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

Project Number : 410-0237T-13A, B

Test Report Date : December 21, 2013

Test Material: 26 Ga. R-Loc Panel 36" Wide

Test Protocol : ASTM E 1592-01
STANDARD TEST METHOD FOR THE STRUCTURAL PERFORMANCE OF SHEET METAL ROOF AND SIDING SYSTEM BY UNIFORM STATIC AIR PRESSURE DIFFERENCE

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

26 Ga. R-Loc Panel

Report by:

Brandon Jasek, P.E.
Lab Manager

Reviewed by:

Terrence E. Wolfe, P.E.
Director of Operations

ACCREDITED LABORATORY TL-417

ACCREDITED LABORATORY

TEXAS DEPARTMENT OF INSURANCE ACCREDITED LABORATORY

Project Number: 410-0237T-13A, B

PURPOSE:

This test method covers the evaluation of the structural performance of sheet metal panels and anchor-to-panel attachments for roof systems under uniform static air pressure difference using a test chamber.

TEST DATES:

November 20 & 21, 2013

TEST SPECIMEN:

Manufacturer:	Central States Manufacturing, Inc. 302 Jane Place Lowell, AR 72745
Panel Description:	R-Loc Panel, 36" coverage, 26 Ga. 1 ¼" tall major ribs at 12" O.C., with purlin bearing leg.
Panel Rollformer:	The Bradbury Company, Inc.
Panel Properties:	Fy = 91.1 ksi Steel, 0.019" thickness (See ASTM E 8 test report in Appendix)
Panel Fastener:	#12-14 x 1 ¼" SteelBinder HWH w/ Integral washer system Self driller by Sealtite. (1) ¼-14 x 7/8" HWH Lap Screw at 20" O.C. on panel side laps
Fastener Pattern:	12"-12"-12"
Purlin Spacing:	Test A: 4 Spans at 5'-0" O.C. Test B: 10 spans at 2'-0" O.C.

TESTING APPARATUS:

Chamber Blower: New York Blower
Test Chamber: 20'x10' steel chamber.
Mounting Frame: 16 Ga. Cold Formed CEE/ I-beam composite section
Pressure Indicator: Digital Pressure Indicators
Deflection Rulers: Aluminum rulers calibrated to 1/64".

PANEL INSTALLATION:

1. The panels were installed per manufactured details onto 16 Ga. purlins with the above fasteners.

2. Plastic was draped loosely on top of the purlins/beneath the panels to create a seal.

TEST PROCEDURE:

1. Initially the system was preloaded to a pressure of -5.0 psf to insure proper seating of the panels and plastic film.

2. With the preloading process complete, initial deflection measurements were taken at the (8) deflection indicator locations. These initial deflection readings represented the zero position/zero load specimen status from which all readings were referenced.

3. Pressure was applied in the intervals shown on the data sheet (see appendix) for 60 seconds at a time. After each interval of loading, the system was allowed to return to atmospheric pressure.

4. Deflection readings were taken during each cycle of applied pressure. Also, a "zero" reading was taken after each cycle to record any permanent deformation produced by the load interval.

5. The test proceeded as stated above until the system reached ultimate failure.

RESULTS/CONCLUSIONS:

Test A

The maximum sustained test pressure was -83.2 psf. The mode of failure was the panel tore at fasteners causing the panel to pull over the fastener at -88.4 psf.

Test B

The maximum sustained test pressure was -218.3 psf. The mode of failure was the panel tore at fasteners causing the panel to pull over the fastener at -225.5 psf.

Graphs plotting deflection and permanent set versus pressure are found in the appendix of this report along with the raw data sheet.

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.

State of Florida
C.O.A.
28778

STATEMENT OF INDEPENDENCE:

Force Engineering & Testing, Inc. or any persons employed by them do not have any financial interest in Central States Manufacturing, Inc.

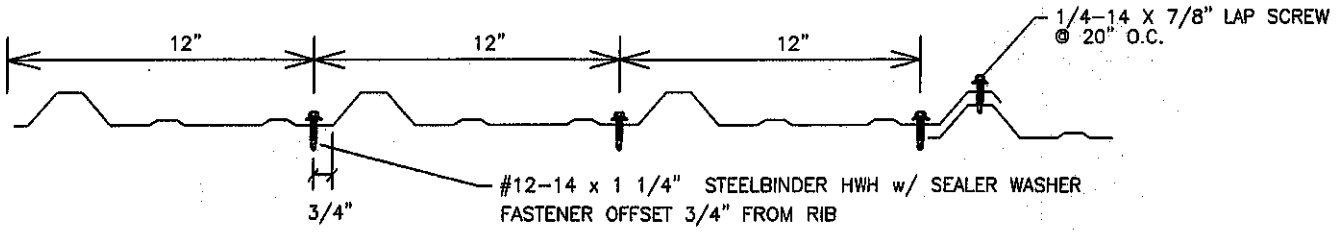
Force Engineering & Testing, Inc. is not owned, operated or controlled by Central States Manufacturing, Inc.

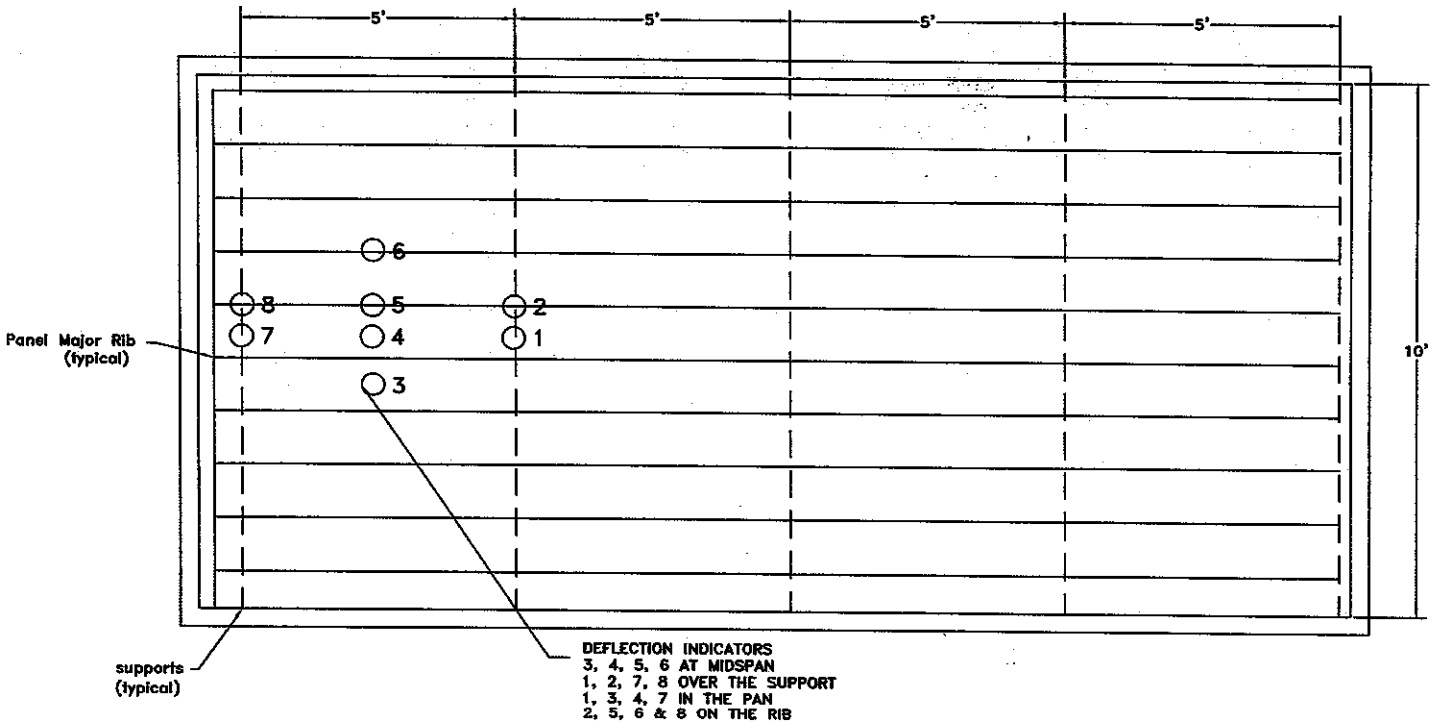
TERRENCE E. WOLFE
LICENSE
No. 44923
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

DEC 13 2013

Appendix

26 GA. R-Loc PANEL FASTENER PATTERN





TEST CHAMBER SETUP

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

TEST:	BY:	DESCRIPTION:	DATE:

PANEL TYPE: 26 GA. R-Loc NEGATIVE LOADING

MANUFACTURER: CENTRAL STATES MANUFACTURING, INC.

TEST PROTOCOL: E-1592

CLIP TYPE: NA | DATE:

CLIP FASTENER: #12-14 | SPAN: 5-0" O.C.

QUOTE NUMBER: 410-0237T-13A | MAX PRESSURE:

E-1592 Raw Test Data

Project: 410-0237T-13A
Description: 26 Ga. R-Loc 36" wide Neg. Loading, 4 Spans @ 5'-0"
Date: 11/20/2013

LOAD	DEFLECTION (IN.)							
PSF	1	2	3	4	5	6	7	8
0.00	3.0313	4.3125	3.0156	3.0000	4.3594	4.3281	2.9688	4.3125
21.00	3.3750	4.6250	3.7500	3.6875	4.7813	4.7813	3.2188	4.5000
0.00	3.0313	4.3125	3.0156	3.0000	4.3594	4.3281	2.9688	4.3125
41.60	3.6250	4.8125	4.2188	4.1250	5.0938	5.0625	3.4531	4.5938
0.00	3.0469	4.3281	3.0313	3.0000	4.3750	4.3438	3.0000	4.3281
52.00	3.7813	4.8906	4.4063	4.3125	5.1875	5.1875	3.5625	4.6250
0.00	3.0625	4.3281	3.0313	3.0000	4.3750	4.3438	3.0000	4.3281
62.40	3.8750	4.9531	4.5625	4.4688	5.3125	5.2813	3.6563	4.6563
0.00	3.0625	4.3438	3.0313	3.0313	4.3750	4.3594	3.0000	4.3281
72.80	3.9688	5.0000	4.7188	4.6563	5.4375	5.4063	3.7500	4.6719
0.00	3.0938	4.3438	3.0625	3.0313	4.3906	4.3750	3.0000	4.3281
83.20	4.0625	5.0625	4.8906	4.9531	5.6563	5.5313	3.8594	4.7188
0.00	3.1094	4.3438	3.0625	3.1250	4.4375	4.3750	3.0000	4.3438

Ultimate Test Pressure: -83.2 psf
Mode of Failure: Panel pulled over fasteners

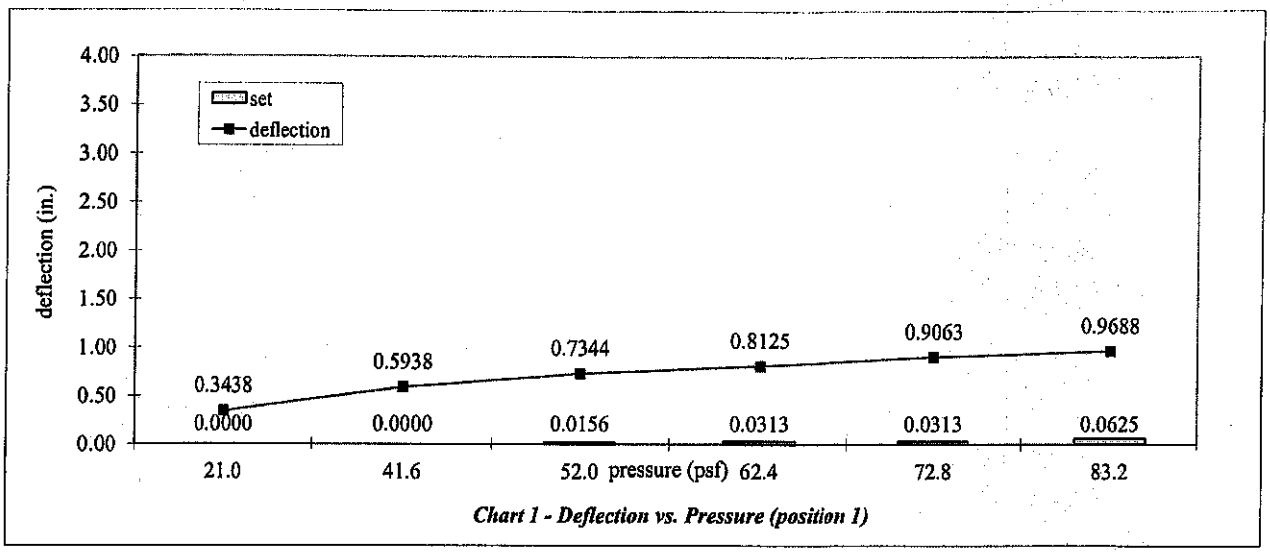


Chart 1 - Deflection vs. Pressure (position 1)

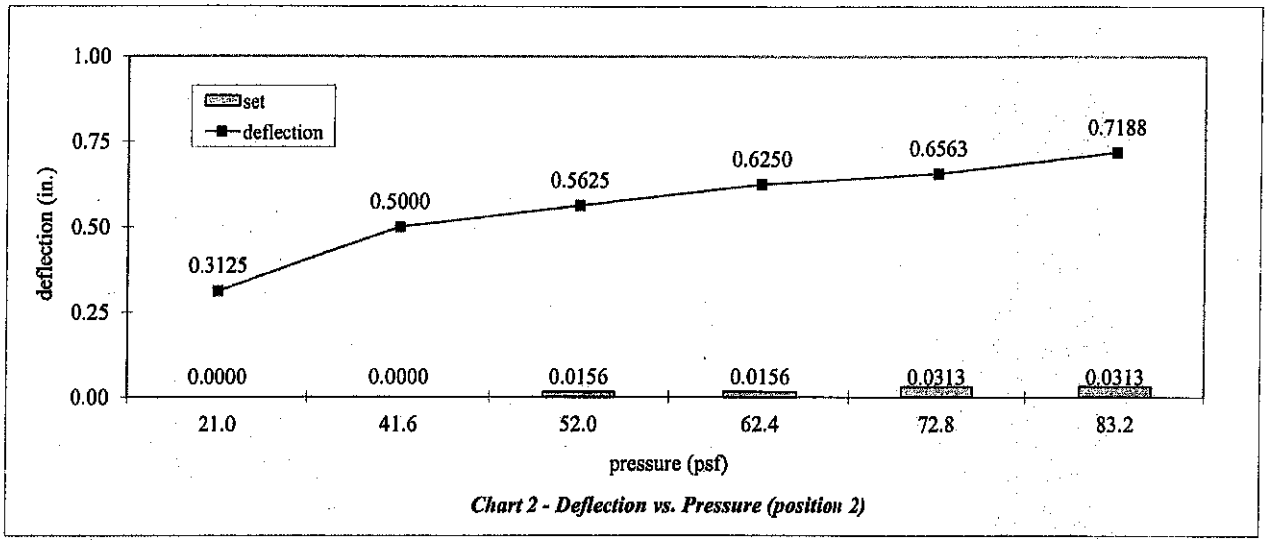


Chart 2 - Deflection vs. Pressure (position 2)

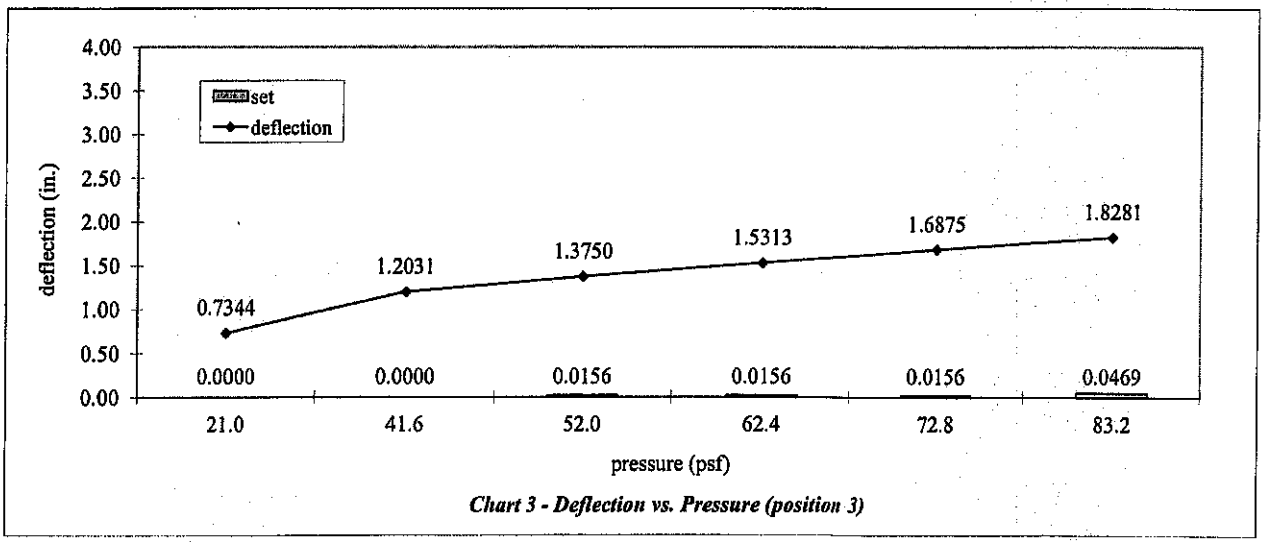


Chart 3 - Deflection vs. Pressure (position 3)

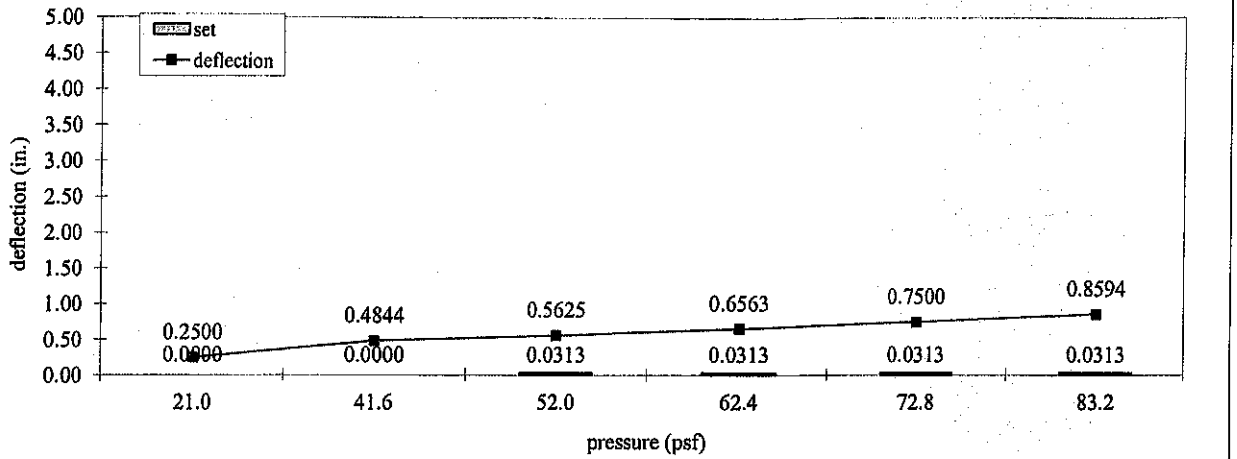


Chart 7 - Deflection vs. Pressure (position 7)

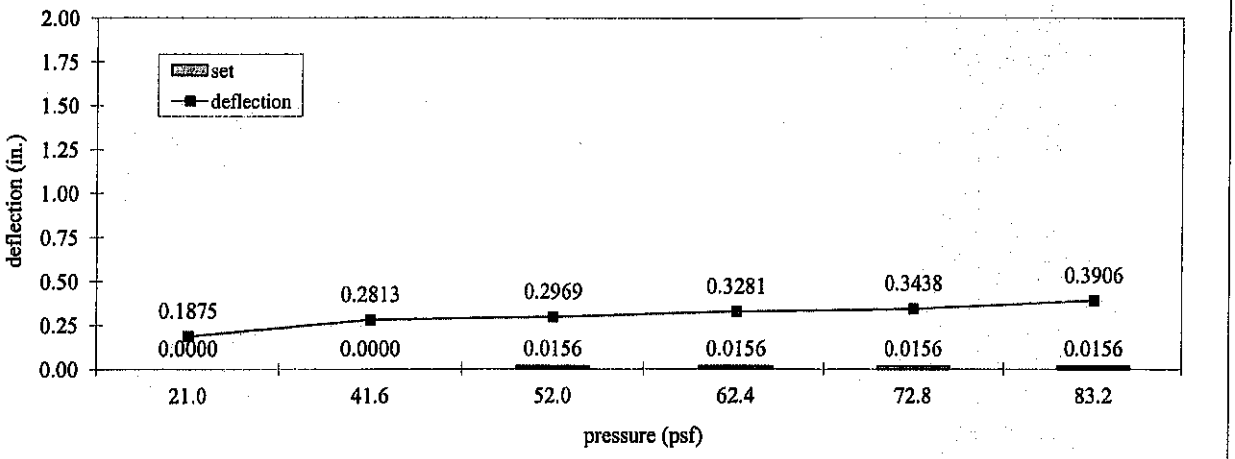
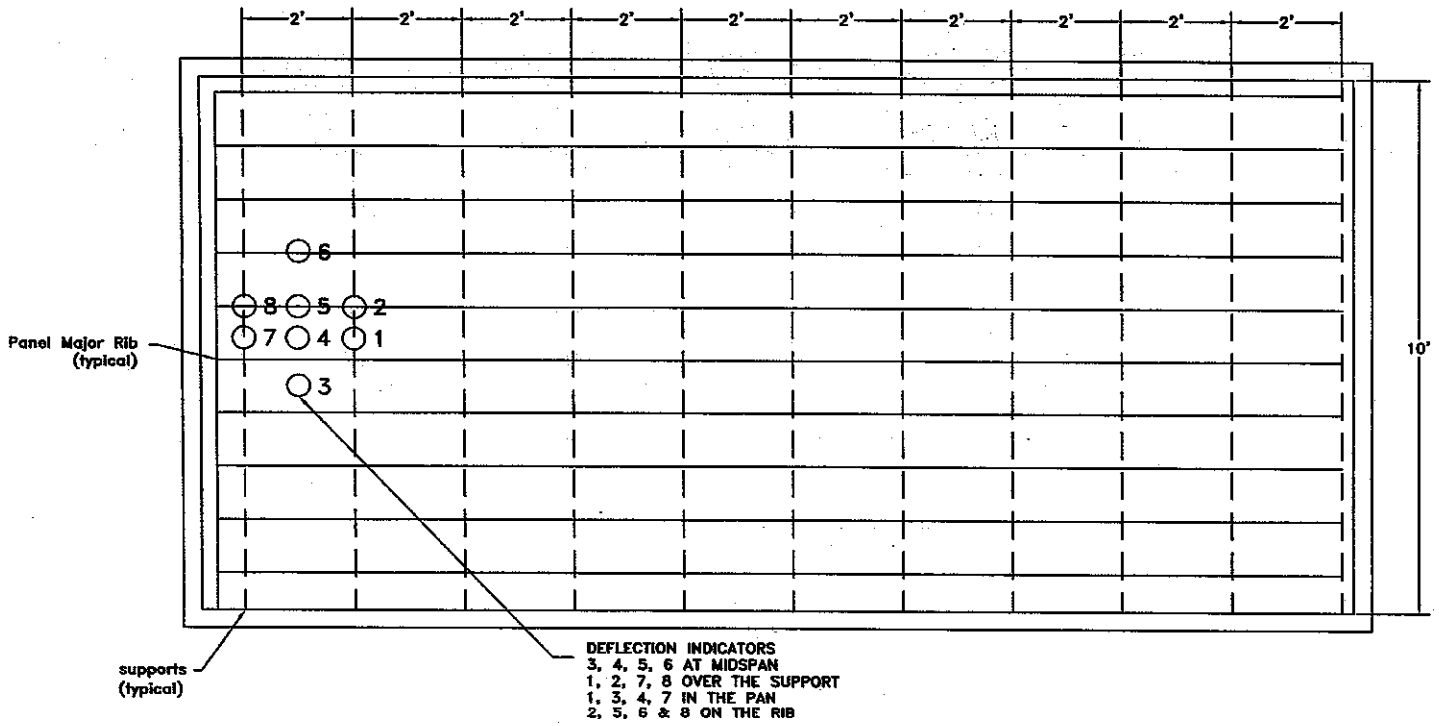


Chart 8- Deflection vs. Pressure (position 8)



TEST CHAMBER SETUP

Force Engineering & Testing Inc.
19530 Rambleswood Dr.
Humble, Texas 77338
Phone: (281) 540-8605 Fax: (281) 540-9966

TEST:	BY:	DESCRIPTION:	DATE:

PANEL TYPE: 26 GA. R-Loc NEGATIVE LOADING	
MANUFACTURER: CENTRAL STATES MANUFACTURING, INC.	CLIP TYPE: NA / DATE:
TEST PROTOCOL: E-1592	CLIP FASTENER: #12-14 / SPAN: 2'-0" O.C.
	QUOTE NUMBER: 410-0237T-13B / MAX PRESSURE:

E-1592 Raw Test Data

Project: 410-0237T-13B
Description: 26 Ga. R-Loc 36" wide Neg. Loading, 10 Spans @ 2'-0"
Date: 11/21/2013

LOAD	DEFLECTION (IN.)							
PSF	1	2	3	4	5	6	7	8
0.00	1.7656	3.0938	1.8438	1.6406	3.0313	2.8438	1.6875	3.0156
21.00	2.0000	3.2813	2.1563	1.9375	3.2188	3.0625	1.9375	3.2500
0.00	1.7656	3.0938	1.8438	1.6406	3.0313	2.8438	1.6875	3.0156
41.60	2.2656	3.4219	2.4375	2.2500	3.3594	3.2188	2.1250	3.3125
0.00	1.7656	3.0938	1.8438	1.6406	3.0313	2.8438	1.7031	3.0156
62.40	2.4688	3.5000	2.6406	2.4531	3.4375	3.3125	2.2500	3.4063
0.00	1.7813	3.0938	1.8594	1.6563	3.0313	2.8750	1.7031	3.0156
83.20	2.6875	3.5938	2.8125	2.6406	3.5156	3.3906	2.3750	3.4375
0.00	1.8125	3.0938	1.8750	1.6563	3.0313	2.8750	1.7031	3.0156
104.00	2.8594	3.6563	2.9688	2.7969	3.5781	3.4531	2.4844	3.4688
0.00	1.8125	3.0938	1.8750	1.6563	3.0313	2.8906	1.7188	3.0156
124.70	2.9531	3.7188	3.0938	2.9063	3.6250	3.5000	2.5938	3.5000
0.00	1.8125	3.1094	1.8906	1.6719	3.0469	2.8906	1.7188	3.0313
145.50	3.0938	3.7500	3.2031	3.0313	3.6875	3.5625	2.6875	3.5313
0.00	1.8125	3.1250	1.8906	1.6875	3.0625	2.9219	1.7344	3.0313
166.30	3.2031	3.7969	3.3281	3.1250	3.7188	3.6250	2.7969	3.5469
0.00	1.8281	3.1563	1.9063	1.6875	3.0781	2.9375	1.7344	3.0469
187.10	3.2969	3.8438	3.4688	3.2188	3.7500	3.6563	2.9531	3.5625
0.00	1.8281	3.1875	1.9219	1.6875	3.0938	2.9531	1.7500	3.0625
207.90	3.3750	3.8594	3.6094	3.3125	3.7813	3.6875	3.0625	3.5938
0.00	1.8281	3.2188	1.9375	1.6875	3.1250	2.9688	1.7500	3.0938

Ultimate Test Pressure: -218.3 psf
Mode of Failure: Panel pulled over fasteners

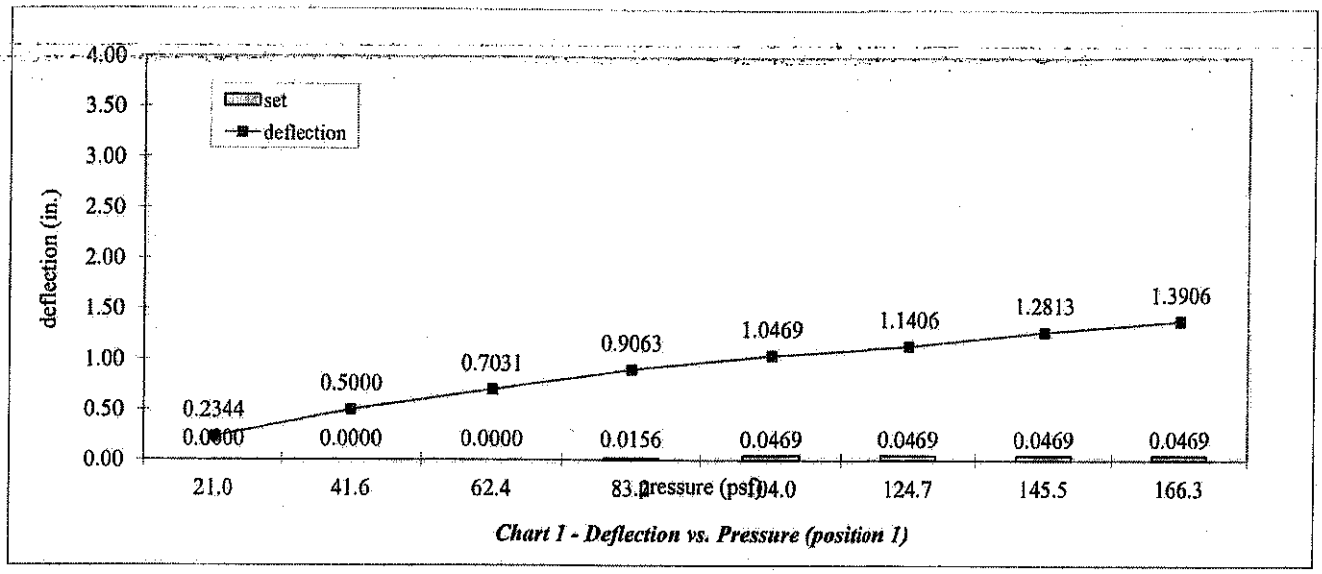


Chart 1 - Deflection vs. Pressure (position 1)

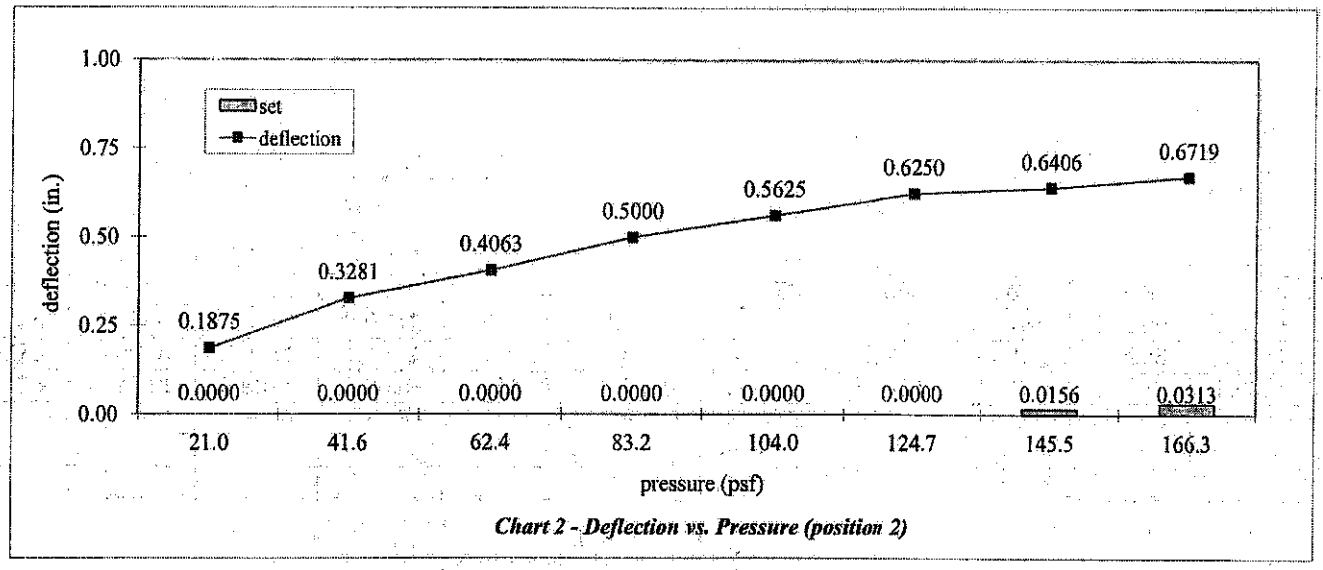


Chart 2 - Deflection vs. Pressure (position 2)

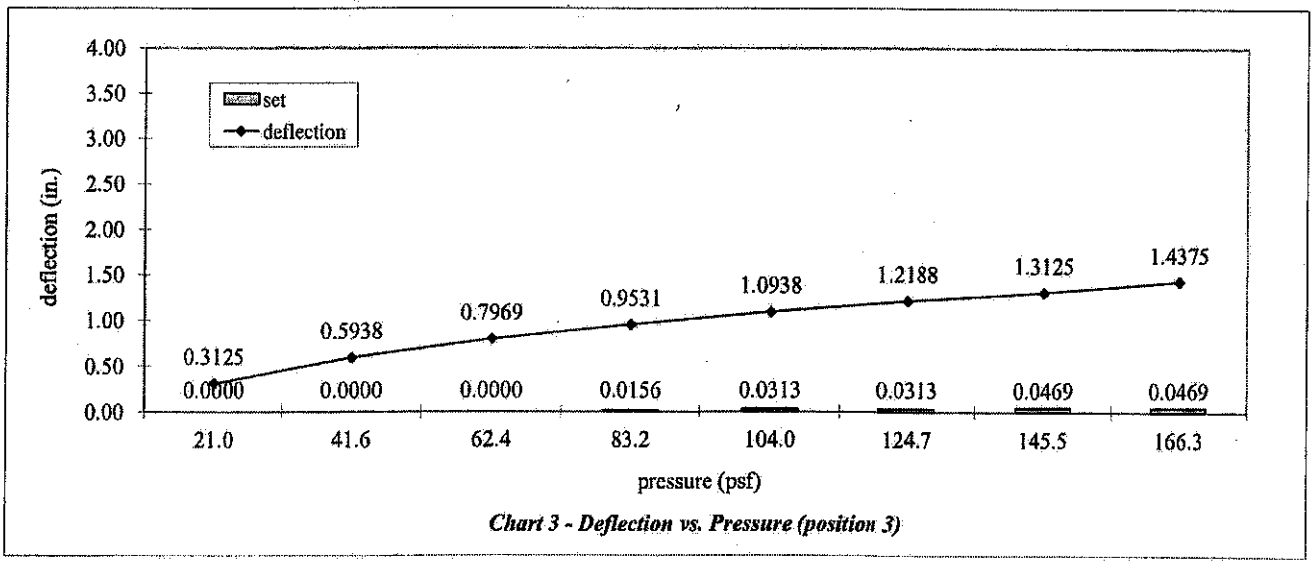


Chart 3 - Deflection vs. Pressure (position 3)

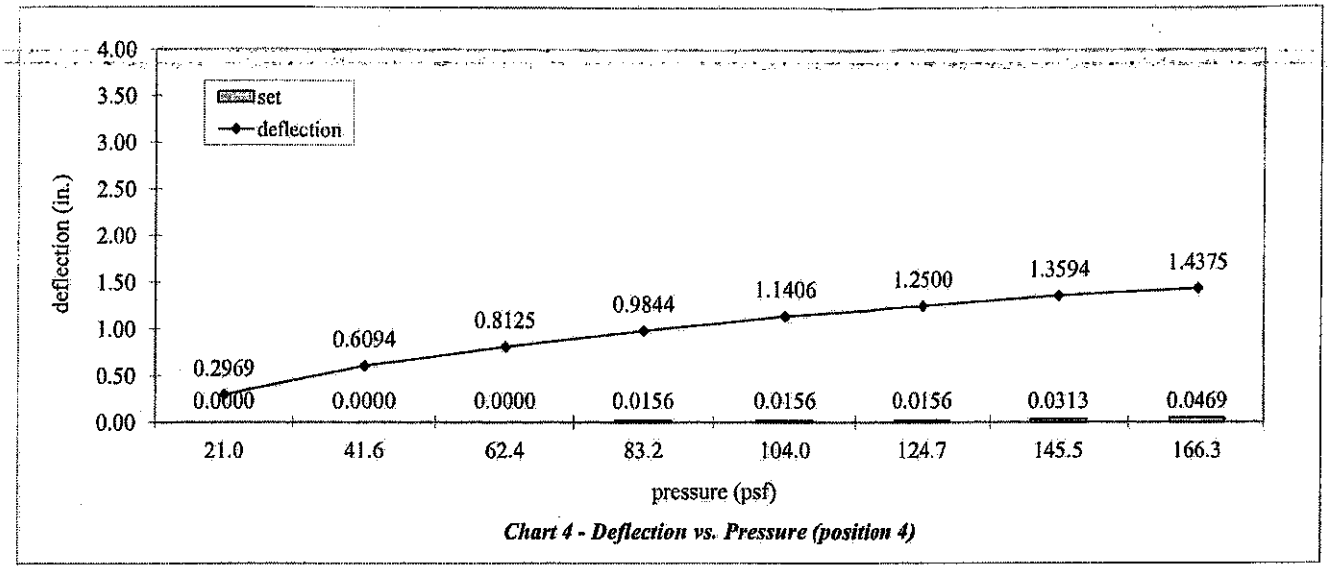


Chart 4 - Deflection vs. Pressure (position 4)

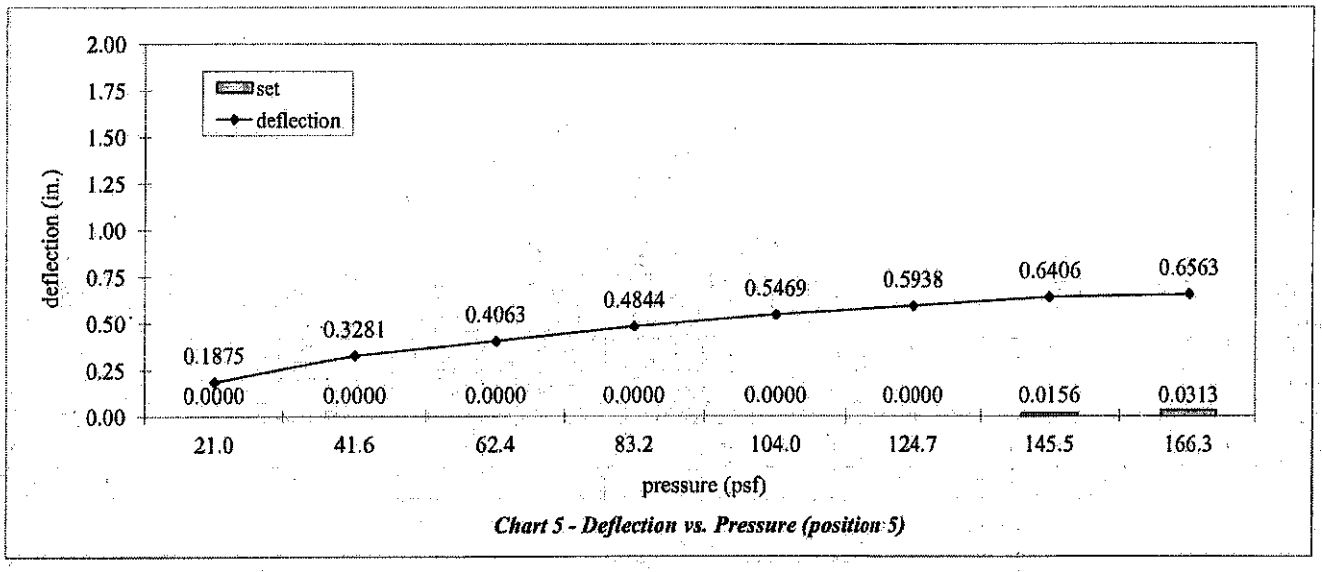


Chart 5 - Deflection vs. Pressure (position 5)

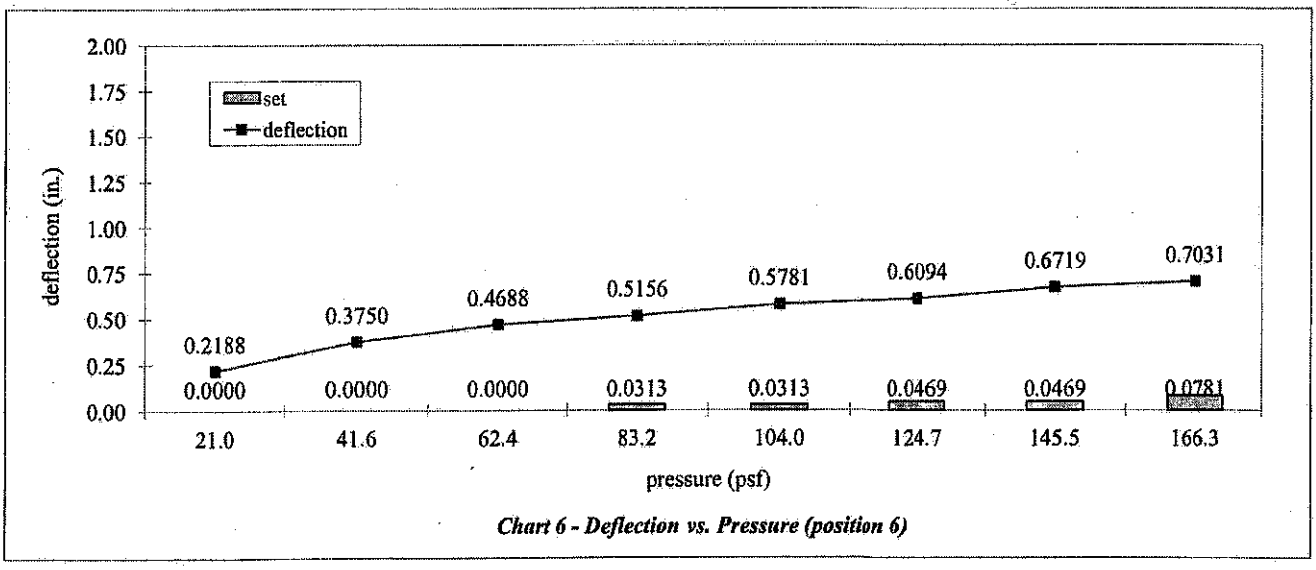


Chart 6 - Deflection vs. Pressure (position 6)

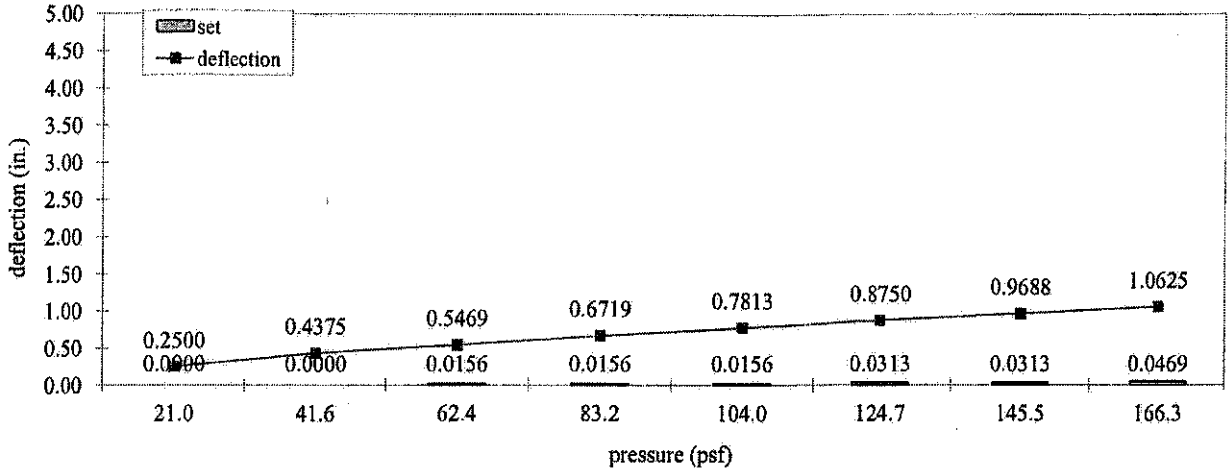


Chart 7 - Deflection vs. Pressure (position 7)

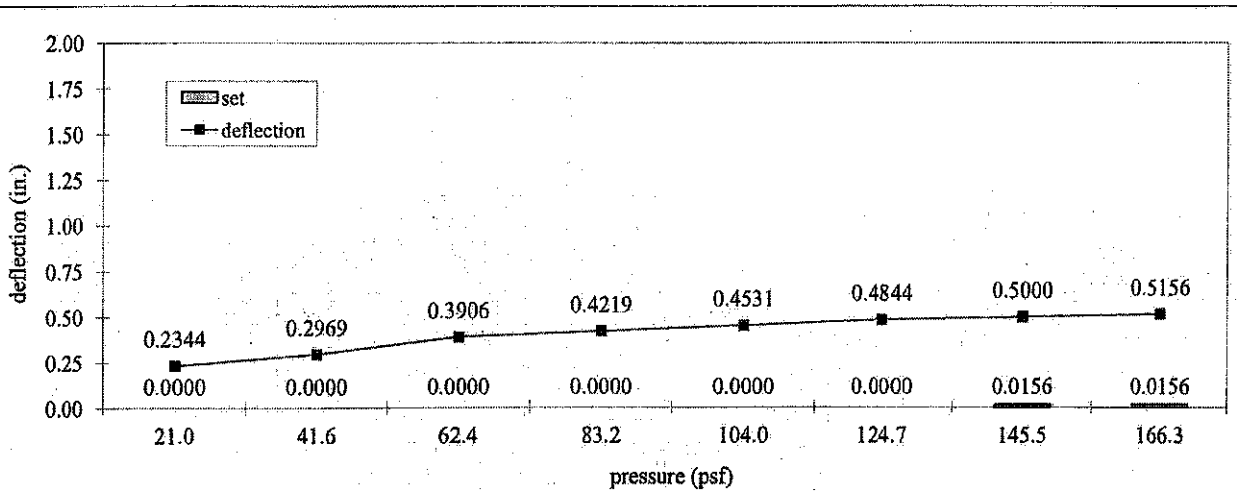
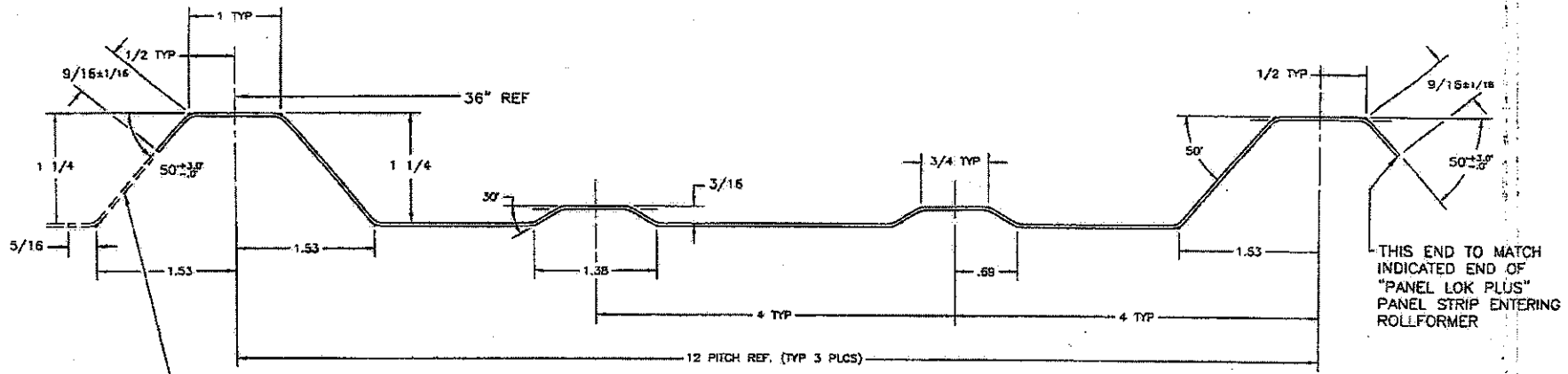


Chart 8- Deflection vs. Pressure (position 8)



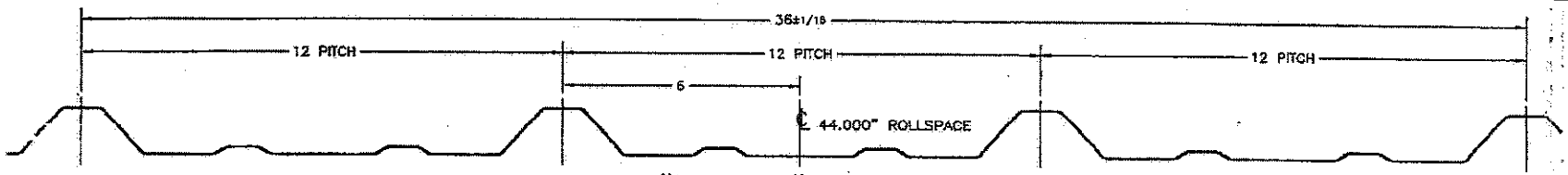
PITCH AND END DETAILS

7/8 SCALE

★TESTED WITH PURLIN BEARING LEG

OUTBOARD SIDE

INBOARD SIDE



"R LOK" PANEL

3/8 SCALE

NOTES:
1. ALL INSIDE BEND RADII ARE .172".
2. MATERIAL: 29-22 GA. GALV. & PAINTED STL. (.017 MIN. .035 MAX.). GRADES "D" AND "E" (50 KSI AND 80 KSI MINIMUM YIELDS).
3. STRIP WIDTH USED = 41.64 AND 43.00".
4. ALL DIMENSIONS SHOWN ARE BASED ON 0.035 MATERIAL
5. TOOLING ALLOWS FOR THE FORMING OF THE LEG PLUS 5/16 LIP ON BOTH THE INBOARD AND OUTBOARD SIDES.

SYM	REVISION	DATE	APPROVED
A	CORRECTED DATE WAS 02-13-05	02/21/2006	A. HOOK

TOLERANCES EXCEPT AS NOTED X/X ±1/16 .X ±.060 .XX ±.030 .XXX ±.015 ∠ 1°

BRADBURY

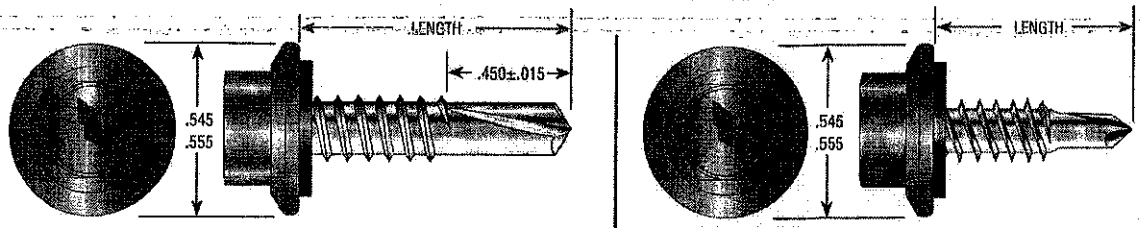
THE BRADBURY COMPANY, INC.
MOUNDRIDGE, KS 67107 U.S.A.

"R LOK" PANEL
CROSS SECTION

DATE 02-13-05 DRAWN BY Tim R.
SCALE AS NOTED APPROVED BY
SHEET 01 PART NO. SCO-3575-C1

CUSTOMER - Central States Manufacturing Company W.O. - B001244

MAXX SteelBinder®



SPECIFICATIONS SUMMARY

#12 Dimensions:

Drill Point: 2.5
Major Diameter: .215/.209
Minor Diameter: .164/.157
Washer Face Dia: .555/.545
Head Across Flats: .305/.311

1/4" Dimensions:

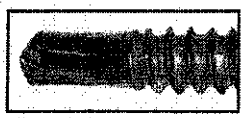
Drill Point: 1
Major Diameter: .246/.240
Minor Diameter: .192/.185
Washer Face Dia: .555/.545
Head Across Flats: .305/.311

SIZE	HEAD STYLE	CARTON QTY.	WEIGHT/M
12-14 x 3/4"	5/16" CHWH*	2500	11.80
12-14 x 1"	5/16" CHWH*	2500	13.96
12-14 x 1-1/4"	5/16" CHWH*	2500	14.61
12-14 x 1-1/2"	5/16" CHWH*	2000	16.62
12-14 x 2"	5/16" CHWH*	1500	19.88
12-14 x 2-1/2"	5/16" CHWH*	1500	22.82
12-14 x 3"	5/16" CHWH*	1000	26.57
1/4-14 x 7/8" STITCH	5/16" CHWH*	2500	13.61

*CHWH-CUPPED HEX WASHER HEAD.

PERFORMANCE DATA

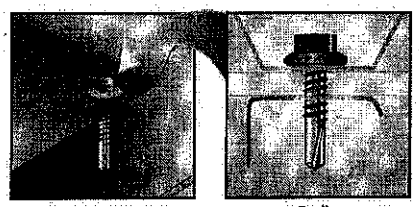
PULL OUT STRENGTH VALUE (LBS. ULT.)	MATERIAL THICKNESS											
	16 GAUGE			26 GA	24 GA	22 GA	18 GA	3/16"	16 GA	14 GA	12 GA	10 GA
	.075"	.105"	.135"	.018"	.024"	.030"	.048"	.188"	.060"	.075"	.105"	.135"
#12 MAXX®	927	958	1678						729	787	1041	1372
1/4" STITCH				342	378	418	1036	620				



Drill point is designed to penetrate steel quickly with no "point walking"

PULL OVER STRENGTH VALUE (LBS. ULT.)	DESIGNATION	MATERIAL AZ55 GALVALUME			
	NOM. GAUGE	29	26	24	22
	THICKNESS	.015	.019	.024	.032
#12 MAXX®		687	1090	1299	1562
1/4" STITCH		746	960	1261	1376

Cupped HWH head design improves Pull over strength versus standard HWH & Bonded Washer. Sealtite sockets are designed to allow for the added thickness of the powder coat.



Purlin

- Fastener designed to attach metal roof and sidewall panels used in pre-engineered metal building applications.
- #12 Diameter 5/16" Cupped HWH self-drilling fastener easily penetrates steel up to .210" in thickness with no "point walking". 1/4" Stitch will securely fasten 2 layers of 26 GA with no strip-out.
- Cupped head & washer encapsulate EPDM rubber washer & provide a secure seal even when driven at an angle.

Stitch

ST Magnetic Sockets are available for powder coated fasteners.

POWDER COATED

ZXL available with Powder Coating End of 2012.

NOTES: 1. *HRS (Hot Rolled Steel)*
2. Pull over values calculated with EPDM rubber washer assembled to cupped head screw with .555" washer face.
3. All strength values shown are ultimate values, expressed in LBS. Apply an appropriate safety factor to obtain design limits.

SEALTITE BUILDING FASTENERS
www.sealtite.com

6357 Reynolds Road
P.O. Box 4515, Tyler, Texas 75712
800-352-4864 • 800-352-3940 Fax
903-592-2826 • 903-592-1583 Fax

9950 Princeton Glendale Rd.
Cincinnati, OH 45246
800-944-8920 • 800-944-4183 Fax
513-874-5905 • 513-874-5903 Fax

METALLURGICAL ENGINEERING SERVICES, INC.
Consulting • Failure Analysis • Laboratory Testing

December 12, 2013

REPORT OF: Tensile Test

REPORT TO: Force Engineering & Testing, Inc.
Gianna Willits
19530 Ramblewood Drive
Humble, Texas 77338

DATE APPROVED: December 6, 2013

IDENTIFICATION: 1 ea. Metal Roof Panel identified as:
G) 410-0237T-13; Central States Mfg; PBR 26 GA

PROCEDURES:

Tensile testing was performed per ASTM E 8-11 on the submitted sample using a Satec Systems Model Apex 22EMF, S/N: 1017, calibration due 5/2/14.

RESULTS: ***Tensile Test*** - 2" Gage Length, 0.2% Offset

SQR Dimensions Inches			Ultimate Strength		Yield Strength		Elong
Width	Thickness	Area, In^2	Load, Lbs	PSI	Load, Lbs	PSI	%
0.5020	0.0190	0.0095	882	92,800	865	91,100	3.9

These results and opinions are based on the tests performed and are subject to change upon the receipt of new or additional information.

Respectfully submitted,

METALLURGICAL ENGINEERING SERVICES, INC.
Firm Registration No. F-2674

Daniel A. Stolk, PE
President

Karen Goldstein
Quality Assurance Assistant

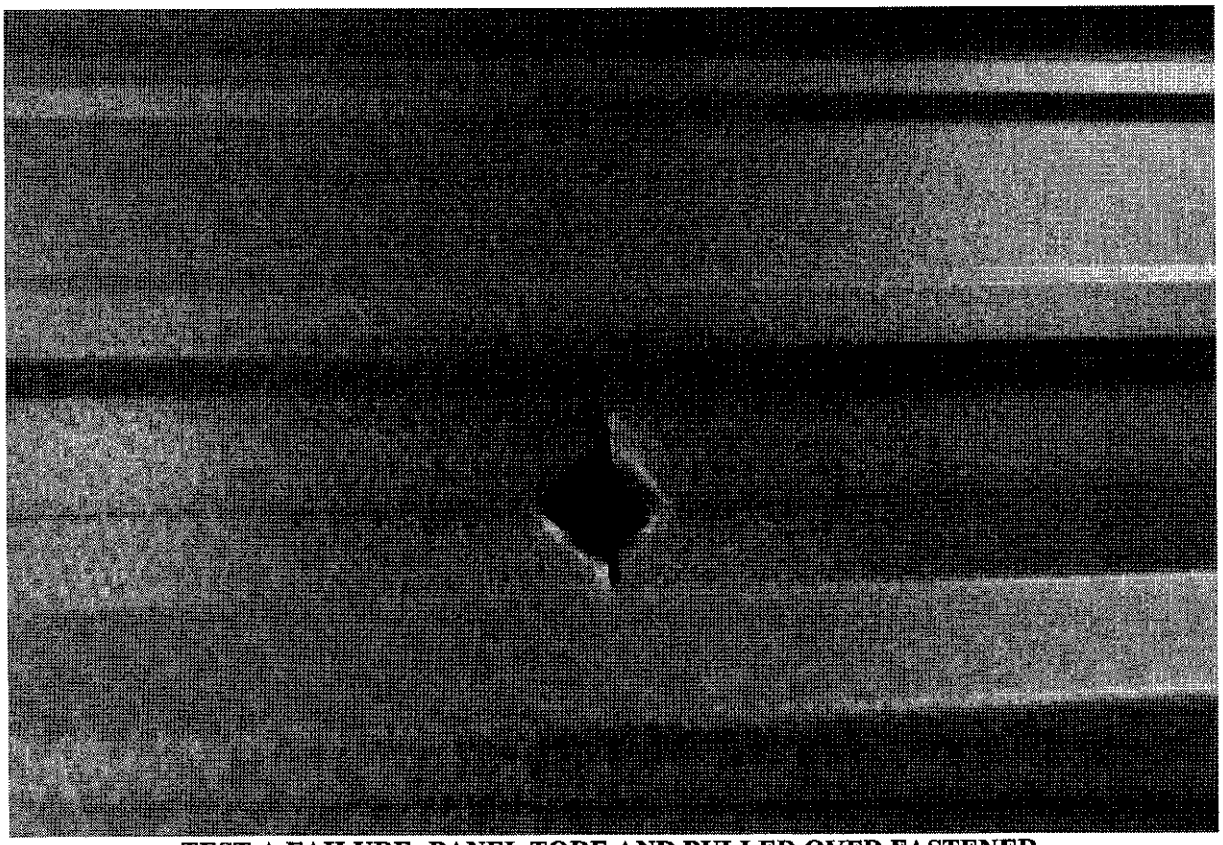
Purchase Order No. 410-0237T-13

Lab No. 29010-G
Page 1 of 1

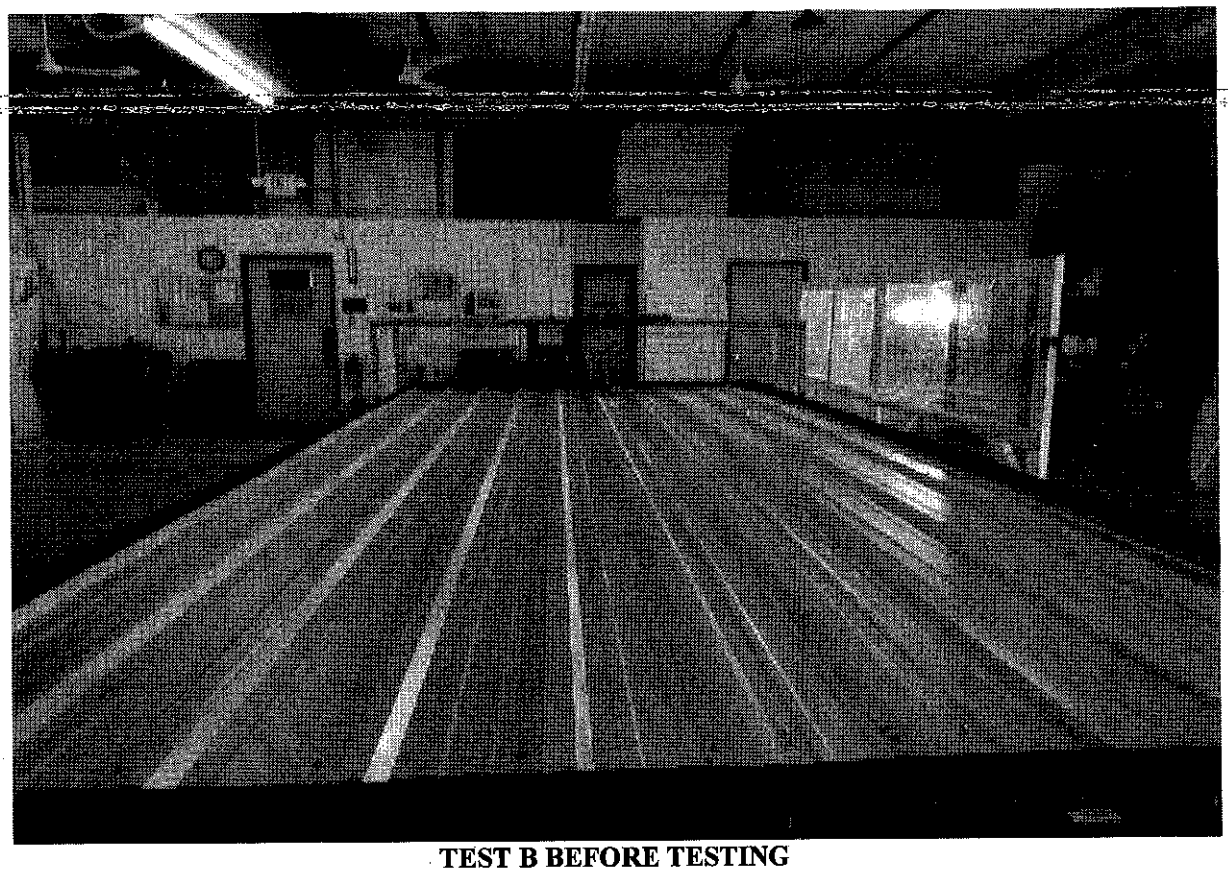
(972) 480-0033 • FAX (972) 480-0036 • 845 E. Arapaho Road • Richardson, Texas 75081 • www.metengr.com

ACCREDITED
Test Lab
Cert. 3065.01

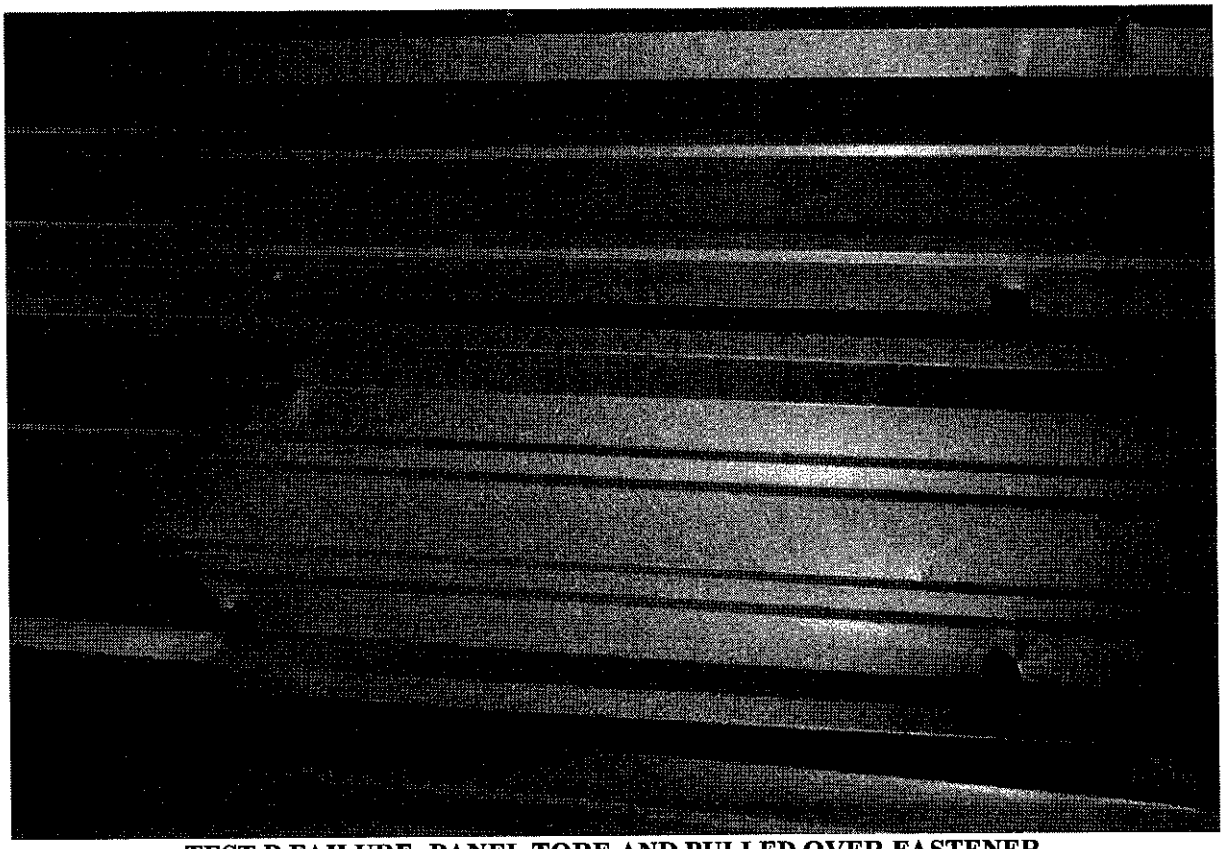
TEST A BEFORE TESTING



TEST A FAILURE: PANEL TORE AND PULLED OVER FASTENER



TEST B BEFORE TESTING



TEST B FAILURE: PANEL TORE AND PULLED OVER FASTENER