



Force Engineering & Testing Inc.

19530 Ramblewood Drive
Humble, Texas 77338
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Project Number : 13-0022T-08B

Test Report Date : April 3, 2008

Test Report Revision: Revision I, 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

Dade County Lab Certification No: 05-1122.13

16 GA. TOPHAT UPLIFT TEST

Report Prepared by:



Brandon Jasek, P.E.

Report Reviewed by:



Terrence E. Wolfe, P.E.

Project Number : 13-0022T-08B

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 positive loading.

TEST DATES:

January 18 - February 18, 2008

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. & 12 Ga.

Purlin Length: 25'-7 ½", Span = 25'-0"

Tophat Manufacturer

Manufacturer: TopHat Framing Systems
8660 Lambright
Houston, TX 77075

Tophat: 16 Ga. 3 ½" Tall Hat section, 0.062" Material Thickness, R Panel punch out pattern

Tophat Fastener: (2) #12-14 x 1" HWH per foot

Tophat Splice: A tophat splice occurred on each purlin on the 8x2.5Z12 tests only. The splice was 5'-0" from one end of the purlin. A 1 ½" x 2" 16 Ga. angle was attached to the tophats on each side with (6) #12-14 x 1-1/4" HWH fasteners. The splices were staggered on the two purlins.

Tophat Length: 20'-0"

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".

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 with a tophat splice 5'-0" from one end of each purlin. The tophat splices were staggered.
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 the three thinnest purlin profiles and for the three thickest purlin profiles.

RESULTS/CONCLUSIONS:

The 8x2.5 x 16 Ga. Zee failed at 29.73 psf, 27.51 psf and 29.02 psf. The mode of failure was buckling of the purlin bottom stiffener lip in all three tests. The 8x2.5 x 12 Ga. Zee failed at 55.0 psf, 52.0 psf and 56.3 psf. The mode of failure was buckling of the purlin bottom stiffener lip in all three tests. From the calculation pages, the modification factors are shown in Table A below.

8" x 2.5" ZEE 16 Ga.	R =	0.768
8" x 2.5" ZEE 14 Ga.	R =	0.769
8" x 2.5" ZEE 12 Ga.	R =	0.773

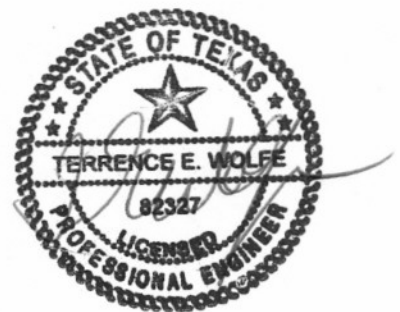
Table A: Modification Factor, R* Revised 3-3-09

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.

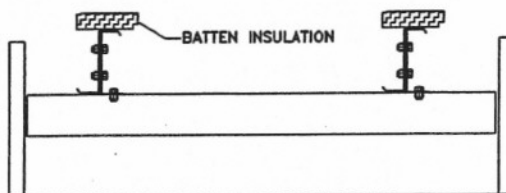
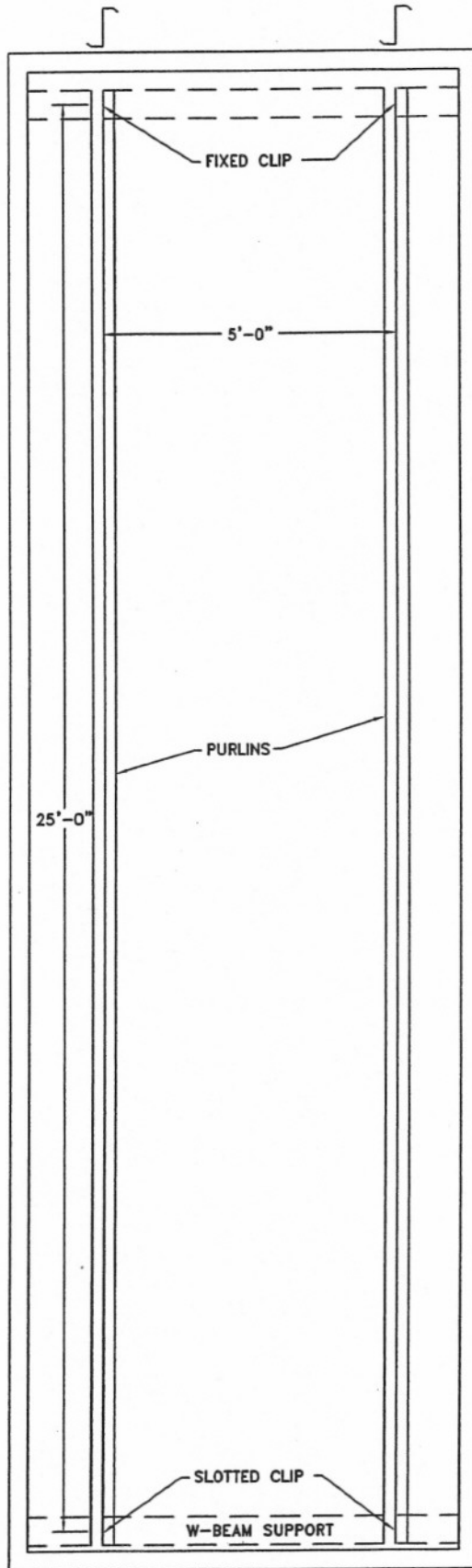
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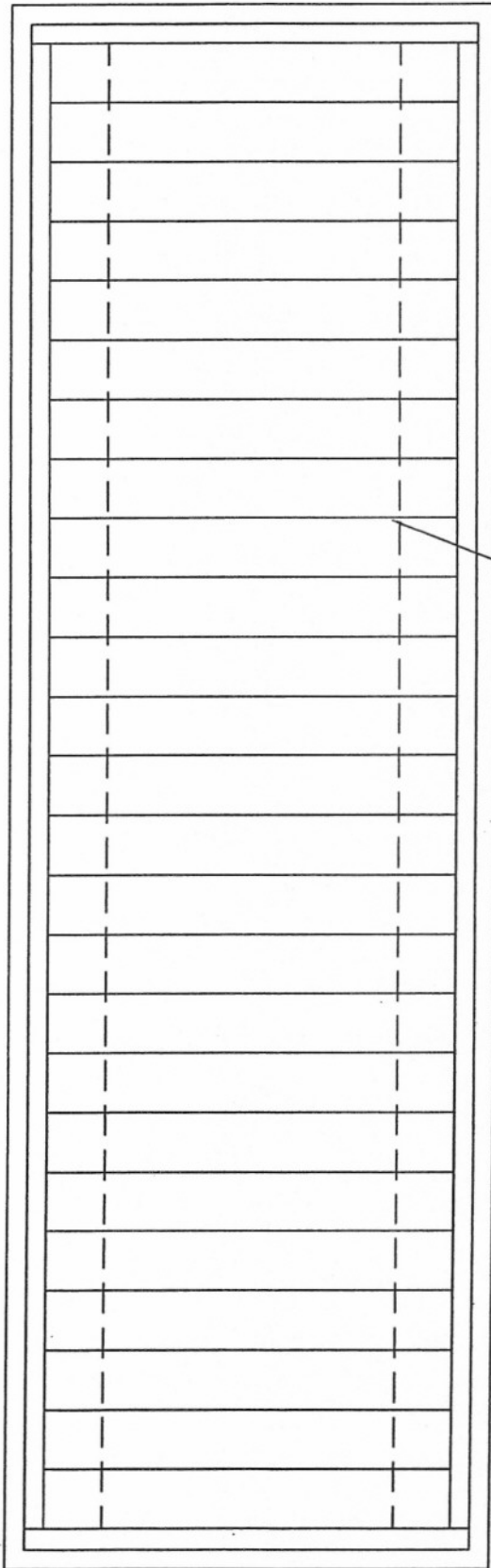
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Appendix

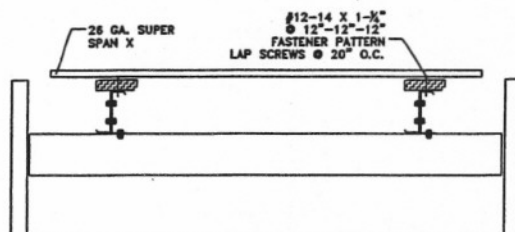
PURLIN LAYOUT



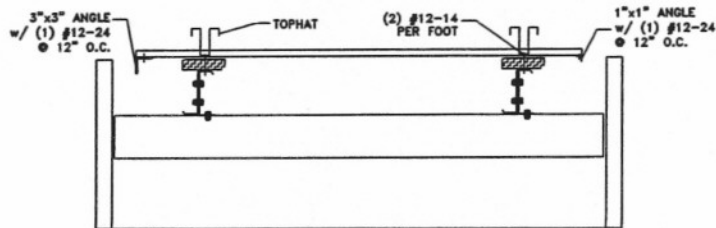
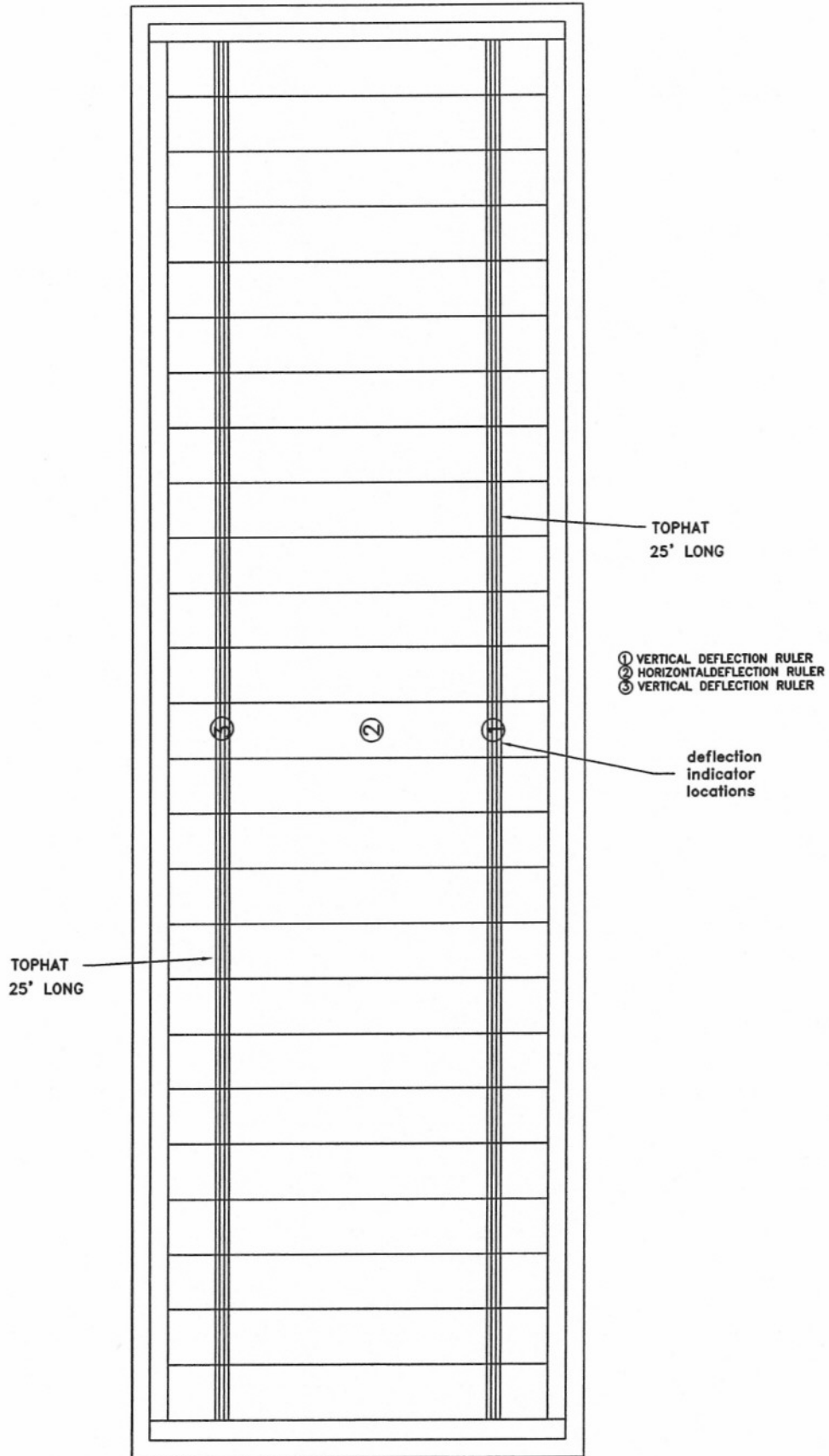
PANEL LAYOUT



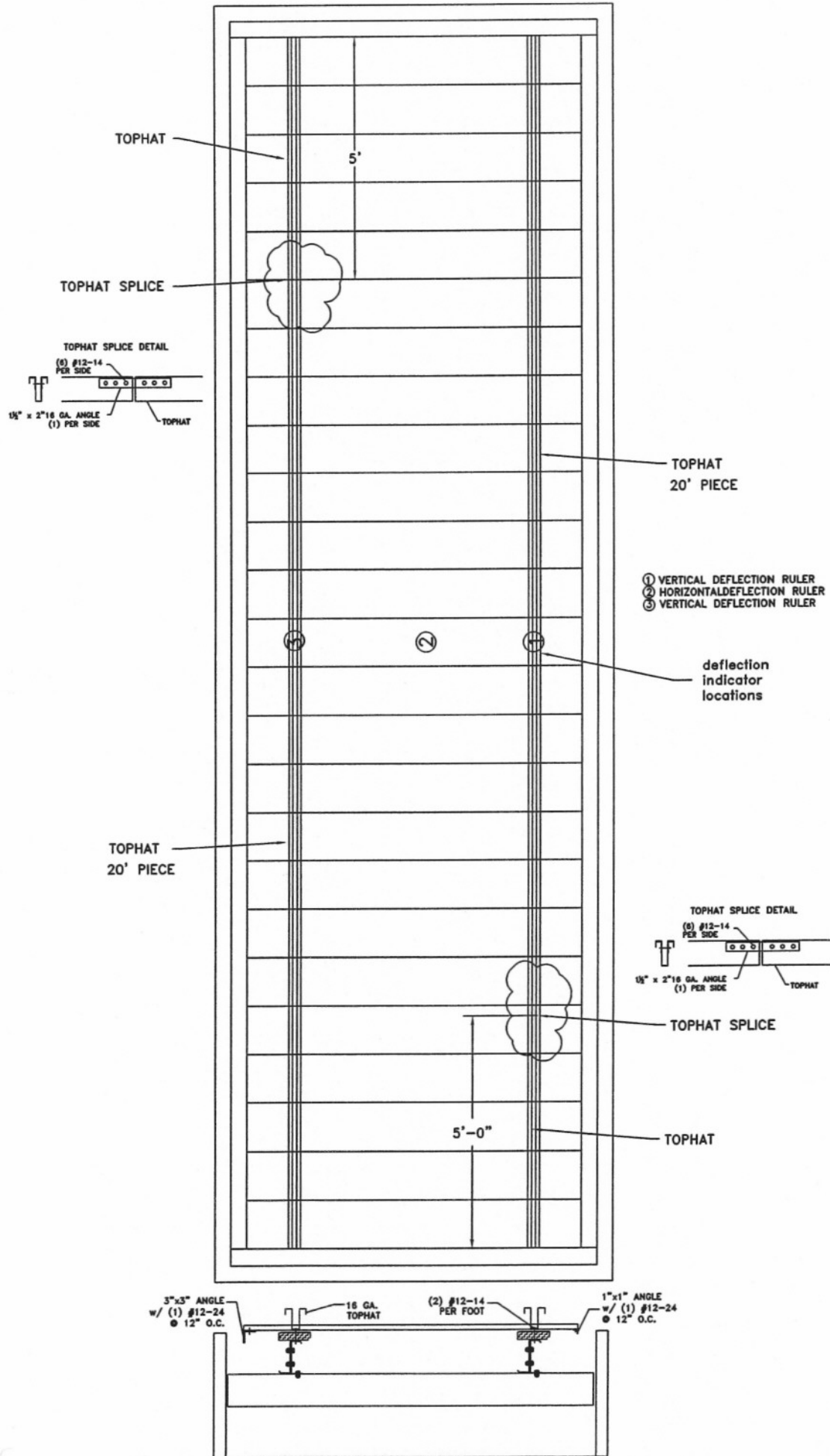
26 GA. SUPER SPAN X PANEL



TOPHAT LAYOUT FOR 16 GA. PURLINS

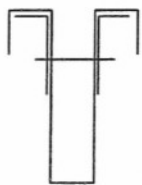


TOPHAT LAYOUT FOR 12 GA. PURLINS

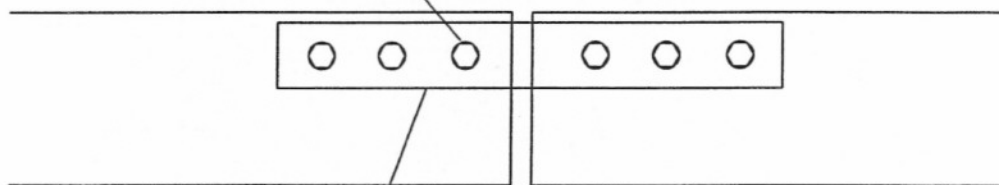


TOPHAT SPLICE DETAIL

(6) #12-14
PER SIDE



1 1/2" x 2" 16 GA. ANGLE
(1) PER SIDE



TOPHAT



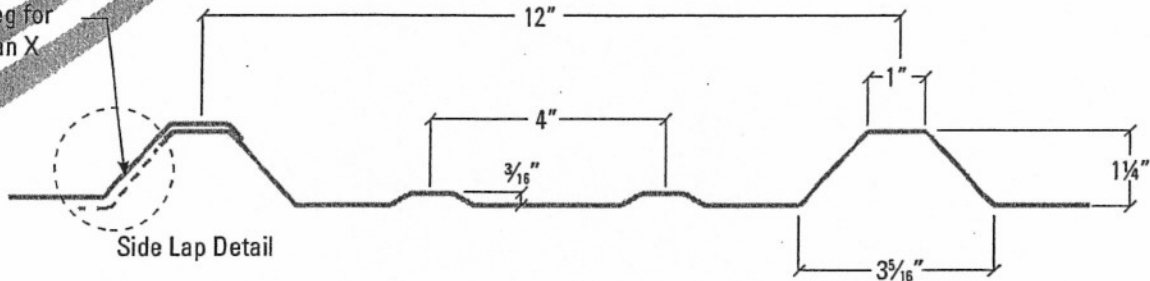
WHIRLWIND BUILDING COMPONENTS

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

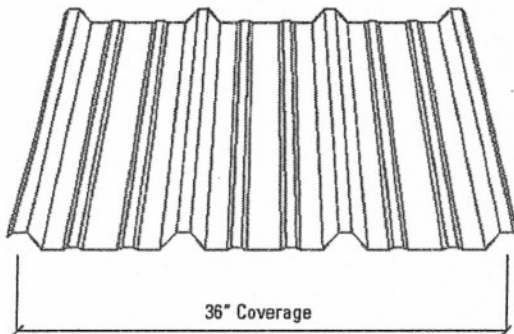


SUPER SPAN-X

Bearing leg for Super Span X



Side Lap Detail



SUPER SPAN-X DESIGN PROPERTIES						
GAUGE/ THICKNESS	F _y (KSI)	F _d (KSI)	TOP IN COMPRESSION		BOTTOM IN COMPRESSION	
			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

* F_y 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. I_x is for deflection determination.
3. M_x 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.

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.

- **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**

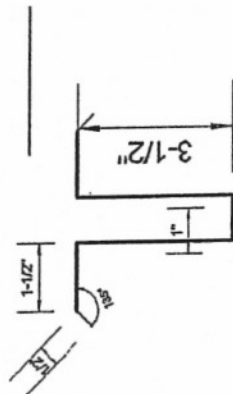
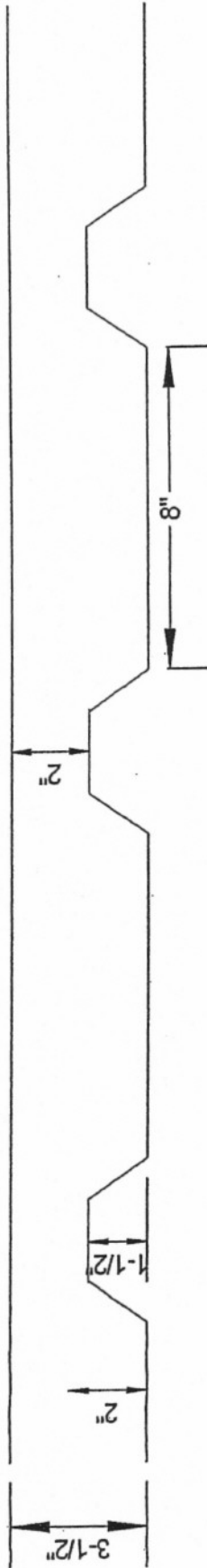
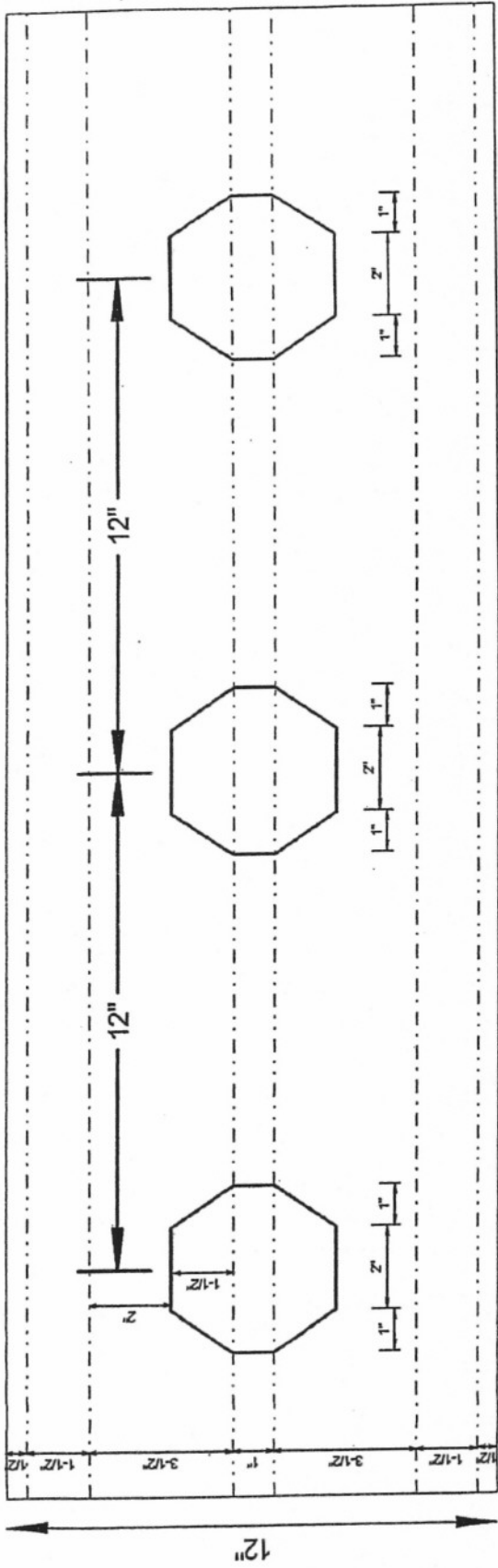
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Bodycote Testing Group, Houston North Laboratory, 9925 Regal Row, Houston, Texas, 77040
 Tel: 281-848-0270, Fax: 281-848-0275

Test Certificate

Force Eng. & Testing Inc.
 19530 Ramblewood Dr.
 Humble, TX

REF No 0801379 : Issue 1
 Ord No 13-0022T-08
 Date Tested 03/25/08
 Date Reported 03/25/08

77338

Attn: Terrance E. Wolfe, P.E.

Item _____ - Sheet Metal sample for Tensile Test
Commercial Siding and Manufacturing, Roofrunner

Specification - Client Requirement

Tensile Test - ASTM E 8								
	Dimensions [in]	Area [in ²]	CL [in]	0.20%YS [psi]	UTS [psi]	%EL	%RA	Comments
001:Parent	0.5090x 0.0620	0.0316	2.00	38200	47800	33	N/A	Nil

Certificate Comments

This is an electronic copy. See original certificate for photographs and figures where referenced.

Approved By Jim Blevins

.....
 Jim Blevins
 For and on authority of
 Bodycote Testing Group

Data Sheets

Base Test Deflection Readings

Project #:

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: 16 ga. Reg Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1-1/4" Per foot

Date: 12/4/2008

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	26.6875	26.5000	19.2500
3.00	26.7500	26.6875	19.2500
6.00	27.0000	26.8750	19.2500
9.00	27.2500	27.0000	19.2500
12.00	27.3750	27.1875	19.2500
15.00	27.6250	27.4375	19.2500
18.00	27.7500	27.5000	19.2500
21.00	28.0000	27.7500	19.3125
24.00	28.1875	27.8750	19.3125
27.00	28.5000	28.0625	19.3125
30.00	FAILED @ 29.73 PSF		

Ultimate Test Pressure: 29.73 psf
Mode of Failure: Purlin Bottom Lip Buckled

Base Test Deflection Readings

Project #:
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: 16 ga. Reg Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1-1/4" Per foot
Date: 1/22/2009

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	25.1250	24.5000	19.3125
3.00	25.4375	24.6875	19.3125
6.00	25.5000	24.8125	19.3125
9.00	25.7500	24.9375	19.3125
12.00	26.0000	25.1250	19.3125
15.00	26.1875	25.3125	19.3125
18.00	26.3750	25.5000	19.3125
21.00	26.6250	25.6875	19.3125
24.00	26.8125	26.0000	19.3125
27.00	FAILED @ 27.51 PSF		

Ultimate Test Pressure: 27.51 psf
Mode of Failure: Purlin Bottom Lip Buckled

Base Test Deflection Readings

Project #:
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: 16 ga. Reg Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1-1/4" Per foot
Date: 1/22/2009

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	24.1875	23.9375	19.1250
3.00	24.3750	24.0625	19.1250
6.00	24.5000	24.1875	19.1250
9.00	24.7500	24.3750	19.1250
12.00	24.8750	24.5625	19.1250
15.00	25.1250	24.7500	19.1250
18.00	25.3125	24.9375	19.1250
21.00	25.5000	25.1250	19.1875
24.00	25.7500	25.3125	19.1875
27.00	26.0000	25.5000	19.1875
30.00	FAILED @ 29.02 PSF		

Ultimate Test Pressure: 29.02 psf
Mode of Failure: Purlin Bottom Lip Buckled

Base Test Deflection Readings

Project #: 13-0022T-08G
Test: Uplift Base Test #1
Panel: 26 Ga. PBR 12"-12"-12" Fastener Pattern x 7'-0" Long
Purlin: 8x2.5ZEE 12 Ga. 25' Span spaced @ 5'-0" O.C. Facing same direction
Tophat: Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1" Per foot
Date: 2/6/2008

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	26.1563	25.2969	7.5625
5.00	26.3750	25.5000	7.5000
10.00	26.5938	25.7500	7.5000
15.00	26.8438	26.0000	7.5000
20.00	27.0781	26.2500	7.5313
25.00	27.3594	26.5000	7.5469
30.00	27.5938	26.7656	7.5938
35.00	27.8750	27.0000	7.6250
40.00	28.1875	27.3125	7.6563
45.00	28.5938	27.5781	7.7031
50.00	29.0000	27.9844	7.7813
55.00	FAILED @ 55.0 PSF		

Ultimate Test Pressure: 55.0 psf
Mode of Failure: Purlin #2 bottom stiffener lip buckled at Mid span

Base Test Deflection Readings

Project #: 13-0022T-08H
Test: Uplift Base Test #2
Panel: 26 Ga. PBR 12"-12"-12" Fastener Pattern x 7'-0" Long
Purlin: 8x2.5ZEE 12 Ga. 25' Span spaced @ 5'-0" O.C. Facing same direction
Tophat: Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1" Per foot
Date: 2/14/2008

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	26.4844	25.8750	7.2813
5.00	26.7031	26.0625	7.2344
10.00	26.9688	26.2969	7.2188
15.00	27.2344	26.5313	7.2031
20.00	27.5625	26.8125	7.2031
25.00	27.8906	27.0625	7.2500
30.00	28.2344	27.3594	7.2813
35.00	28.7031	27.6563	7.3125
40.00	29.2188	28.0313	7.3438
45.00	29.8906	28.3750	7.3750
50.00	30.5000	28.8125	7.3750
55.00	FAILED @ 52.0 PSF		

Ultimate Test Pressure: 52.0 psf
Mode of Failure: Purlin #2 bottom stiffener lip buckled at Mid span

Base Test Deflection Readings

Project #: 13-0022T-08I
Test: Uplift Base Test #3
Panel: 26 Ga. PBR 12"-12"-12" Fastener Pattern x 7'-0" Long
Purlin: 8x2.5ZEE 12 Ga. 25' Span spaced @ 5'-0" O.C. Facing same direction
Tophat: Tophat over PBR panel, attached to Purlin w/ (2) #12-14 x 1" Per foot
Date: 2/15/2008

LOAD (psf)	Vertical Deflection of Purlin 1 (in)	Vertical Deflection of Purlin 2 (in)	Horizontal Deflection of Panel (in)
0.00	27.2500	26.4375	8.5000
5.00	27.4688	26.6406	8.4688
10.00	27.6875	26.8438	8.4688
15.00	27.9063	27.0938	8.4531
20.00	28.2031	27.3281	8.4375
25.00	28.4688	27.5938	8.4375
30.00	28.8438	27.8281	8.4688
35.00	29.1406	28.1250	8.5000
40.00	29.4688	28.4219	8.5000
45.00	29.8438	28.7969	8.5000
50.00	30.3281	29.1094	8.5156
55.00	30.9063	29.3906	8.5313
60.00	FAILED @ 56.3 PSF		

Ultimate Test Pressure: 56.3 psf
Mode of Failure: Purlin #2 bottom stiffener lip buckled at Mid span

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
DESCRIPTION : 25'-0" Span Uplift Base Test

#1 12-4-08	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	29.73	psf
pd	weight of the specimen	2.350	psf
s	purlin tributary width	3.500	ft
PI	lateral anchorage force	11.99	lbs/ft
wts	failure load	95.83	lbs/ft
L	purlin span	25.00	ft
Mts	failure moment	89.84	k-in
Set	section modulus of the specimen	1.6839	in^3
Se	section modulus	1.7701	in^3
Fy	design yield strength	57.00	ksi
Fyt	measured yield strength	64.70	ksi
Mn	nominal flexural strength	100.90	k-in
Mnt	flexural strength	108.95	k-in
Rt	modification factor	0.8246	

#1 2-6-08	8X2.5X12GA. ZEE		
b	purlin flange width	2.125	in.
B	purlin spacing	60.00	in.
d	purlin depth	8.00	in.
t	purlin thickness	0.105	in.
pts	failure load	55.00	psf
pd	weight of the specimen	2.970	psf
s	purlin tributary width	3.500	ft
PI	lateral anchorage force	15.33	lbs/ft
wts	failure load	182.11	lbs/ft
L	purlin span	25.00	ft
Mts	failure moment	170.72	k-in
Set	section modulus of the specimen	3.3367	in^3
Se	section modulus	3.3367	in^3
Fy	design yield strength	57.00	ksi
Fyt	measured yield strength	61.30	ksi
Mn	nominal flexural strength	190.19	k-in
Mnt	flexural strength	204.54	k-in
Rt	modification factor	0.8347	

#2 1-22-09	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	27.51	psf
pd	weight of the specimen	2.350	psf
s	purlin tributary width	3.500	ft
PI	lateral anchorage force	11.16	lbs/ft
wts	failure load	88.06	lbs/ft
L	purlin span	25.00	ft
Mts	failure moment	82.56	k-in
Set	section modulus of the specimen	1.6987	in^3
Se	section modulus	1.7701	in^3
Fy	design yield strength	57.00	ksi
Fyt	measured yield strength	63.50	ksi
Mn	nominal flexural strength	100.90	k-in
Mnt	flexural strength	107.87	k-in
Rt	modification factor	0.7653	

#2 2-14-08	8X2.5X12GA. ZEE		
b	purlin flange width	2.125	in.
B	purlin spacing	60.00	in.
d	purlin depth	8.00	in.
t	purlin thickness	0.101	in.
pts	failure load	52.00	psf
pd	weight of the specimen	2.970	psf
s	purlin tributary width	3.500	ft
PI	lateral anchorage force	14.88	lbs/ft
wts	failure load	171.61	lbs/ft
L	purlin span	25.00	ft
Mts	failure moment	160.88	k-in
Set	section modulus of the specimen	3.2170	in^3
Se	section modulus	3.3367	in^3
Fy	design yield strength	57.00	ksi
Fyt	measured yield strength	65.10	ksi
Mn	nominal flexural strength	190.19	k-in
Mnt	flexural strength	209.43	k-in
Rt	modification factor	0.7682	

#3 1-22-09	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	29.02	psf
pd	weight of the specimen	2.350	psf
s	purlin tributary width	3.500	ft
PI	lateral anchorage force	11.72	lbs/ft
wts	failure load	93.35	lbs/ft
L	purlin span	25.00	ft
Mts	failure moment	87.51	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	0.8052	

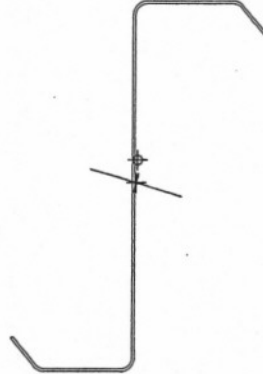
#3 2-15-08	8X2.5X12GA. ZEE		
b	purlin flange width	2.125	in.
B	purlin spacing	60.00	in.
d	purlin depth	8.00	in.
t	purlin thickness	0.101	in.
pts	failure load	56.30	psf
pd	weight of the specimen	2.970	psf
s	purlin tributary width	3.500	ft
PI	lateral anchorage force	16.05	lbs/ft
wts	failure load	186.66	lbs/ft
L	purlin span	25.00	ft
Mts	failure moment	174.99	k-in
Set	section modulus of the specimen	3.2170	in^3
Se	section modulus	3.3367	in^3
Fy	design yield strength	57.00	ksi
Fyt	measured yield strength	63.50	ksi
Mn	nominal flexural strength	190.19	k-in
Mnt	flexural strength	204.28	k-in
Rt	modification factor	0.8566	

AVERAGE Rt	0.798
STANDARD DEVIATION	0.030
Rt min.	0.768
Mnt min.	108.499

AVERAGE Rt	0.820
STANDARD DEVIATION	0.046
Rt max.	0.774
Mnt max.	206.082

8x2.5 Zee 16 Ga.	R =	0.7677
8x2.5 Zee 14 Ga.	R =	0.769
8x2.5 Zee 12 Ga.	R =	0.7729

Average Tested Failure Moment			
8x2.5 Zee 16 Ga.	Mts =	86.64	
8x2.5 Zee 14 Ga.	Mts =	127.75	
8x2.5 Zee 12 Ga.	Mts =	168.06	



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 in⁶
 Torsion Constant Override, J 0 in⁴

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

Section: 8x2.5Z16 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

Full Section Properties

Area	0.82082 in ²	Wt.	2.7908 lb/ft	Width	13.936 in
Ix	7.7244 in ⁴	rx	3.0677 in	Ixy	2.1089 in ⁴
Sx(t)	1.9661 in ³	y(t)	3.9288 in	α	-16.250 deg
Sx(b)	1.8973 in ³	y(b)	4.0712 in		
		Height	8.0000 in		
Iy	1.1040 in ⁴	ry	1.1597 in	Xo	0.0242 in
Sy(l)	0.4005 in ³	x(l)	2.7563 in	Yo	0.4860 in
Sy(r)	0.3814 in ³	x(r)	2.8945 in	jx	0.0586 in
		Width	5.6508 in	jy	-0.5195 in
I1	8.3391 in ⁴	r1	3.1874 in		
I2	0.4893 in ⁴	r2	0.7721 in		
Ic	8.8284 in ⁴	rc	3.2796 in	Cw	12.572 in ⁶
Io	9.0228 in ⁴	ro	3.3155 in	J	0.000949 in ⁴

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
		Sxe(b)	1.8565 in ³	Sye(r)	0.3465 in ³
Tension		Negative Moment		Negative Moment	
Ta	26677 lb	Maxo	60.415 k-in	Mayo	12.367 k-in
		Ixe	7.3990 in ⁴	Iye	1.0370 in ⁴
Shear		Sxe(t)	1.9370 in ³	Sye(l)	0.3718 in ³
Vay	2463 lb	Sxe(b)	1.7701 in ³	Sye(r)	0.3623 in ³
Vax	4525 lb				



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 64.7 ksi
 Tensile Strength, Fu 75.9 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴

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	16200 lb	Maxo	66.459 k-in	Mayo	13.041 k-in
Ae	0.45068 in ²	Ixe	7.1147 in ⁴	Iye	0.9944 in ⁴
		Sxe(t)	1.7154 in ³	Sye(l)	0.3687 in ³
		Sxe(b)	1.8468 in ³	Sye(r)	0.3366 in ³
		Negative Moment		Negative Moment	
		Maxo	65.239 k-in	Mayo	13.877 k-in
		Ixe	7.1945 in ⁴	Iye	1.0211 in ⁴
		Sxe(t)	1.9301 in ³	Sye(l)	0.3647 in ³
		Sxe(b)	1.6839 in ³	Sye(r)	0.3582 in ³
Tension					
Ta	31202 lb				
Shear					
Vay	2476 lb				
Vax	5145 lb				



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 63.5 ksi
 Tensile Strength, Fu 78 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴

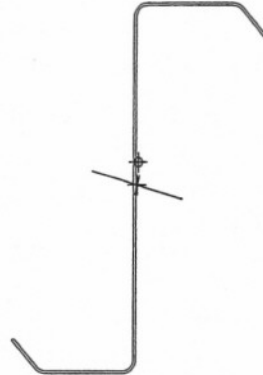
Z-Section, Thickness 0.059 in
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to center of gravity 0 in

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	16021 lb	Maxo	65.818 k-in	Mayo	12.889 k-in
Ae	0.45415 in ²	Ixe	7.1517 in ⁴	Iye	1.0002 in ⁴
		Sxe (t)	1.7310 in ³	Sye (l)	0.3705 in ³
		Sxe (b)	1.8488 in ³	Sye (r)	0.3390 in ³
Tension		Negative Moment		Negative Moment	
Ta	31263 lb	Maxo	64.590 k-in	Mayo	13.647 k-in
		Ixe	7.2311 in ⁴	Iye	1.0237 in ⁴
Shear		Sxe (t)	1.9319 in ³	Sye (l)	0.3658 in ³
Vay	2476 lb	Sxe (b)	1.6987 in ³	Sye (r)	0.3589 in ³
Vax	5049 lb				



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 75.5 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴

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
		Sxe(b)	1.8473 in ³	Sye(r)	0.3372 in ³
		Negative Moment		Negative Moment	
		Maxo	65.077 k-in	Mayo	13.819 k-in
		Ixe	7.2036 in ⁴	Iye	1.0217 in ⁴
		Sxe(t)	1.9305 in ³	Sye(l)	0.3650 in ³
		Sxe(b)	1.6876 in ³	Sye(r)	0.3584 in ³
Tension					
Ta	31038 lb				
Shear					
Vay	2476 lb				
Vax	5121 lb				



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 in⁶
 Torsion Constant Override, J 0 in⁴

Z-Section, Thickness 0.0705 in
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to center of gravity 0 in

Outside dimensions, Open shape

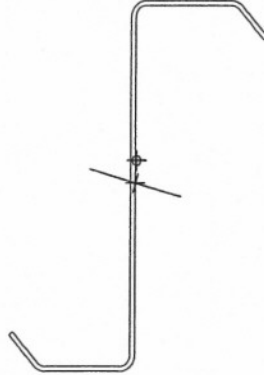
	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.9605	-50.000	0.25000	None	0.000	0.0000	0.4803
2	2.1250	0.000	0.25000	Single	0.000	0.0000	1.0625
3	8.0000	90.000	0.25000	Zee	0.000	0.0000	4.0000
4	2.3750	0.000	0.25000	Single	0.000	0.0000	1.1875
5	0.9605	-50.000	0.25000	None	0.000	0.0000	0.4803

Full Section Properties

Area	0.98243 in ²	Wt.	3.3403 lb/ft	Width	13.935 in
Ix	9.214 in ⁴	rx	3.0624 in	Ixy	2.527 in ⁴
Sx(t)	2.3451 in ³	y(t)	3.9289 in	α	-16.329 deg
Sx(b)	2.2632 in ³	y(b)	4.0711 in		
		Height	8.0000 in		
Iy	1.329 in ⁴	ry	1.1629 in	Xo	0.0244 in
Sy(l)	0.4808 in ³	x(l)	2.7632 in	Yo	0.4853 in
Sy(r)	0.4579 in ³	x(r)	2.9011 in	jx	0.0578 in
		Width	5.6643 in	jy	-0.5187 in
I1	9.954 in ⁴	r1	3.1831 in		
I2	0.588 in ⁴	r2	0.7737 in		
Ic	10.542 in ⁴	rc	3.2758 in	Cw	15.103 in ⁶
Io	10.774 in ⁴	ro	3.3116 in	J	0.001628 in ⁴

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

Compression		Positive Moment		Positive Moment	
Pao	19873 lb	Maxo	76.287 k-in	Mayo	15.001 k-in
Ae	0.62756 in ²	Ixe	8.9498 in ⁴	Iye	1.2823 in ⁴
		Sxe(t)	2.2351 in ³	Sye(l)	0.4669 in ³
Tension		Sxe(b)	2.2398 in ³	Sye(r)	0.4395 in ³
Ta	31929 lb				
		Negative Moment		Negative Moment	
		Maxo	75.801 k-in	Mayo	15.266 k-in
Shear		Ixe	9.1076 in ⁴	Iye	1.2913 in ⁴
Vay	4237 lb	Sxe(t)	2.3359 in ³	Sye(l)	0.4650 in ³
Vax	5365 lb	Sxe(b)	2.2208 in ³	Sye(r)	0.4473 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 57 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴

Z-Section, Thickness 0.105 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	1.0200	-50.000	0.25000	None	0.000	0.0000	0.5100
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	1.0200	-50.000	0.25000	None	0.000	0.0000	0.5100

Full Section Properties

Area	1.4633 in ²	Wt.	4.9752 lb/ft	Width	13.936 in
Ix	13.583 in ⁴	rx	3.0467 in	Ixy	3.778 in ⁴
Sx(t)	3.4570 in ³	y(t)	3.9292 in	α	-16.575 deg
Sx(b)	3.3367 in ³	y(b)	4.0708 in		
		Height	8.0000 in		
Iy	2.013 in ⁴	ry	1.1728 in	Xo	0.0249 in
Sy(l)	0.7228 in ³	x(l)	2.7847 in	Yo	0.4830 in
Sy(r)	0.6889 in ³	x(r)	2.9216 in	jx	0.0555 in
		Width	5.7063 in	jy	-0.5161 in
I1	14.708 in ⁴	r1	3.1704 in		
I2	0.888 in ⁴	r2	0.7791 in		
Ic	15.596 in ⁴	rc	3.2647 in	Cw	22.761 in ⁶
Io	15.938 in ⁴	ro	3.3003 in	J	0.005378 in ⁴

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

Compression		Positive Moment		Positive Moment	
Pao	35129 lb	Maxo	113.89 k-in	Mayo	23.51 k-in
Ae	1.1093 in ²	Ixe	13.583 in ⁴	Iye	2.013 in ⁴
		Sxe(t)	3.4570 in ³	Sye(l)	0.7228 in ³
Tension		Sxe(b)	3.3367 in ³	Sye(r)	0.6889 in ³
Ta	47557 lb	Negative Moment		Negative Moment	
		Maxo	113.89 k-in	Mayo	23.51 k-in
Shear		Ixe	13.583 in ⁴	Iye	2.013 in ⁴
Vay	12389 lb	Sxe(t)	3.4570 in ³	Sye(l)	0.7228 in ³
Vax	7763 lb	Sxe(b)	3.3367 in ³	Sye(r)	0.6889 in ³



Section Inputs

Material: [Tested]
 No strength increase from cold work of forming.
 Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 61.3 ksi
 Tensile Strength, Fu 71.7 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴

Z-Section, Thickness 0.105 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	1.0200	-50.000	0.25000	None	0.000	0.0000	0.5100
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	1.0200	-50.000	0.25000	None	0.000	0.0000	0.5100

Section: 8x2.5Z12 Uplift Test #1.sct

Brandon Jasek

8 x 2.5 Z 12 Gage

Force Engineering & Testing

LGSJ Library

8x2.5Z12 Uplift Test #1

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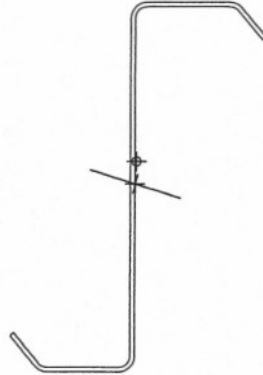
By: Brandon Jasek

Full Section Properties

Area	1.4633 in ²	Wt.	4.9752 lb/ft	Width	13.936 in
Ix	13.583 in ⁴	rx	3.0467 in	Ixy	3.778 in ⁴
Sx(t)	3.4570 in ³	y(t)	3.9292 in	α	-16.575 deg
Sx(b)	3.3367 in ³	y(b)	4.0708 in		
		Height	8.0000 in		
Iy	2.013 in ⁴	ry	1.1728 in	Xo	0.0249 in
Sy(l)	0.7228 in ³	x(l)	2.7847 in	Yo	0.4830 in
Sy(r)	0.6889 in ³	x(r)	2.9216 in	jx	0.0555 in
		Width	5.7063 in	jy	-0.5161 in
I1	14.708 in ⁴	r1	3.1704 in		
I2	0.888 in ⁴	r2	0.7791 in		
Ic	15.596 in ⁴	rc	3.2647 in	Cw	22.761 in ⁶
Io	15.938 in ⁴	ro	3.3003 in	J	0.005378 in ⁴

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

Compression		Positive Moment		Positive Moment	
Pao	37355 lb	Maxo	122.48 k-in	Mayo	25.29 k-in
Ae	1.0969 in ²	Ixe	13.583 in ⁴	Iye	2.013 in ⁴
		Sxe(t)	3.4570 in ³	Sye(l)	0.7228 in ³
		Sxe(b)	3.3367 in ³	Sye(r)	0.6889 in ³
Tension		Negative Moment		Negative Moment	
Ta	52459 lb	Maxo	122.48 k-in	Mayo	25.29 k-in
		Ixe	13.583 in ⁴	Iye	2.013 in ⁴
		Sxe(t)	3.4570 in ³	Sye(l)	0.7228 in ³
		Sxe(b)	3.3367 in ³	Sye(r)	0.6889 in ³
Shear					
Vay	12848 lb				
Vax	8349 lb				



Section Inputs

Material: [Tested]
 No strength increase from cold work of forming.
 Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 65.1 ksi
 Tensile Strength, Fu 74.9 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴

Z-Section, Thickness 0.101 in
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to center of gravity 0 in

Outside dimensions, Open shape

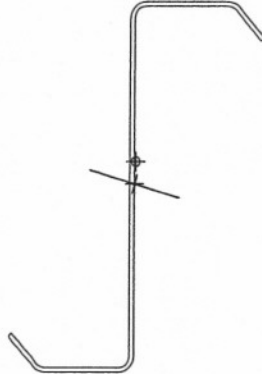
	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.0200	-50.000	0.25000	None	0.000	0.0000	0.5100
2	2.1250	0.000	0.25000	Single	0.000	0.0000	1.0625
3	8.0000	90.000	0.25000	Zee	0.000	0.0000	4.0000
4	2.3750	0.000	0.25000	Single	0.000	0.0000	1.1875
5	1.0200	-50.000	0.25000	None	0.000	0.0000	0.5100

Full Section Properties

Area	1.4089 in ²	Wt.	4.7904 lb/ft	Width	13.950 in
Ix	13.096 in ⁴	rx	3.0487 in	Ixy	3.645 in ⁴
Sx(t)	3.3329 in ³	y(t)	3.9292 in	α	-16.587 deg
Sx(b)	3.2170 in ³	y(b)	4.0708 in		
		Height	8.0000 in		
Iy	1.943 in ⁴	ry	1.1744 in	Xo	0.0249 in
Sy(l)	0.6973 in ³	x(l)	2.7867 in	Yo	0.4826 in
Sy(r)	0.6647 in ³	x(r)	2.9236 in	jx	0.0554 in
		Width	5.7103 in	jy	-0.5156 in
I1	14.181 in ⁴	r1	3.1726 in		
I2	0.857 in ⁴	r2	0.7801 in		
Ic	15.039 in ⁴	rc	3.2671 in	Cw	22.000 in ⁶
Io	15.368 in ⁴	ro	3.3026 in	J	0.004791 in ⁴

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

Compression		Positive Moment		Positive Moment	
Pao	37389 lb	Maxo	125.40 k-in	Mayo	25.91 k-in
Ae	1.0338 in ²	Ixe	13.096 in ⁴	Iye	1.943 in ⁴
		Sxe(t)	3.3329 in ³	Sye(l)	0.6973 in ³
		Sxe(b)	3.2170 in ³	Sye(r)	0.6647 in ³
Tension		Negative Moment		Negative Moment	
Ta	52765 lb	Maxo	125.40 k-in	Mayo	25.91 k-in
		Ixe	13.096 in ⁴	Iye	1.943 in ⁴
		Sxe(t)	3.3329 in ³	Sye(l)	0.6973 in ³
		Sxe(b)	3.2170 in ³	Sye(r)	0.6647 in ³
Shear					
Vay	12250 lb				
Vax	8557 lb				



Section Inputs

Material: [Tested]
 No strength increase from cold work of forming.
 Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 63.5 ksi
 Tensile Strength, Fu 74.3 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴

Z-Section, Thickness 0.101 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	1.0200	-50.000	0.25000	None	0.000	0.0000	0.5100
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	1.0200	-50.000	0.25000	None	0.000	0.0000	0.5100

Full Section Properties

Area	1.4089 in ²	Wt.	4.7904 lb/ft	Width	13.950 in
Ix	13.096 in ⁴	rx	3.0487 in	Ixy	3.645 in ⁴
Sx(t)	3.3329 in ³	y(t)	3.9292 in	α	-16.587 deg
Sx(b)	3.2170 in ³	y(b)	4.0708 in		
		Height	8.0000 in		
Iy	1.943 in ⁴	ry	1.1744 in	Xo	0.0249 in
Sy(l)	0.6973 in ³	x(l)	2.7867 in	Yo	0.4826 in
Sy(r)	0.6647 in ³	x(r)	2.9236 in	jx	0.0554 in
		Width	5.7103 in	jy	-0.5156 in
I1	14.181 in ⁴	r1	3.1726 in		
I2	0.857 in ⁴	r2	0.7801 in		
Ic	15.039 in ⁴	rc	3.2671 in	Cw	22.000 in ⁶
Io	15.368 in ⁴	ro	3.3026 in	J	0.004791 in ⁴

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

Compression		Positive Moment		Positive Moment	
Pao	36607 lb	Maxo	122.32 k-in	Mayo	25.27 k-in
Ae	1.0377 in ²	Ixe	13.096 in ⁴	Iye	1.943 in ⁴
		Sxe(t)	3.3329 in ³	Sye(l)	0.6973 in ³
		Sxe(b)	3.2170 in ³	Sye(r)	0.6647 in ³
Tension		Negative Moment		Negative Moment	
Ta	52342 lb	Maxo	122.32 k-in	Mayo	25.27 k-in
		Ixe	13.096 in ⁴	Iye	1.943 in ⁴
		Sxe(t)	3.3329 in ³	Sye(l)	0.6973 in ³
		Sxe(b)	3.2170 in ³	Sye(r)	0.6647 in ³
Shear					
Vay	12099 lb				
Vax	8347 lb				

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# : W0901576

DATE : 02/12/09 12:03:33
PO NO :13-0459T-08
SPECIMEN :16REGU1

TEST DATA

REDUCED SECTION TENSILE

UTS PSI	YS.2%PSI	%EL	%RA	WIDTH	THICK	AREA IN.
75,900	64,700	16.20	51.90	0.501	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# : W0901577

DATE : 02/12/09 12:05:39
PO NO :13-0459T-08
SPECIMEN :16REGU2

TEST DATA

REDUCED SECTION TENSILE

UTS PSI	YS.2%PSI	%EL	%RA	WIDTH	THICK	AREA IN.
78,000	63,500	15.60	62.40	0.502	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# : W0901578

DATE : 02/12/09 12:06:34
PO NO :13-0459T-08
SPECIMEN :16REGU3

TEST DATA

REDUCED SECTION TENSILE

UTS PSI	YS.2%PSI	%EL	%RA	WIDTH	THICK	AREA IN.
75,500	64,400	18.60	61.10	0.503	0.059	0.030


MTEC Representative



Bodycote Testing Group, Houston North Laboratory, 9925 Regal Row, Houston, Texas, 77040
 Tel: 281-848-0270, Fax: 281-848-0275

Test Certificate

Force Eng. & Testing Inc.
 19530 Ramblewood Dr.
 Humble, TX

REF No O801383 : Issue 1
 Ord No 13-0022T-08
 Date Tested 03/25/08
 Date Reported 03/25/08

77338

Attn: Terrance E. Wolfe, P.E.

Item _____ - Sheet Metal samples for Tensile Test, Samples 1 thru 3
 Commercial Siding and Manufacturing, 8x2.5ZEE12 Uplift 1-3

Specification - Client Requirement

Tensile Test - ASTM E 8								
	Dimensions [in]	Area [in ²]	GL [in]	0.20%YS [psi]	UTS [psi]	%EL	%RA	Comments
001:Parent	0.5050x 0.1050	0.0530	2.00	61300	71700	22	N/A	Sample 1
002:Parent	0.4900x 0.1010	0.0495	2.00	65100	74900	20	N/A	Sample 2
003:Parent	0.5050x 0.1010	0.0510	2.00	63500	74300	27	N/A	Sample 3

Certificate Comments

This is an electronic copy. See original certificate for photographs and figures where referenced.

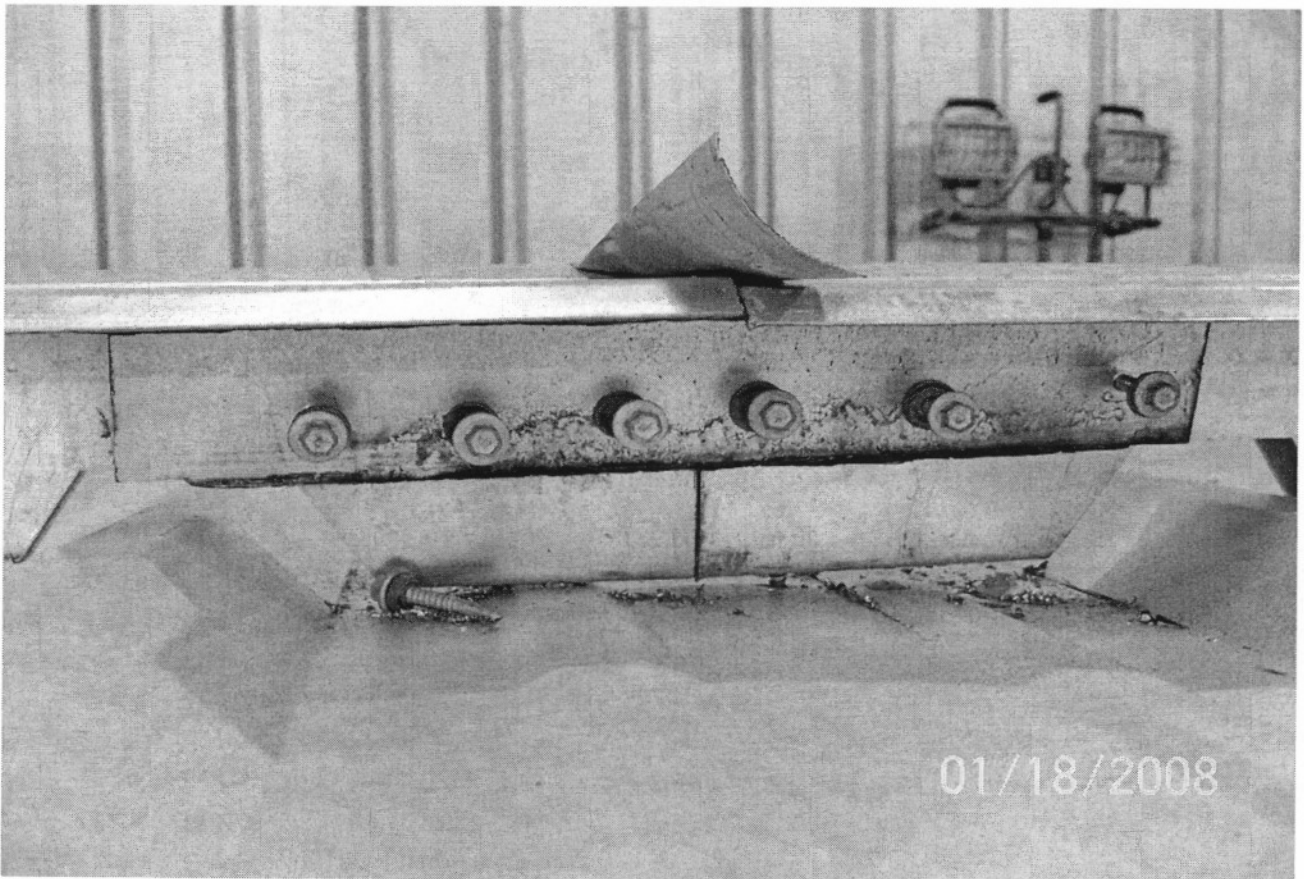
Approved By Jim Blevins

.....
 Jim Blevins
 For and on authority of
 Bodycote Testing Group

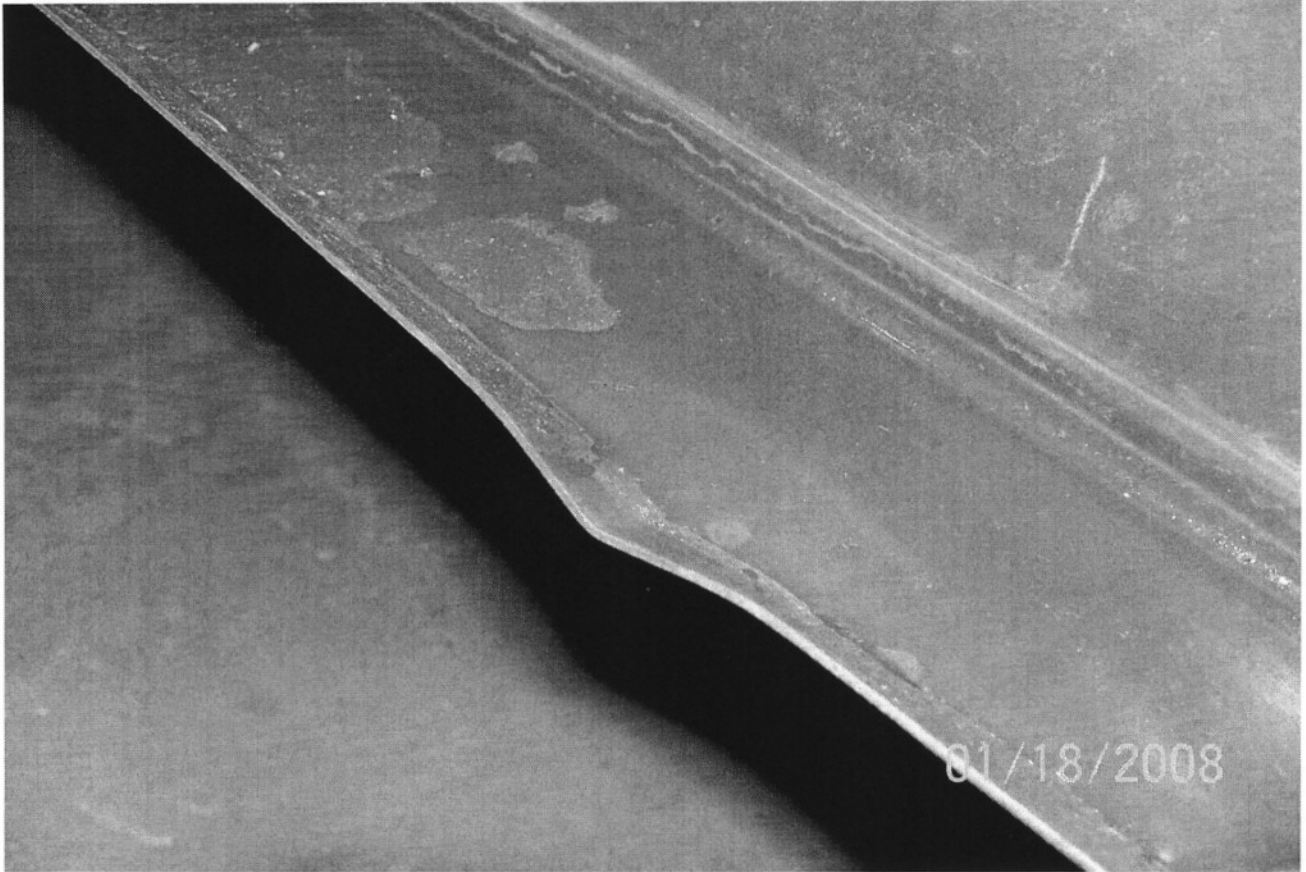
Photos



TYPICAL TEST SET UP



TYPICAL TOPHAT SPLICE



8X2.5ZEE 16 GA. TEST #1 FAILURE



8X2.5ZEE 16 GA. TEST #2 FAILURE



8X2.5ZEE 16 GA. TEST #3 FAILURE



8X2.5ZEE 12 GA. TEST #1 FAILURE



8X2.5ZEE 12 GA. TEST #2 FAILURE