0.50 ounces (combined total of both sides) per square foot). GALVALUME® coated steel for panels shall conform to ASTM A792, Structural Quality. The 26 gauge panel shall conform to Grade 80 (80 ksi minimum yield strength); the 24 gauge panel shall conform to Grade 50 (50 ksi minimum yield strength). All material shall be ordered to a minimum decimal thickness. Minimum ordered thickness for coated steel products always includes the thickness of the coating.

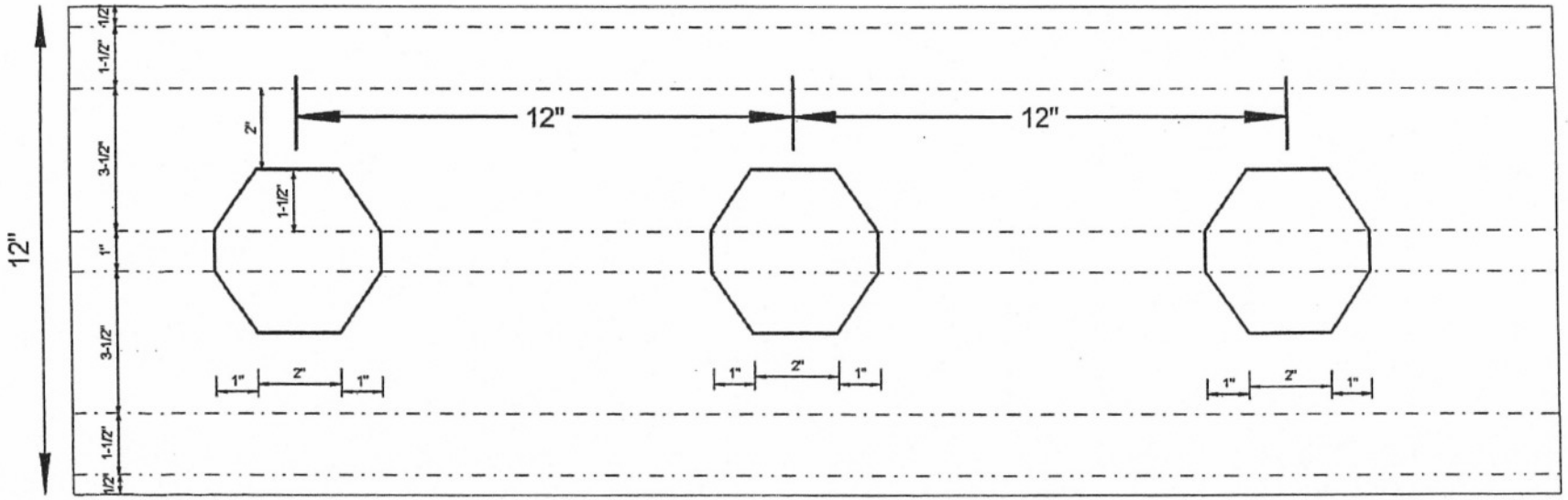
PAINTED FINISH
All painted GALVALUME® shall be factory coated by a firm which coats coil products exclusively. The coater shall be responsible for ensuring color consistency, paint film hardness, and paint film thickness. Each side of the GALVALUME® will be coated with 0.2 mils baked-on primer before the color coating. The 26 gauge panel shall receive a baked-on silicone polyester finish coat on the exposed side. The 24 gauge panel shall receive a KYNAR 500® Fluoropolymer finish coat on the exposed side. Thickness of the finish coat will be a nominal 1.0 mils (including the primer coat). A baked-on straight polyester wash coat will be applied on the non-exposed side. Thickness of the wash coat will be a nominal 0.5 mils (including the primer coat).

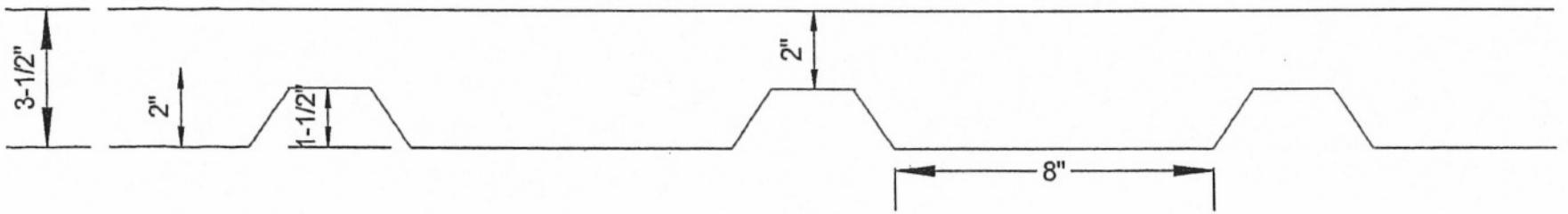
LIMITED MATERIAL WARRANTY
Specific conditions concerning each finish shall be covered in detail on the written warranty issued, on request, with each order. Minimum roof slope - 1/2:12. GALVALUME® panels shall have a twenty-five year limited warranty providing that GALVALUME® panels will not rupture, fail structurally, or perforate within a period twenty-five years after shipment due to exposure to normal atmospheric corrosion. The clear acrylic finish does not carry a warranty. The 26 gauge factory coated GALVALUME® panel shall have a thirty-year limited color finish warranty from peeling and cracking, and a twenty-five year limited color finish warranty from excessive chalking and color change (fading). The 24 gauge factory coated GALVALUME® panel shall have a thirty-year limited color finish warranty from excessive chalking and color change (fading), peeling and cracking. The wash coat does not carry a warranty.

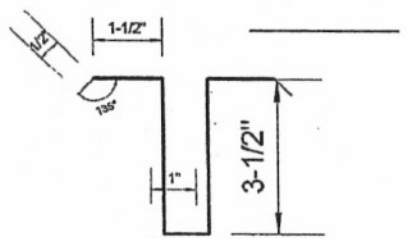
- **UL CONSTRUCTION NO. 167**
- **UL 580 UP-LIFT TESTED CLASS 90 RATED**
- **UL 2218 HAIL IMPACT RESISTANT TESTED INCLINED: UNLIMITED IMPACT: CLASS 4**
- **FLORIDA PRODUCT APPROVAL FL# 1845.3**

PANELS
Panel coverage will be 36" to the weather. Maximum panel length shall be 40'-0". Where endlaps are required, they shall be a minimum of 4" and shall occur at a purlin. A roof installed as listed in UL Construction No. 167 shall meet the requirements of Underwriters Laboratories standard UL 580 Class 90 for uplift resistance. All installations shall be in accordance with standard industry practices. Before securing, all laps of roof panels shall be sealed with a continuous ribbon of tape sealant. A closure strip shall be installed at the eave. Panels shall be secured to intermediate framing members with sheet metal screws at a maximum spacing of 12" on center. At endlaps, the maximum screw spacing shall be 6" on center. Sheet metal stitch screws at a maximum of 20" on center shall be installed at sidelaps. The panel must not rest on the concrete foundation; the panel must sit 1/8" above the concrete. Panels shall be furnished square cut.

Houston, TX (800) 324-9992
Lithia Springs, GA (800) 363-8142
Claremore, OK (877) 875-0077
Lathrop, CA (866) 922-2216
Freeport, MN (888) 836-7203


12"
1-1/2"
3-1/2"
1"
3-1/2"
1-1/2"
1/2"
2"
12"
12"
1-1/2"
1"
2"
1"
1"
2"
1"
1"
2"
1"


3-1/2"
2"
1-1/2"
2"
8"


1/2"
1-1/2"
135°
1"
3-1/2"

MTEC
MECHANICAL
TESTING
SERVICES

ISO 9001-2000

CERTIFICATE OF TEST

ATTENTION : BRANDON JASEK
CUSTOMER : FORCE ENGINEERING & TESTING INC.
19530 RAMBLEWOOD DR
HUMBLE, TX 77338

8676 TAUB ROAD
Houston, TX 77064
281/469-2609

LAB# : W0901584

DATE : 02/12/09 12:16:02
PO NO :13-0459T-08
SPECIMEN :14RTP

TEST DATA

REDUCED SECTION TENSILE

UTS PSI	YS.2%PSI	%EL	%RA	WIDTH	THICK	AREA IN.
59,500	50,600	34.70	59.40	0.500	0.072	0.036

Alta S. Hall
MTEC Representative

Data Sheets

Base Test Deflection Readings

Project #: 13-0459T-08G
Test: Uplift Base Test #1
Panel: 26 Ga. PBR 12"-12"-12" Fastener Pattern x 7'-0" Long
Purlin: 8x2.5ZEE 16 Ga. 25' Span spaced @ 5'-0" O.C. Facing same direction
Tophat: 14 ga. Reg Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1-1/4" Per foot
Date: 12/5/2008

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	27.1250	27.3125	17.8750
3.00	27.2500	27.4375	17.8750
6.00	27.5000	27.7500	17.8750
9.00	27.6875	27.9375	17.8125
12.00	27.8750	28.1250	17.8125
15.00	28.0625	28.3125	17.8125
18.00	28.1875	28.4375	17.8125
21.00	28.3750	28.5625	17.8125
24.00	28.5625	28.6875	17.8125
27.00	28.7500	28.8125	17.8125
30.00	28.9375	29.0000	17.8125
33.00	29.1875	29.1875	17.8125
36.00	FAILED @ 34.85 PSF		

Ultimate Test Pressure: 34.85 psf
Mode of Failure: Purlin Bottom Lip Buckled

Base Test Deflection Readings

Project #: 13-0459T-08H
Test: Uplift Base Test #2
Panel: 26 Ga. PBR 12"-12"-12" Fastener Pattern x 7'-0" Long
Purlin: 8x2.5ZEE 16 Ga. 25' Span spaced @ 5'-0" O.C. Facing same direction
Tophat: 14 ga. Reg Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1-1/4" Per foot
Date: 1/19/2009

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	24.3750	24.3750	19.5000
3.00	24.5000	24.5625	19.5000
6.00	24.6250	24.6875	19.5000
9.00	24.8125	24.8750	19.5000
12.00	25.0000	25.0000	19.5000
15.00	25.1875	25.1875	19.5000
18.00	25.3750	25.3750	19.5000
21.00	25.6250	25.5625	19.5000
24.00	26.6875	25.8125	19.6875
27.00	27.3750	26.0000	19.8125
30.00	28.1250	26.1875	19.8750
33.00	FAILED @ 33.1 PSF		

Ultimate Test Pressure: 33.1 psf
Mode of Failure: Purlin Bottom Lip Buckled

Base Test Deflection Readings

Project #: 13-0459T-08I
Test: Uplift Base Test #3
Panel: 26 Ga. PBR 12"-12"-12" Fastener Pattern x 7'-0" Long
Purlin: 8x2.5ZEE 16 Ga. 25' Span spaced @ 5'-0" O.C. Facing same direction
Tophat: 14 ga. Reg Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1-1/4" Per foot
Date: 1/23/2009

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	24.0625	23.7500	18.5000
3.00	24.1875	23.8750	18.5000
6.00	24.3750	24.0625	18.5000
9.00	24.5000	24.1875	18.5000
12.00	24.7500	24.3750	18.5000
15.00	24.8750	24.5000	18.5000
18.00	25.0625	24.6875	18.5000
21.00	25.3125	24.8750	18.5000
24.00	25.5000	25.0625	18.5000
27.00	25.7500	25.2500	18.5000
30.00	26.0000	25.4375	18.5625
33.00	FAILED @ 32.93 PSF		

Ultimate Test Pressure: 32.93 psf
Mode of Failure: Purlin Bottom Lip Buckled

Calculations

CALCULATIONS

PANEL : 26 Ga. PBR 7'-0" long
CLIP : NA
FASTENER : #12-14 x 1-1/4" HWH
PURLIN : 8x2.5Zee w/ Tophat attached w/ (2) #12-14 every foot
TOPHAT : 14 Ga. Reg Strength Tophat
DESCRIPTION : 25'-0" Span Uplift Base Test

#1 12-5-08		8X2.5X16GA. ZEE		
b		purlin flange width	2.125	in.
B		purlin spacing	60.00	in.
d		purlin depth	8.00	in.
t		purlin thickness	0.059	in.
pts		failure load	34.85	psf
pd		weight of the specimen	2.550	psf
s		purlin tributary width	3.500	ft
Pl		lateral anchorage force	13.98	lbs/ft
wts		failure load	113.05	lbs/ft
L		purlin span	25.00	ft
Mts		failure moment	105.98	k-in
Set		section modulus of the specimen	1.7152	in^3
Se		section modulus	1.7701	in^3
Fy		design yield strength	57.00	ksi
Fyt		measured yield strength	62.20	ksi
Mn		nominal flexural strength	100.90	k-in
Mnt		flexural strength	106.69	k-in
Rt		modification factor	0.9934	

#2 1-19-09		8X2.5X16GA. ZEE		
b		purlin flange width	2.125	in.
B		purlin spacing	60.00	in.
d		purlin depth	8.00	in.
t		purlin thickness	0.059	in.
pts		failure load	33.10	psf
pd		weight of the specimen	2.550	psf
s		purlin tributary width	3.500	ft
Pl		lateral anchorage force	13.32	lbs/ft
wts		failure load	106.93	lbs/ft
L		purlin span	25.00	ft
Mts		failure moment	100.24	k-in
Set		section modulus of the specimen	1.6827	in^3
Se		section modulus	1.7701	in^3
Fy		design yield strength	57.00	ksi
Fyt		measured yield strength	64.80	ksi
Mn		nominal flexural strength	100.90	k-in
Mnt		flexural strength	109.04	k-in
Rt		modification factor	0.9193	

#3 1-23-09		8X2.5X16GA. ZEE		
b		purlin flange width	2.125	in.
B		purlin spacing	60.00	in.
d		purlin depth	8.00	in.
t		purlin thickness	0.059	in.
pts		failure load	32.93	psf
pd		weight of the specimen	2.550	psf
s		purlin tributary width	3.500	ft
Pl		lateral anchorage force	13.26	lbs/ft
wts		failure load	106.33	lbs/ft
L		purlin span	25.00	ft
Mts		failure moment	99.68	k-in
Set		section modulus of the specimen	1.6876	in^3
Se		section modulus	1.7701	in^3
Fy		design yield strength	57.00	ksi
Fyt		measured yield strength	64.40	ksi
Mn		nominal flexural strength	100.90	k-in
Mnt		flexural strength	108.68	k-in
Rt		modification factor	0.9172	

AVERAGE Rt	0.943
STANDARD DEVIATION	0.043
Rt min.	0.900
Mnt min.	108.135

Section: 8x2.5Z16 Uplift Calculated.sct
8 x 2.5 Z 16 Gage
LGSI Library
Rev. Date: 4/2/2008 1:31:07 PM
By: Brandon Jasek

Brandon Jasek
Force Engineering & Testing
8x2.5Z16 Uplift Calculated

Section Inputs

```
Material: A1011 HSLAS Grade 55/2
No strength increase from cold work of forming.
Modulus of Elasticity, E          29500 ksi
Yield Strength, Fy                   57 ksi
Tensile Strength, Fu                 65 ksi
Warping Constant Override, Cw         0 in^6
Torsion Constant Override, J          0 in^4

Z-Section, Thickness 0.0589 in
Placement of Part from Origin:
X to center of gravity                0 in
Y to center of gravity                0 in
Outside dimensions, Open shape
```

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.9410	-50.000	0.25000	None	0.000	0.0000	0.4705
2	2.1250	0.000	0.25000	Single	0.000	0.0000	1.0625
3	8.0000	90.000	0.25000	Zee	0.000	0.0000	4.0000
4	2.3750	0.000	0.25000	Single	0.000	0.0000	1.1875
5	0.9410	-50.000	0.25000	None	0.000	0.0000	0.4705

Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	14942 lb	Maxo	61.130 k-in	Mayo	11.825 k-in
Ae	0.47186 in^2	Ixe	7.2926 in^4	Iye	1.0183 in^4
		Sxe(t)	1.7910 in^3	Sye(l)	0.3755 in^3
Tension		Sxe(b)	1.8565 in^3	Sye(r)	0.3465 in^3
Ta	26677 lb				
		Negative Moment		Negative Moment	
		Maxo	60.415 k-in	Mayo	12.367 k-in
Shear		Ixe	7.3990 in^4	Iye	1.0370 in^4
Vay	2463 lb	Sxe(t)	1.9370 in^3	Sye(l)	0.3718 in^3
Vax	4525 lb	Sxe(b)	1.7701 in^3	Sye(r)	0.3623 in^3

Section Inputs

```
Material: [A1011 HSLAS Grade 55/2]
No strength increase from cold work of forming.
Modulus of Elasticity, E          29500 ksi
Yield Strength, Fy                 62.2 ksi
Tensile Strength, Fu               76.7 ksi
Warping Constant Override, Cw         0 in^6
Torsion Constant Override, J          0 in^4

Z-Section, Thickness 0.059 in
Placement of Part from Origin:
X to center of gravity             0 in
Y to center of gravity             0 in
Outside dimensions, Open shape
        Length      Angle     Radius  Web      k    Hole Size   Distance
          (in)      (deg)       (in)         Coef.       (in)       (in)
  1     0.9410    -50.000    0.25000 None    0.000     0.0000     0.4705
  2     2.1250      0.000    0.25000 Single  0.000     0.0000     1.0625
  3     8.0000     90.000    0.25000 Zee     0.000     0.0000     4.0000
  4     2.3750      0.000    0.25000 Single  0.000     0.0000     1.1875
  5     0.9410    -50.000    0.25000 None    0.000     0.0000     0.4705
```

Fully Braced Strength - 2001 AISI Specification - US (ASD)

```
Compression                Positive Moment            Positive Moment
Pao        15826 lb        Maxo       65.139 k-in     Mayo       12.723 k-in
Ae       0.45800 in^2      Ixe         7.1940 in^4    Iye         1.0068 in^4
                           Sxe(t)      1.7489 in^3    Sye(l)      0.3724 in^3
Tension                    Sxe(b)      1.8510 in^3    Sye(r)      0.3416 in^3
Ta         30623 lb
                           Negative Moment            Negative Moment
                           Maxo       63.884 k-in     Mayo       13.397 k-in
Shear                      Ixe         7.2719 in^4    Iye         1.0267 in^4
Vay         2476 lb        Sxe(t)      1.9338 in^3    Sye(l)      0.3671 in^3
Vax         4946 lb        Sxe(b)      1.7152 in^3    Sye(r)      0.3597 in^3
```

Section: 14 Ga. Reg Test 2.sct
8 x 2.5 Z 16 Gage
LGSI Library
Rev. Date: 2/26/2009 10:08:26 AM
By: Brandon Jasek

Brandon Jasek
Force Engineering & Testing
14 Ga. Reg Test 2

Section Inputs

```
Material: [A1011 HSLAS Grade 55/2]
No strength increase from cold work of forming.
Modulus of Elasticity, E          29500 ksi
Yield Strength, Fy                 64.8 ksi
Tensile Strength, Fu               75.6 ksi
Warping Constant Override, Cw         0 in^6
Torsion Constant Override, J          0 in^4

Z-Section, Thickness 0.059 in
Placement of Part from Origin:
X to center of gravity             0 in
Y to center of gravity             0 in
Outside dimensions, Open shape
        Length      Angle     Radius  Web      k    Hole Size   Distance
          (in)      (deg)       (in)          Coef.      (in)       (in)
  1     0.9410    -50.000    0.25000 None    0.000     0.0000     0.4705
  2     2.1250      0.000    0.25000 Single  0.000     0.0000     1.0625
  3     8.0000     90.000    0.25000 Zee     0.000     0.0000     4.0000
  4     2.3750      0.000    0.25000 Single  0.000     0.0000     1.1875
  5     0.9410    -50.000    0.25000 None    0.000     0.0000     0.4705
```

Fully Braced Strength - 2001 AISI Specification - US (ASD)

```
Compression                Positive Moment          Positive Moment
Pao        16214 lb        Maxo      66.512 k-in    Mayo      13.054 k-in
Ae       0.45040 in^2      Ixe        7.1116 in^4   Iye        0.9939 in^4
                           Sxe(t)     1.7141 in^3   Sye(l)     0.3686 in^3
Tension                    Sxe(b)     1.8466 in^3   Sye(r)     0.3364 in^3
Ta         31079 lb
                           Negative Moment          Negative Moment
                           Maxo      65.293 k-in    Mayo      13.896 k-in
Shear                      Ixe        7.1915 in^4   Iye        1.0208 in^4
Vay         2476 lb        Sxe(t)     1.9300 in^3   Sye(l)     0.3646 in^3
Vax         5152 lb        Sxe(b)     1.6827 in^3   Sye(r)     0.3581 in^3
```

Section: 14 Ga. Reg Test 3.sct
8 x 2.5 Z 16 Gage
LGSI Library
Rev. Date: 2/26/2009 10:09:04 AM
By: Brandon Jasek

Brandon Jasek
Force Engineering & Testing
14 Ga. Reg Test 3

Section Inputs

Material: [A1011 HSLAS Grade 55/2]
No strength increase from cold work of forming.

Modulus of Elasticity, E	29500 ksi
Yield Strength, Fy	64.4 ksi
Tensile Strength, Fu	76.5 ksi
Warping Constant Override, Cw	0 in^6
Torsion Constant Override, J	0 in^4

Z-Section, Thickness 0.059 in
Placement of Part from Origin:

X to center of gravity	0 in
Y to center of gravity	0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.9410	-50.000	0.25000	None	0.000	0.0000	0.4705
2	2.1250	0.000	0.25000	Single	0.000	0.0000	1.0625
3	8.0000	90.000	0.25000	Zee	0.000	0.0000	4.0000
4	2.3750	0.000	0.25000	Single	0.000	0.0000	1.1875
5	0.9410	-50.000	0.25000	None	0.000	0.0000	0.4705

Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	16155 lb	Maxo	66.299 k-in	Mayo	13.003 k-in
Ae	0.45154 in^2	Ixe	7.1238 in^4	Iye	0.9958 in^4
		Sxe(t)	1.7192 in^3	Sye(l)	0.3692 in^3
Tension		Sxe(b)	1.8473 in^3	Sye(r)	0.3372 in^3
Ta	31449 lb				
		Negative Moment		Negative Moment	
		Maxo	65.077 k-in	Mayo	13.819 k-in
Shear		Ixe	7.2036 in^4	Iye	1.0217 in^4
Vay	2476 lb	Sxe(t)	1.9305 in^3	Sye(l)	0.3650 in^3
Vax	5121 lb	Sxe(b)	1.6876 in^3	Sye(r)	0.3584 in^3

MTEC
MECHANICAL
TESTING
SERVICES

ISO 9001-2000

CERTIFICATE OF TEST

ATTENTION : BRANDON JASEK
CUSTOMER : FORCE ENGINEERING & TESTING INC.
19530 RAMBLEWOOD DR
HUMBLE, TX 77338

8676 TAUB ROAD
Houston, TX 77064
281/469-2609

LAB# : W0901579

DATE : 02/12/09 12:11:35
PO NO :13-0459T-08
SPECIMEN :14REGU1

TEST DATA

REDUCED SECTION TENSILE

UTS PSI	YS.2%PSI	%EL	%RA	WIDTH	THICK	AREA IN.
76,700	62,200	17.80	52.00	0.503	0.059	0.030

Otha S Hall
MTEC Representative

MTEC
MECHANICAL
TESTING
SERVICES

ISO 9001-2000

CERTIFICATE OF TEST

ATTENTION : BRANDON JASEK
CUSTOMER : FORCE ENGINEERING & TESTING INC.
19530 RAMBLEWOOD DR
HUMBLE, TX 77338

8676 TAUB ROAD
Houston, TX 77064
281/469-2609

LAB# : W0901580

DATE : 02/12/09 12:12:18
PO NO :13-0459T-08
SPECIMEN :14REGU2

TEST DATA

REDUCED SECTION TENSILE

UTS PSI	YS.2%PSI	%EL	%RA	WIDTH	THICK	AREA IN.
75,600	64,800	19.10	65.50	0.500	0.059	0.030

MTEC Representative

MTEC
MECHANICAL
TESTING
SERVICES

ISO 9001-2000

CERTIFICATE OF TEST

ATTENTION : BRANDON JASEK
CUSTOMER : FORCE ENGINEERING & TESTING INC.
19530 RAMBLEWOOD DR
HUMBLE, TX 77338

8676 TAUB ROAD
Houston, TX 77064
281/469-2609

LAB# : W0901581

DATE : 02/12/09 12:13:21
PO NO :13-0459T-08
SPECIMEN :14REGU3

TEST DATA

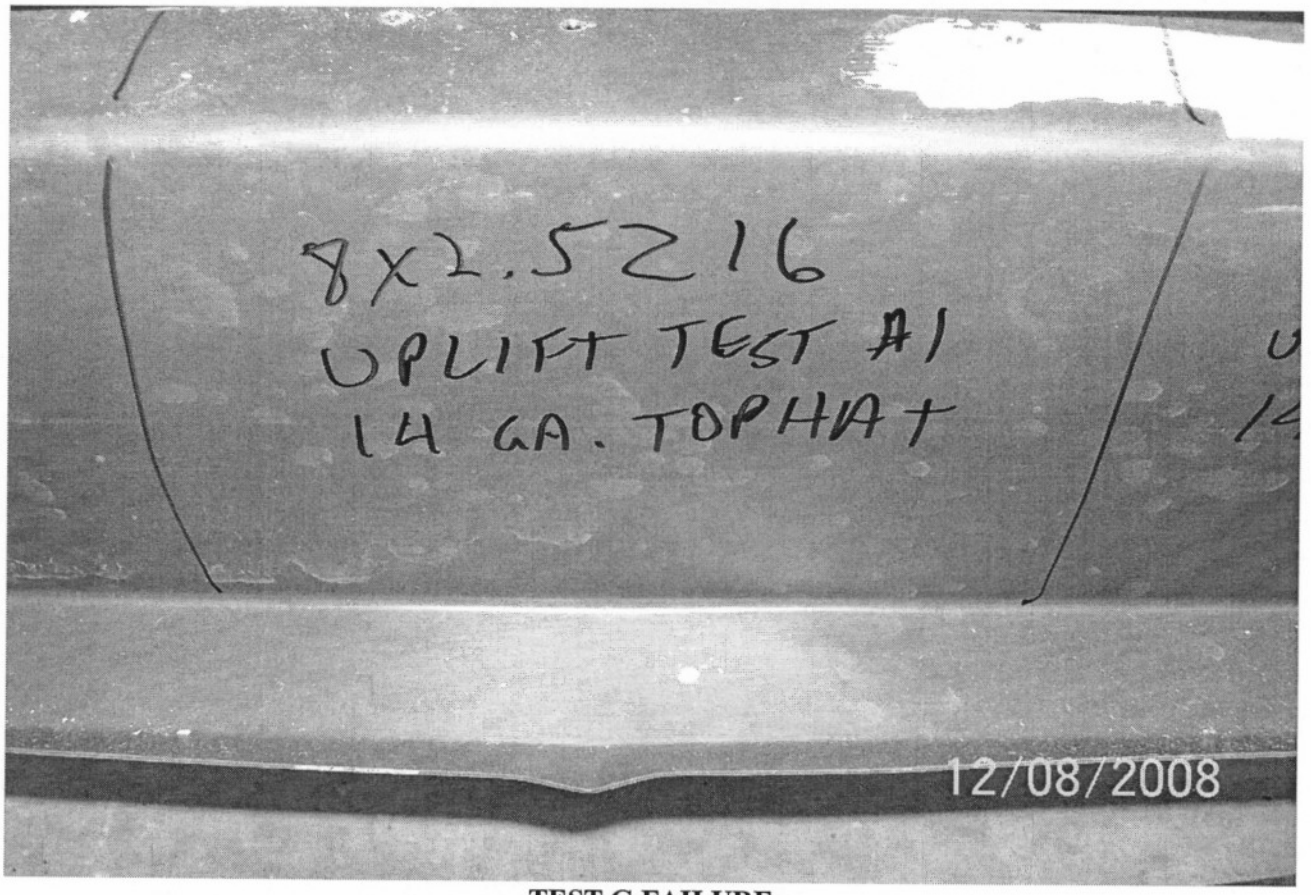
REDUCED SECTION TENSILE

UTS PSI	YS.2%PSI	%EL	%RA	WIDTH	THICK	AREA IN.
76,500	64,400	18.10	54.30	0.503	0.059	0.030

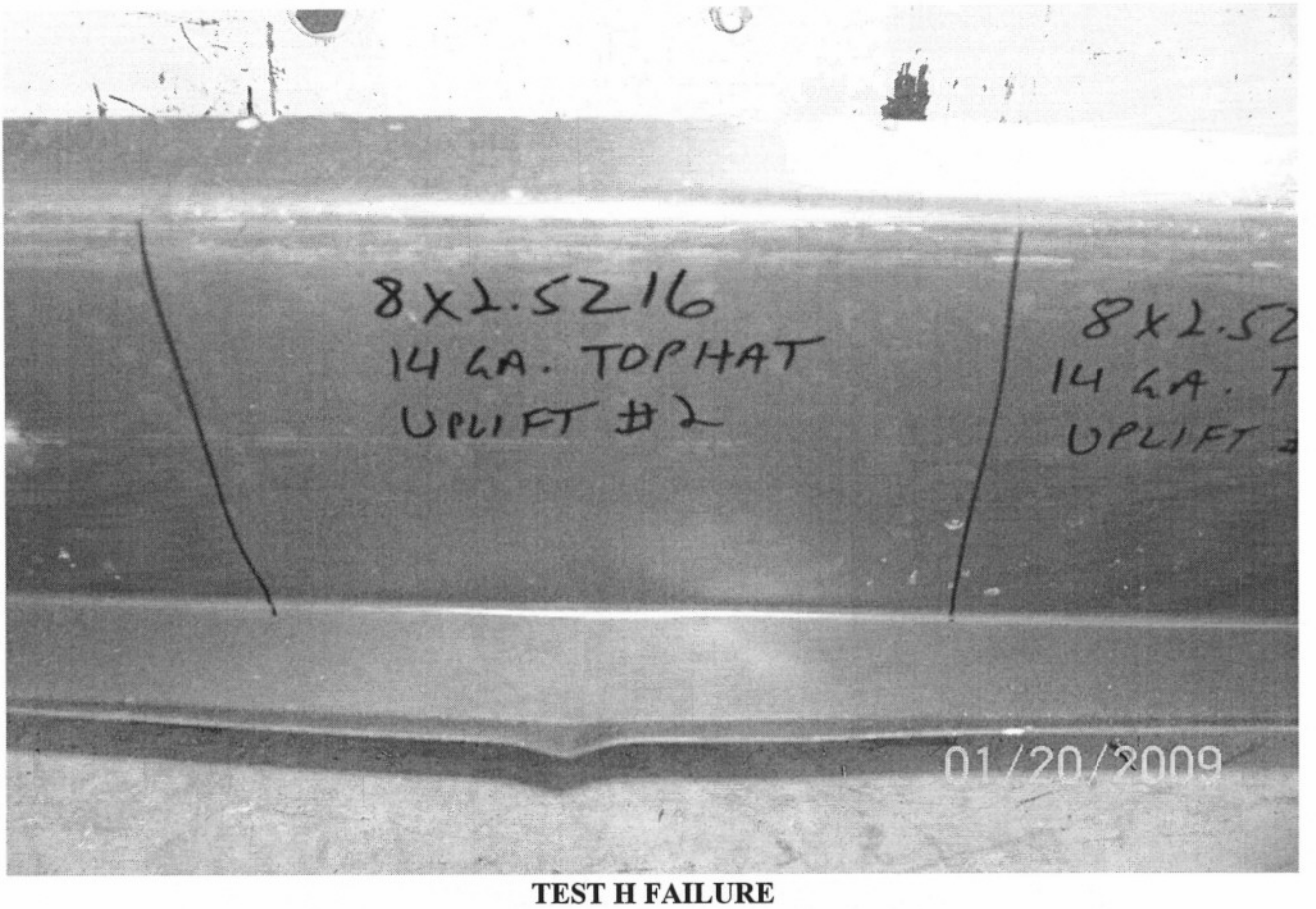
MTEC Representative

Photos

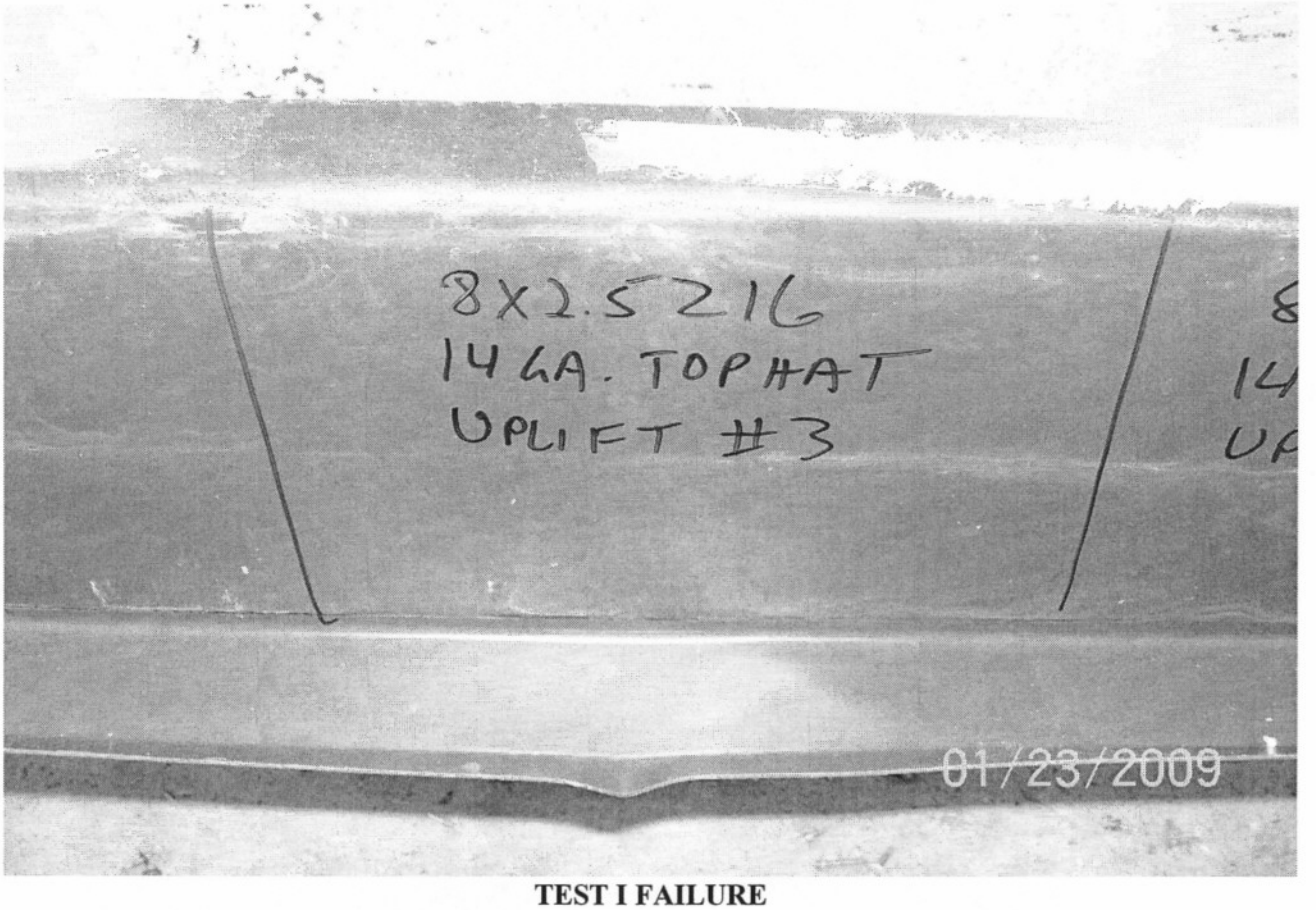
TYPICAL TEST SET UP



TEST G FAILURE



TEST H FAILURE



TEST I FAILURE