Farabaugh Engineering and Testing, Inc.

Project No. T120-98

Report Date: March 20, 1998

ASTM 1592
STANDARD TEST METHOD FOR
STRUCTURAL PERFORMANCE OF SHEET METAL ROOF AND SIDING
SYSTEMS BY UNIFORM STATIC AIR PRESSURE DIFFERENCE

BEMO 305 PANEL

0.039 ALUM / 12" WIDE

FOR

BEMO USA
3062 N. MAPLE STREET
MESA, AZ 85215

Report Prepared By:

Patrick J. Farabaugh, PE

Reviewed and Approved By:

Daniel G. Farabaugh, PE

10/13/02

Keystone Commons • 515 Braddock Avenue • Turtle Creek, PA 15145
(412) 824-3316 • FAX (412) 824-3367

Project No. T120-98

ASTM 1592
STANDARD TEST METHOD FOR
STRUCTURAL PERFORMANCE OF SHEET METAL ROOF AND SIDING SYSTEMS BY UNIFORM STATIC AIR PRESSURE DIFFERENCE

Purpose

This test method covers the evaluation of the structural performance of Sheet Metal Panels and Anchor to Panel Attachments for roof or siding systems under uniform static air pressure difference.

Test Date

March 2, 1998 (3 Spans @ 5' oc.)
March 20, 1998 (7 Spans @ 2' oc.)

Test Specimen

Manufacturer: Bemo USA
3062 N. Maple Street
Mesa, AZ 85215

Panel: 0.039 Alum. BEMO 305 Standing Seam Panel 12" Wide
Clip: 18 GA Stainless Steel Hook Clip
Panel Length: as shown

Testing Apparatus

Test Chamber: Vacuum Chamber Composed of Wood

Mounting Frame: 16 ga Hat Shape Subgirts fastened to W6 X 15 Wide Flange Beams

Pressure Indicator: Digital Pressure Indicator from Micro-Pneumatic Logic, Inc. with accuracy to one tenth of an inch and traceable to the National Bureau of Standards

Deflection Dials: Dial Indicators from Starrett, Fowler, CDI and Teclock with accuracy to 0.001 of an inch, certified by Do-All Gage Block #6125 traceable to the National Bureau of Standards.

Installation

- The panels were installed with clips onto 16 ga Hat shape Subgirts using (2) #14 Tek fasteners per clip. The side joints consisted of the female rib interlocking with the male rib and mechanically seamed. Continuity fasteners were located at the interlocking joints at panel ends.

- The system was inverted and attached to the steel beams with #14 tek fasteners and C-Clamps.

- Plastic (4 mil thick) was employed loosely between the panels and subgirts and in the side joints to create a vacuum seal.

Procedure

- The specimen was checked for proper adjustment and all vents closed in the pressure measuring lines.

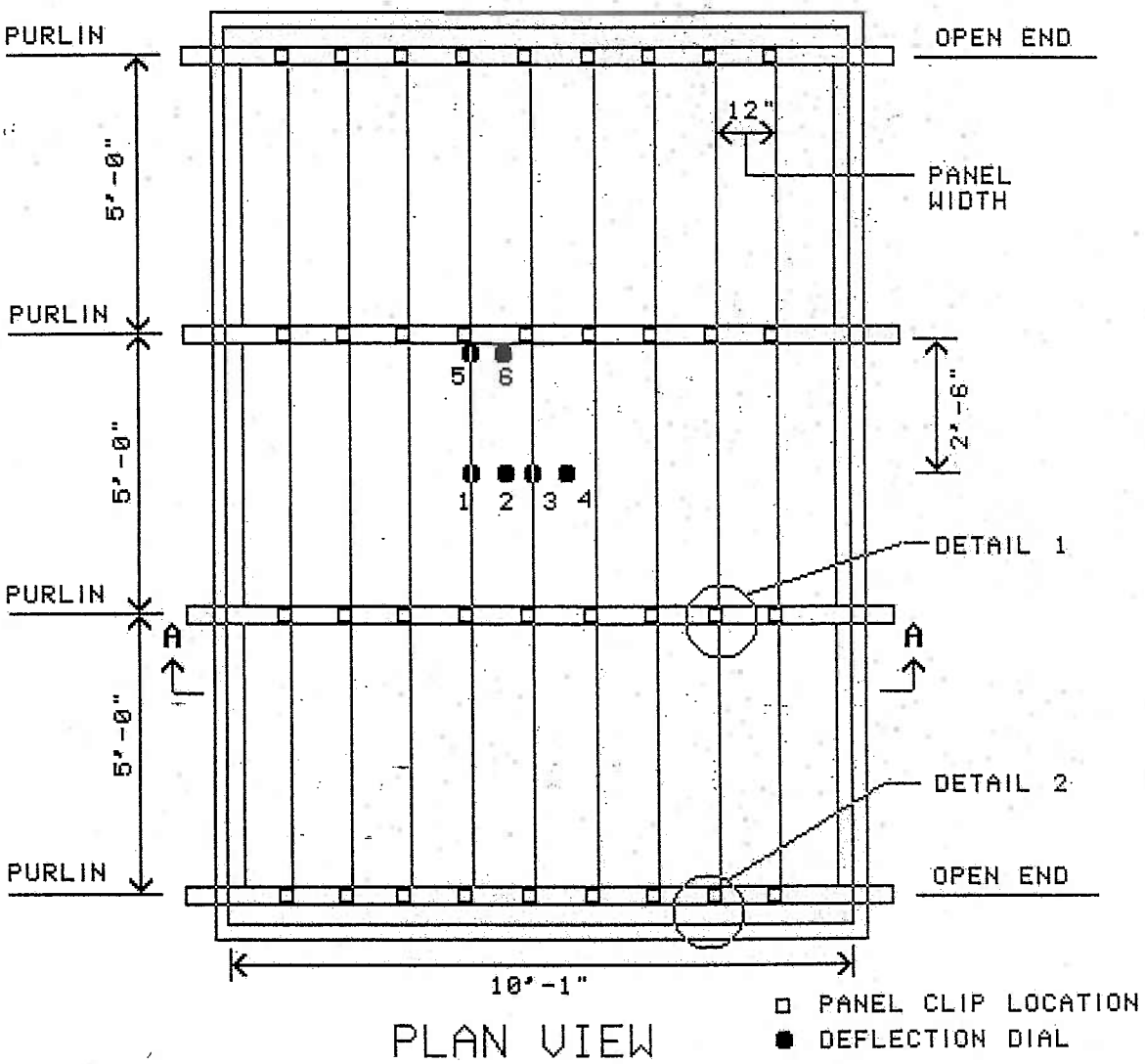
- The required deflection measuring devices were installed at their specified locations.

- A nominal initial pressure was applied equal to at least four times but not more than ten times the dead weight of the specimen. This nominal pressure was used as the reference zero and initial deflection readings were recorded.

- At each load increment, pressure was maintained for a period of not less than 60 seconds and until the deflection gages indicated no further increase in deflections.

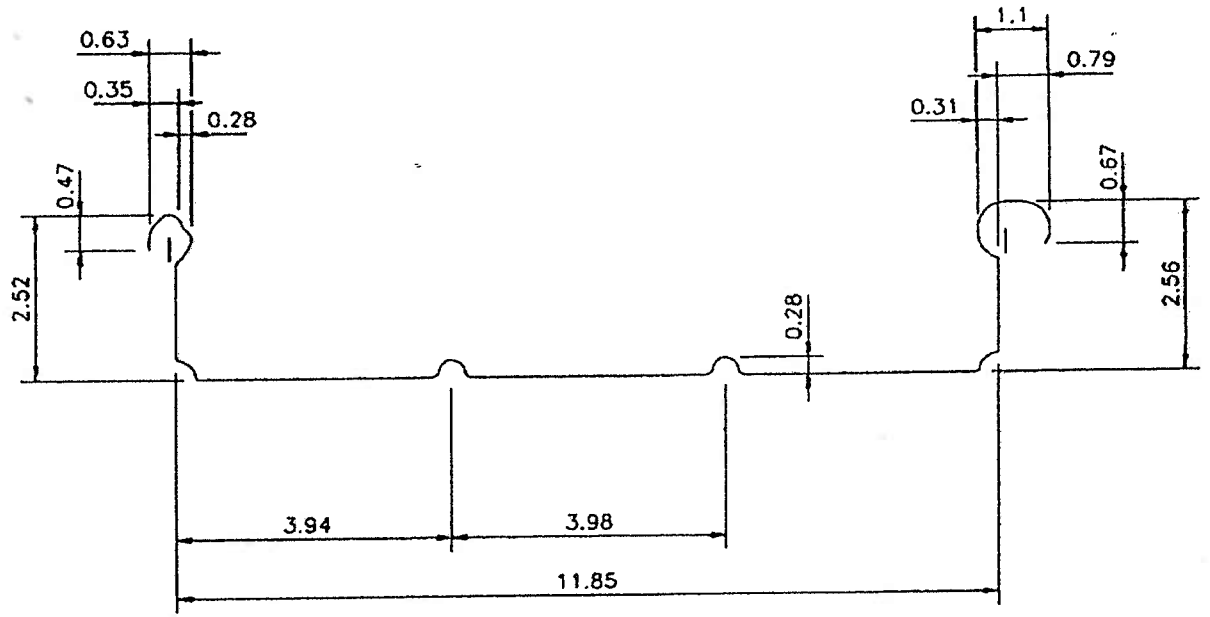
- Successive increments were achieved as above until failure or ultimate load was reached.

The test was conducted according to the procedure in ASTM E-1592-94 and as noted herein. In our opinion the tape and plastic had no influence on the results of the test.


PURLIN
OPEN END
12"
PANEL WIDTH
5'-0"
PURLIN
5
6
2'-6"
5'-0"
1
2
3
4
DETAIL 1
PURLIN
A
A
5'-0"
DETAIL 2
PURLIN
OPEN END
10'-1"
PANEL CLIP LOCATION
DEFLECTION DIAL

PLAN VIEW

Project No. T120-98

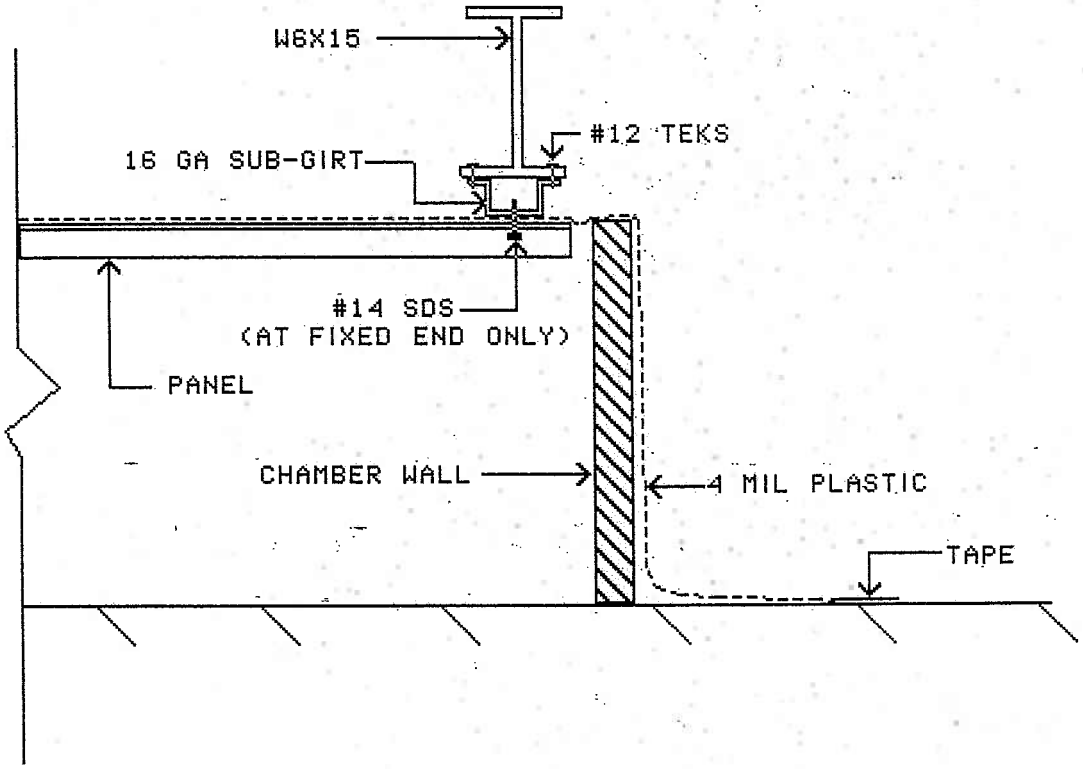


BEMO 305 PANEL

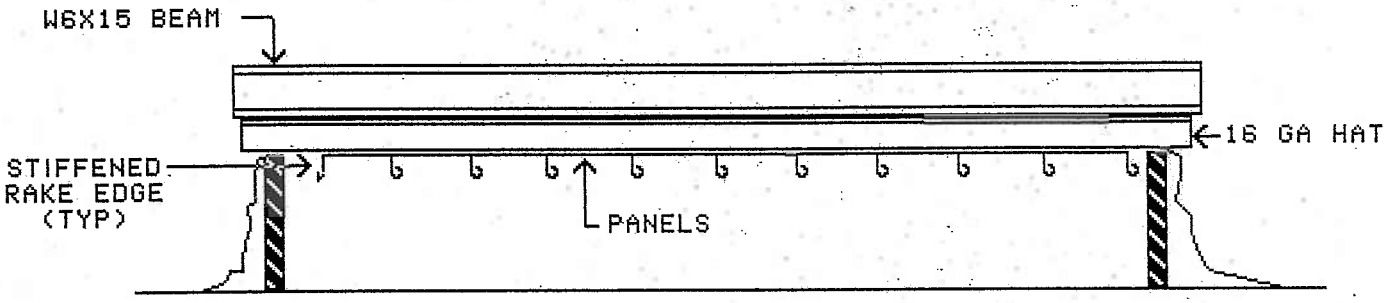
BEMO·USA
Xtreme Roofing Solutions
3062 N. Maple Street
Mesa, Arizona 85215
480-545-7900
1-800-926-2366

6/18/97

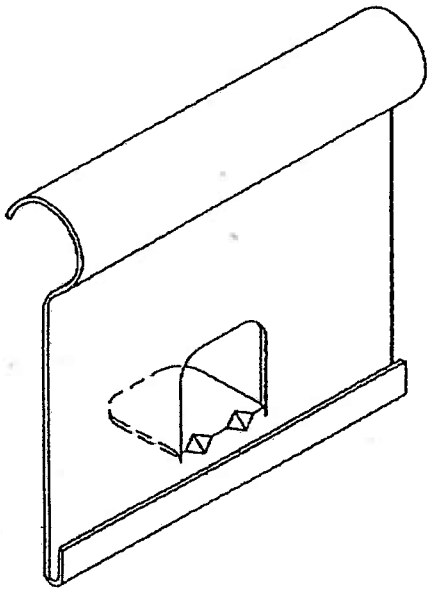
DETAIL 1


W6X15
#12 TEKS
16 GA SUB-GIRT
#14 SDS
(AT FIXED END ONLY)
PANEL
CHAMBER WALL
4 MIL PLASTIC
TAPE

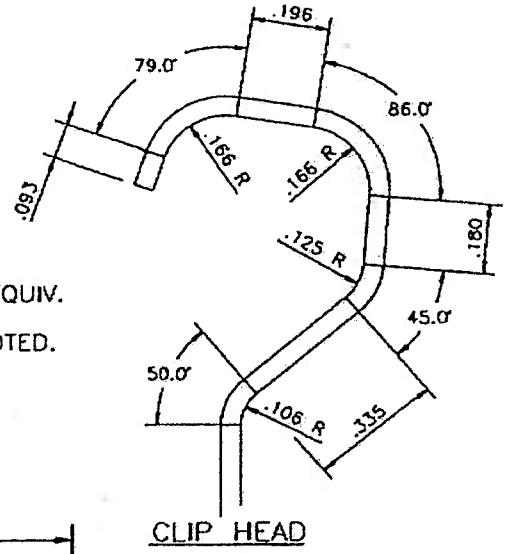
DETAIL 2

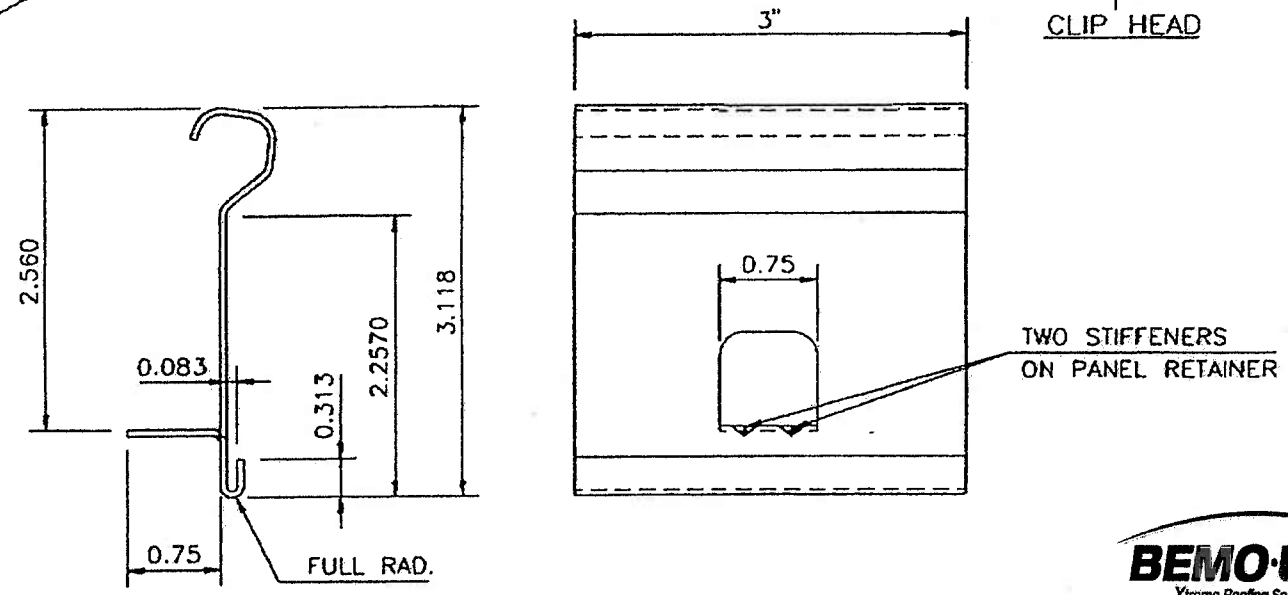


SECTION A-A



NOTES:
1. MATERIAL: STAINLESS STEEL, TYPE 302 OR EQUIV. .047 TO .052 THICK
2. ALL RADII TO BE .06 UNLESS OTHERWISE NOTED.





BEMO HOOK CLIP STEM

18 GA. STAINLESS STEEL TYPE 301

3/11/98 REV. 0

BEMO·USA
Xtreme Roofing Solutions
3062 N. Maple Street
Mesa, Arizona 85215
480-545-7900
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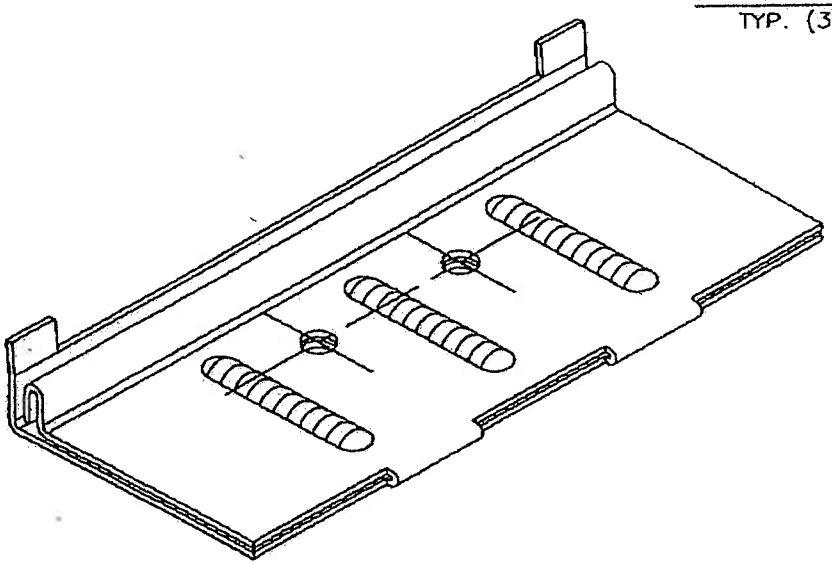
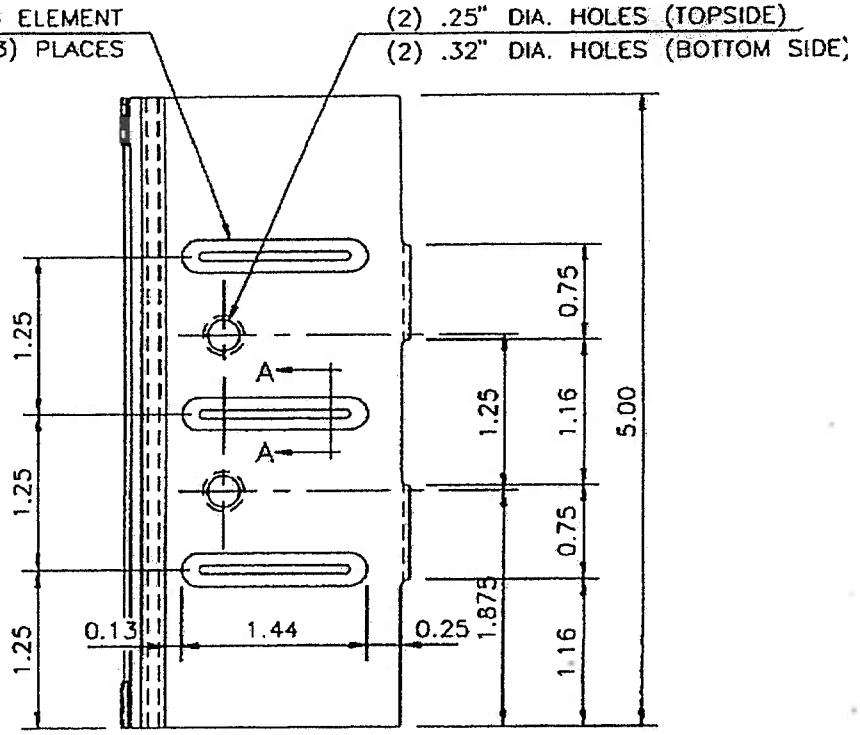
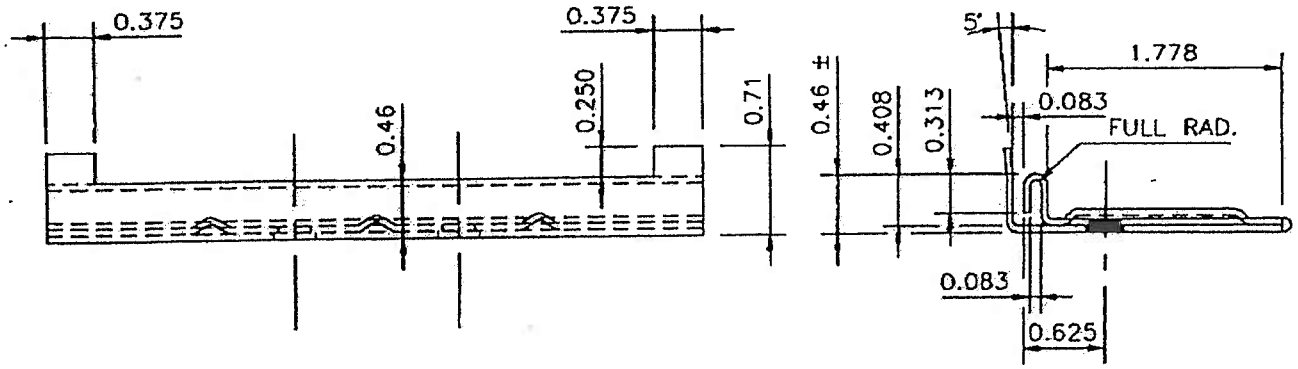
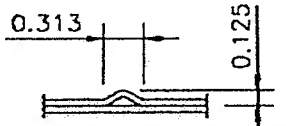




NOTES:
1. MATERIAL: G-90 GALVANIZED STEEL- PLAIN FINISH. MIN. 33 KSI YIELD, .047 TO .052 THICK
2. ALL RADII TO BE .04 UNLESS OTHERWISE NOTED.





TYP. STIFFENING ELEMENT
SECT. A-A

BEMO HOOK CLIP BASE

18 GA. GALV. STEEL

3/11/98 REV. 0

BEMO·USA
Xtreme Roofing Solutions
3062 N. Maple Street
Mesa, Arizona 85215
480-545-7900
1-800-926-2366

Project No. T120-98

6

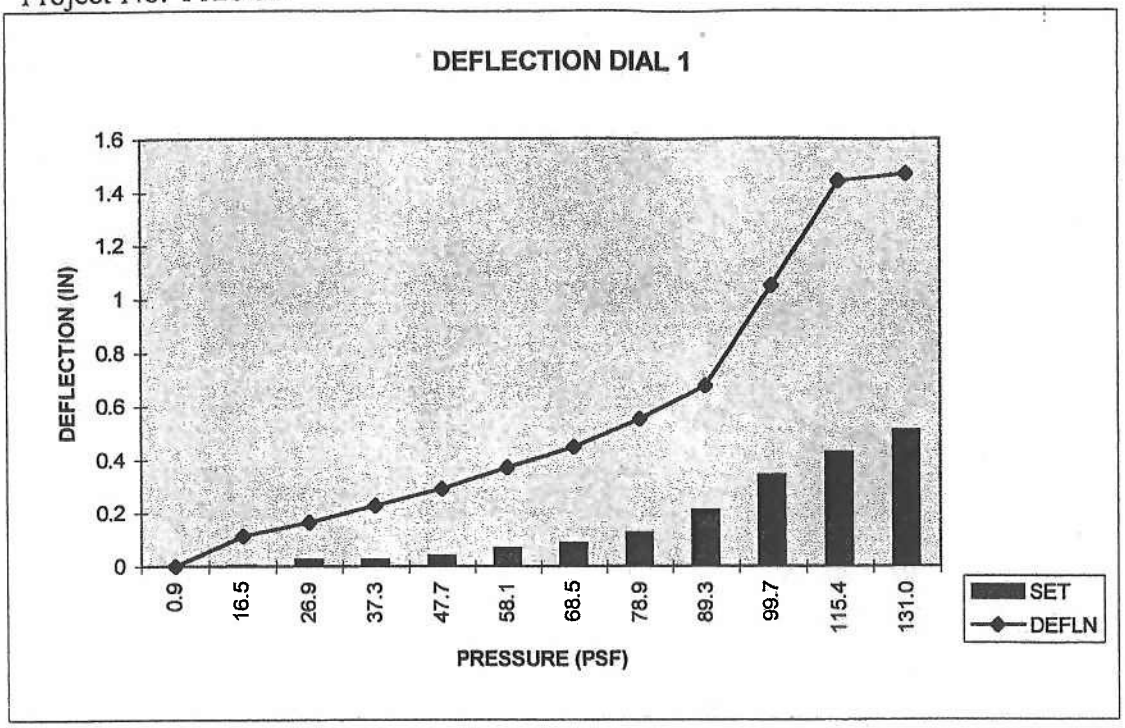
Project No. T120-98

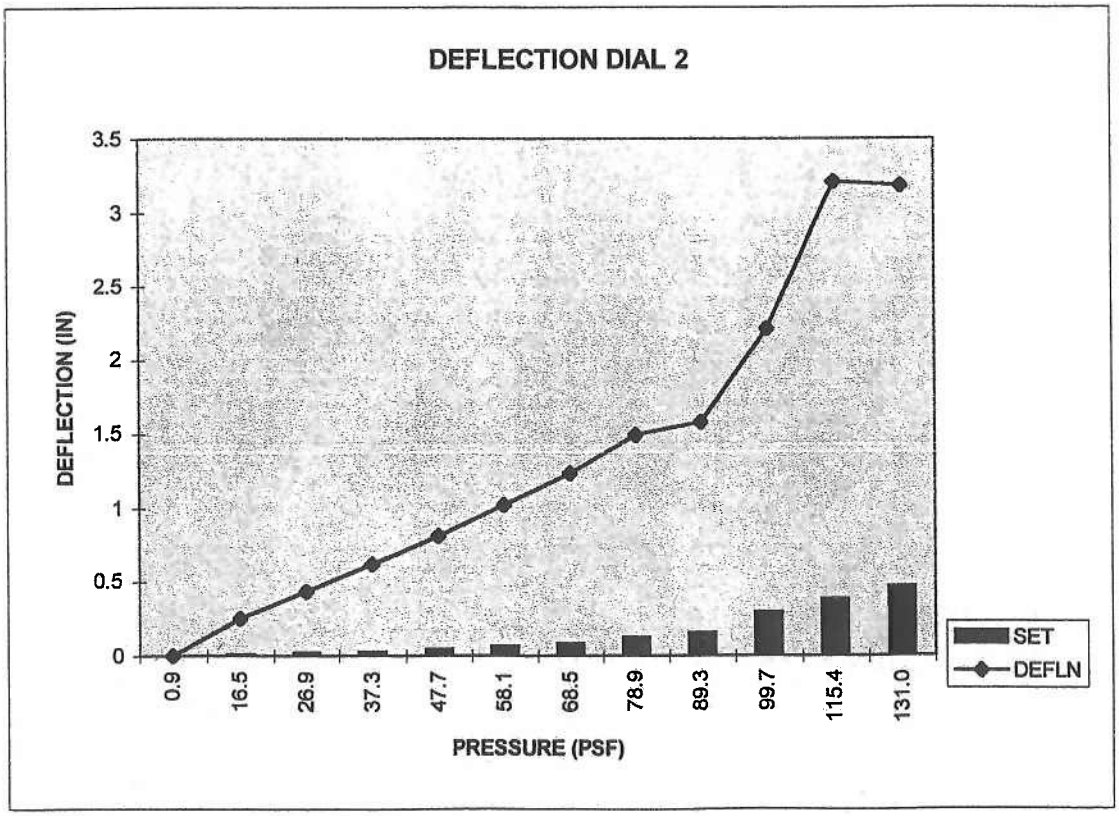
	TEST DATA FOR 12" BEMO 0.039 ALUM. W/18 GA CLIPS 3 SPANS @ 5 '						
	DEFLECTION DIAL READINGS (INCHES)						
LOAD (PSF)	DIAL 1	DIAL 2	DIAL 3	DIAL 4	DIAL 5	DIAL 6	REMARKS
0.9	0	0	0	0	0	0	PANEL WT.
16.5	0.113	0.252	0.106	0.29	0.025	0.113	
0.9	0.003	0.007	0.009	0.018	0.008	0.005	PANEL WT.
26.9	0.165	0.435	0.163	0.476	0.039	0.261	
0.9	0.023	0.02	0.012	0.023	0.021	0.011	PANEL WT.
37.3	0.227	0.619	0.231	0.664	0.064	0.379	
0.9	0.023	0.028	0.024	0.025	0.024	0.029	PANEL WT.
47.7	0.29	0.811	0.318	0.892	0.083	0.502	
0.9	0.039	0.045	0.045	0.041	0.031	0.03	PANEL WT.
58.1	0.371	1.021	0.414	1.144	0.108	0.654	
0.9	0.067	0.064	0.074	0.068	0.038	0.032	PANEL WT.
68.5	0.447	1.236	0.506	1.396	0.129	0.86	
0.9	0.086	0.084	0.087	0.079	0.044	0.055	PANEL WT.
78.9	0.551	1.494	0.617	1.703	0.164	1.056	
0.9	0.127	0.126	0.133	0.119	0.052	0.058	PANEL WT.
89.3	0.675	1.578	0.837	2.252	0.214	1.053	
0.9	0.211	0.159	0.19	0.2	0.072	0.041	PANEL WT.
99.7	1.051	2.212	1.053	2.528	0.302	1.438	
0.9	0.341	0.297	0.312	0.27	0.089	0.059	PANEL WT.
115.4	1.443	3.207	1.649	3.506	0.451	2.018	
0.9	0.427	0.383	0.379	0.374	0.135	0.129	PANEL WT.
131.0	1.469	3.181	1.598	3.642	0.524	2.276	
0.9	0.509	0.465	0.438	0.481	0.159	0.197	PANEL WT.
141.4							SEAM
							DISENGAGEMENT

NOTE: SEE SKETCH 1 FOR LOCATION OF SEAM DISENGAGEMENT.

AS A RESULT OF THE SEAM DISENGAGEMENT FAILURE, CLIP SCREWS PULLED OUT OF SUPPORT AT ADJACENT SEAM. SEE SKETCH 1 FOR LOCATIONS.

Project No. T120-98





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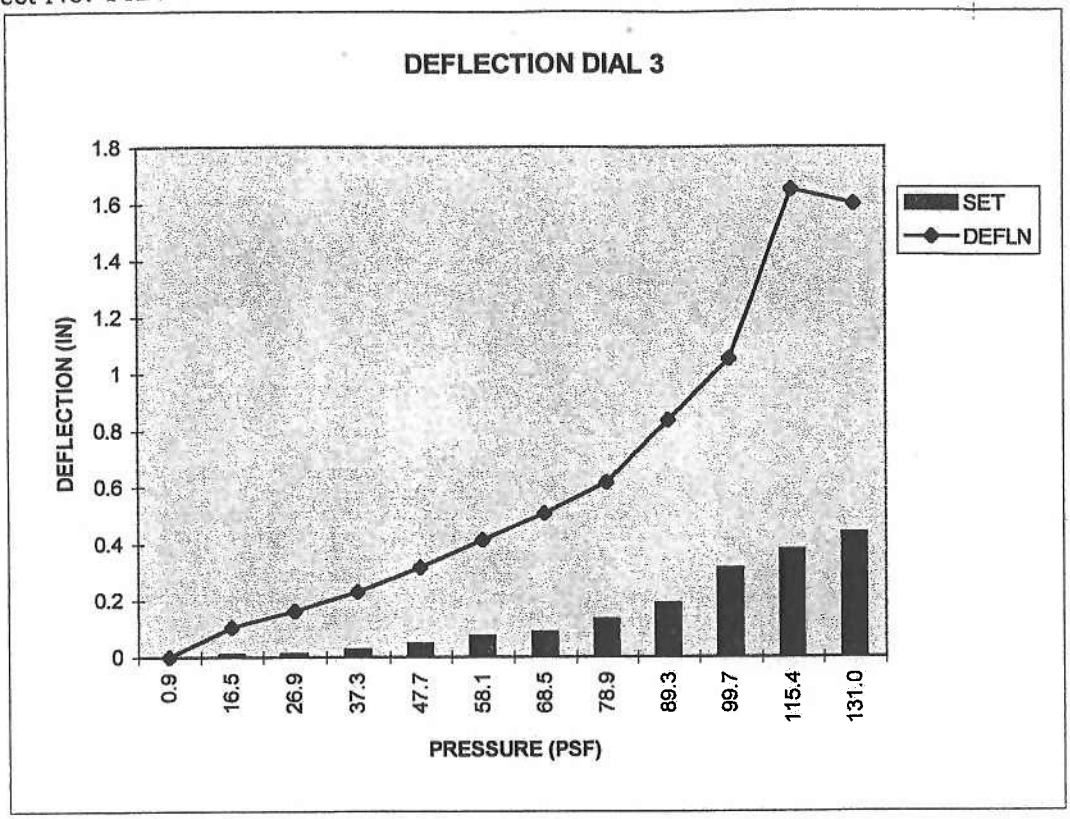

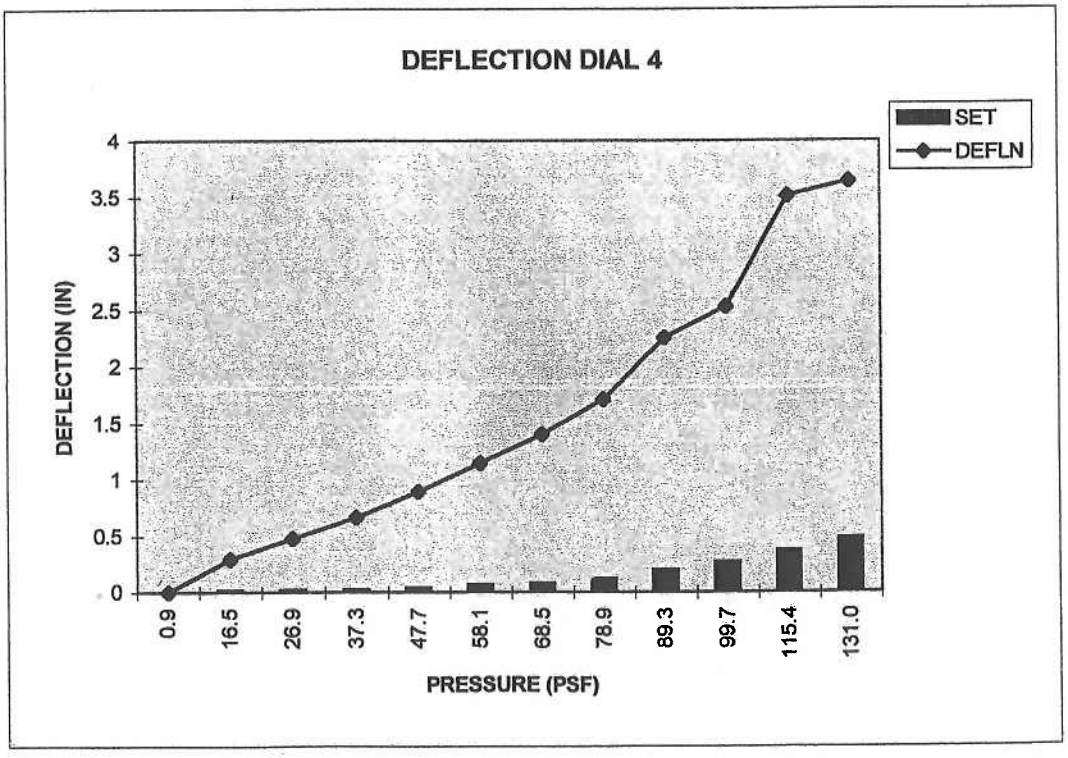

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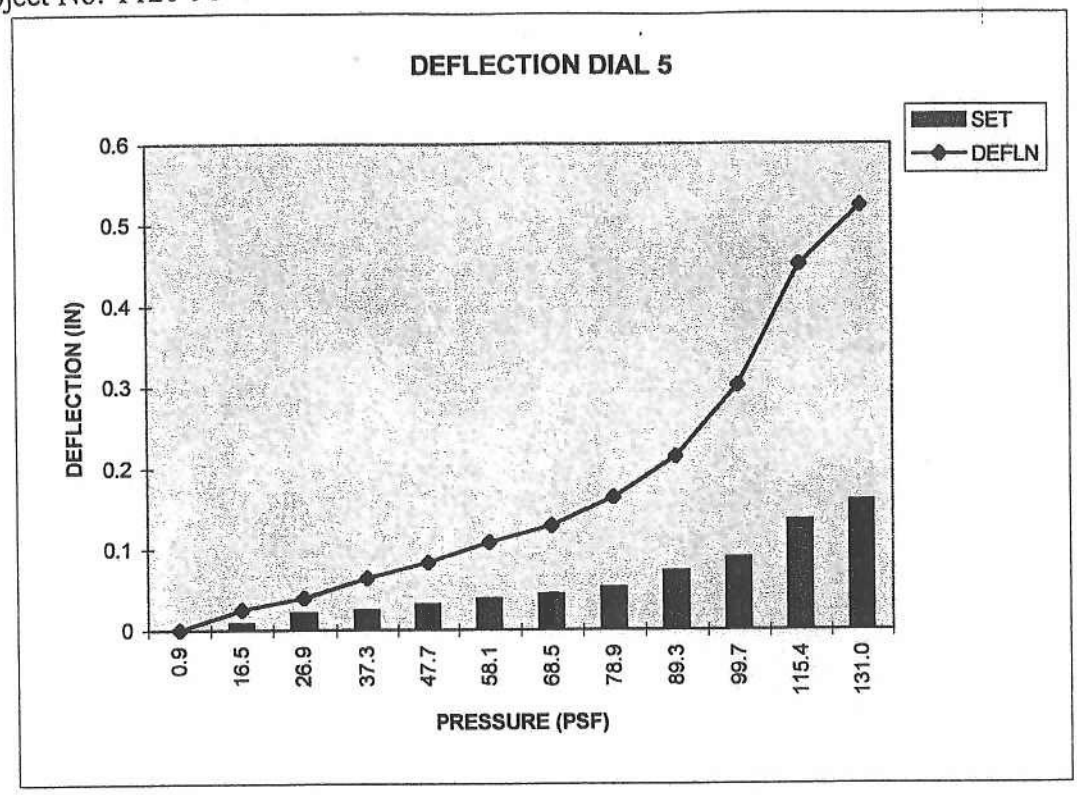
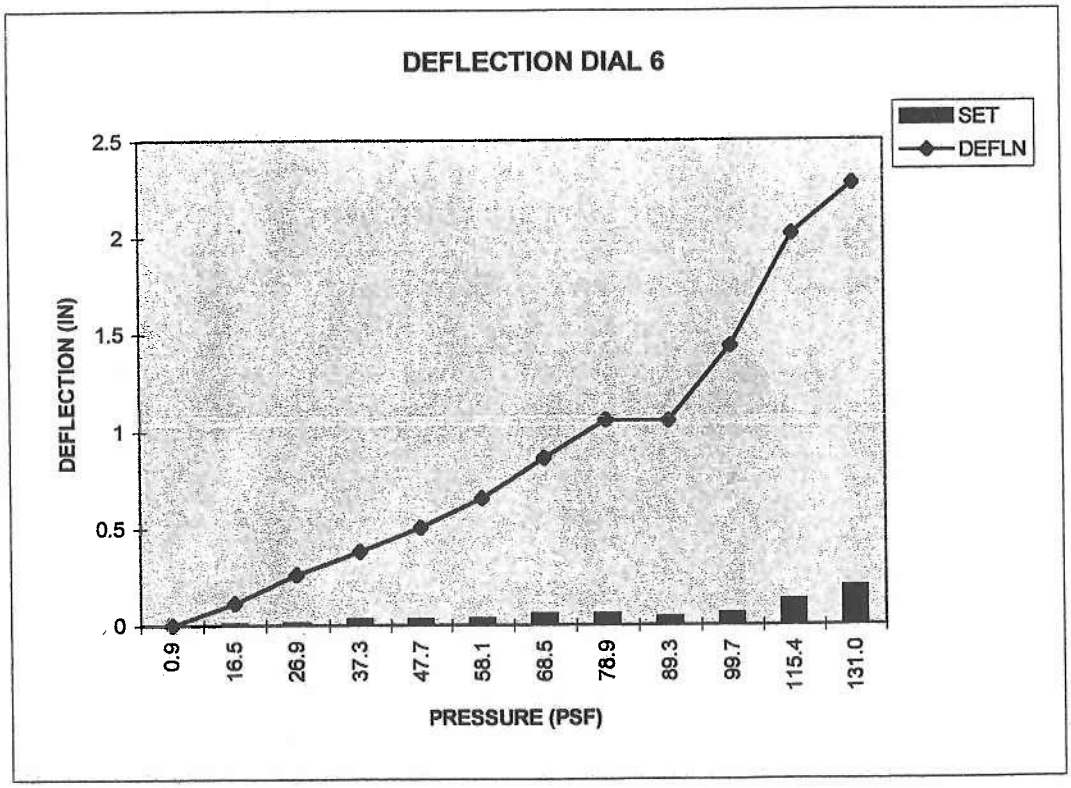
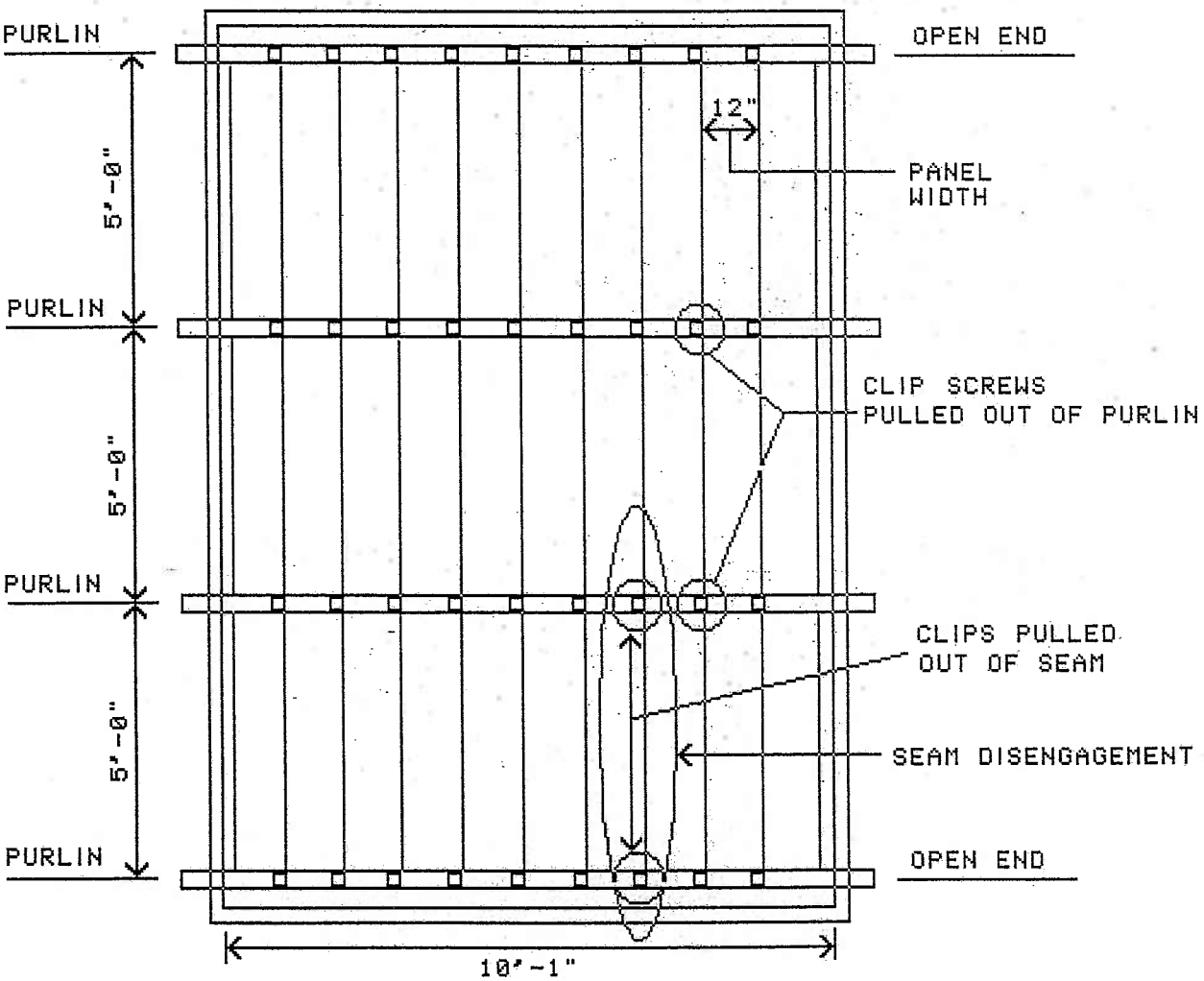
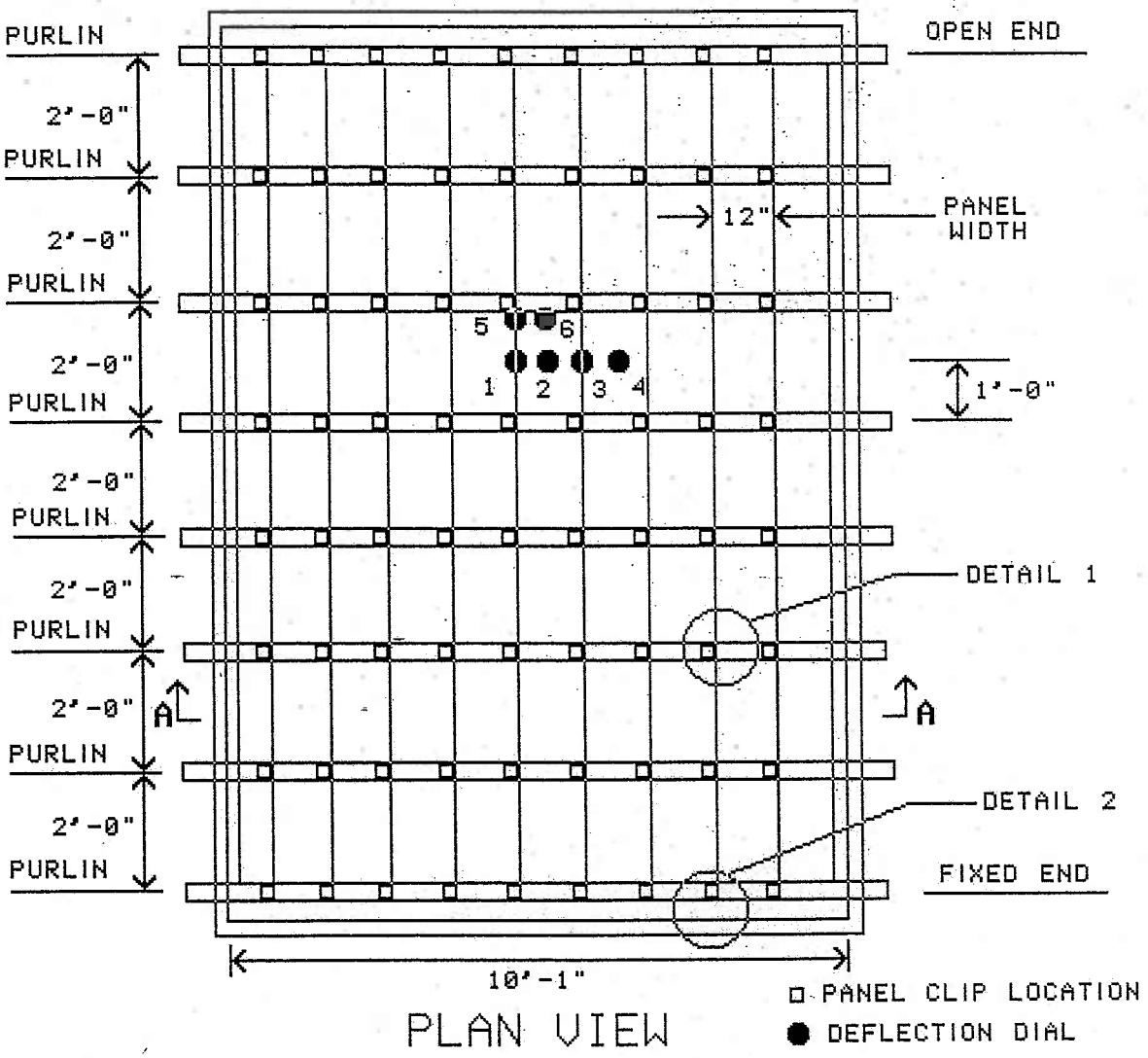





PURLIN
OPEN END
12"
PANEL
WIDTH
5'-0"
PURLIN
CLIP SCREWS
PULLED OUT OF PURLIN
5'-0"
PURLIN
CLIPS PULLED
OUT OF SEAM
SEAM DISENGAGEMENT
5'-0"
PURLIN
OPEN END
10'-1"

SKETCH 1


PURLIN
2'-0"
PURLIN
2'-0"
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2'-0"
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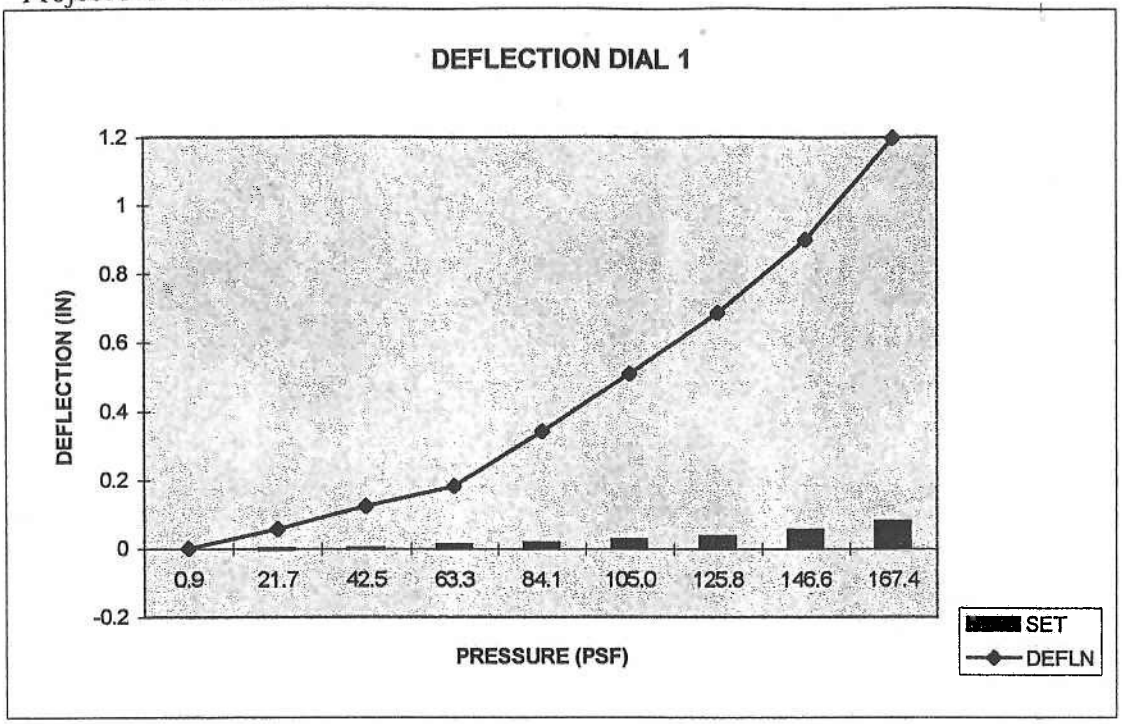
PURLIN
2'-0"
PURLIN
2'-0"
PURLIN
OPEN END
12"
PANEL WIDTH
5
6
1
2
3
4
1'-0"
DETAIL 1
A
A
DETAIL 2
FIXED END
10'-1"
PLAN VIEW
PANEL CLIP LOCATION
DEFLECTION DIAL

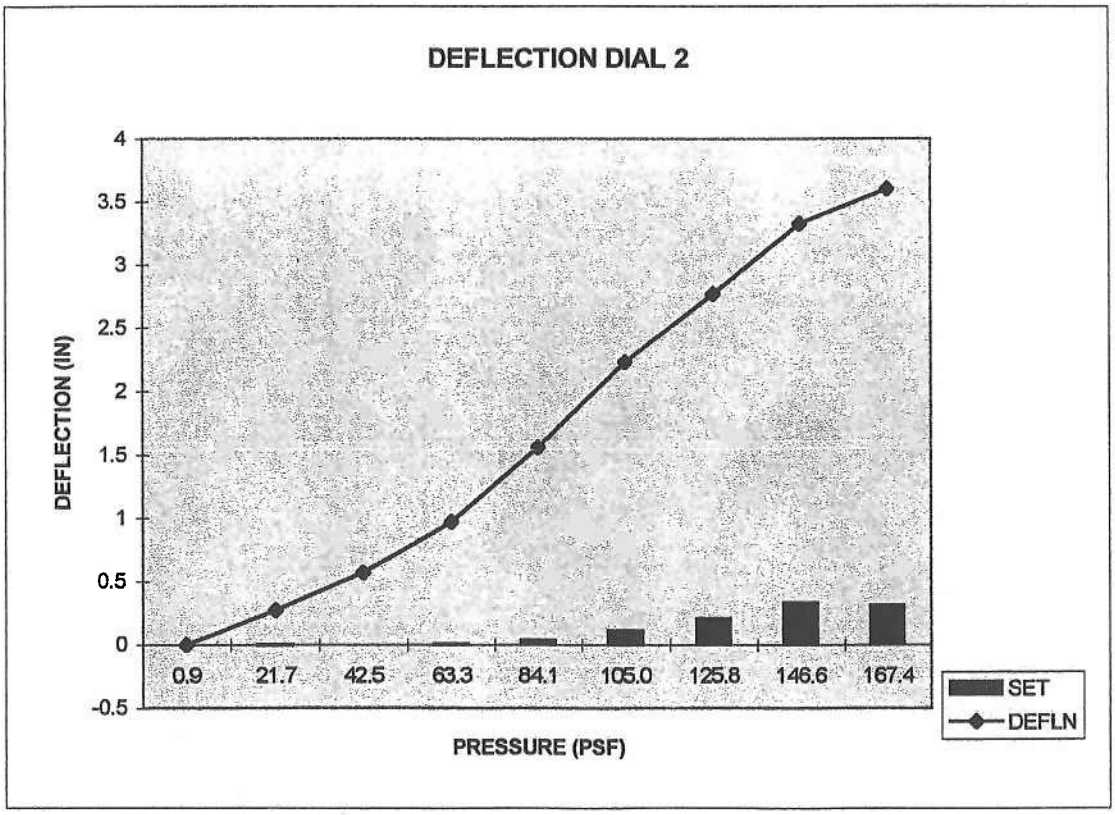
Project No. T120-98

	TEST DATA FOR 12" BEMO 0.039 ALUM W/ 18 GA CLIPS 7 SPANS @ 2'						
	DEFLECTION DIAL READINGS (INCHES)						
LOAD (PSF)	DIAL 1	DIAL 2	DIAL 3	DIAL 4	DIAL 5	DIAL 6	REMARKS
0.9	0	0	0	0	0	0	PANEL WT.
21.7	0.056	0.267	0.048	0.255	0.024	0.207	
0.9	-0.004	-0.01	-0.012	-0.007	-0.01	-0.003	PANEL WT.
42.5	0.125	0.57	0.116	0.609	0.05	0.49	
0.9	0.001	-0.002	0.002	-0.001	0.125	0.002	PANEL WT.
63.3	0.182	0.97	0.194	0.991	0.105	0.839	
0.9	0.011	0.007	0.004	0.01	0.014	0.001	PANEL WT.
84.1	0.342	1.557	0.305	1.513	0.212	1.418	
0.9	0.017	0.035	0.03	0.023	0.001	0.026	PANEL WT.
105.0	0.511	2.233	0.498	2.28	0.366	2.075	
0.9	0.026	0.112	0.036	0.091	0.021	0.1	PANEL WT.
125.8	0.687	2.771	0.691	2.806	0.538	2.608	
0.9	0.036	0.207	0.074	0.176	0.039	0.199	PANEL WT.
146.6	0.901	3.329	0.861	3.174	0.821	3.093	
0.9	0.055	0.332	0.09	0.229	0.045	0.28	PANEL WT.
167.4	1.198	3.604	1.085	3.495	0.952	3.427	
0.9	0.079	0.31	0.077	0.274	0.061	0.255	PANEL WT.
188.2							SEAM
							DISENGAGEMENT

NOTE: SEE SKETCH 2 FOR LOCATION OF SEAM DISENGAGEMENT.

Project No. T120-98





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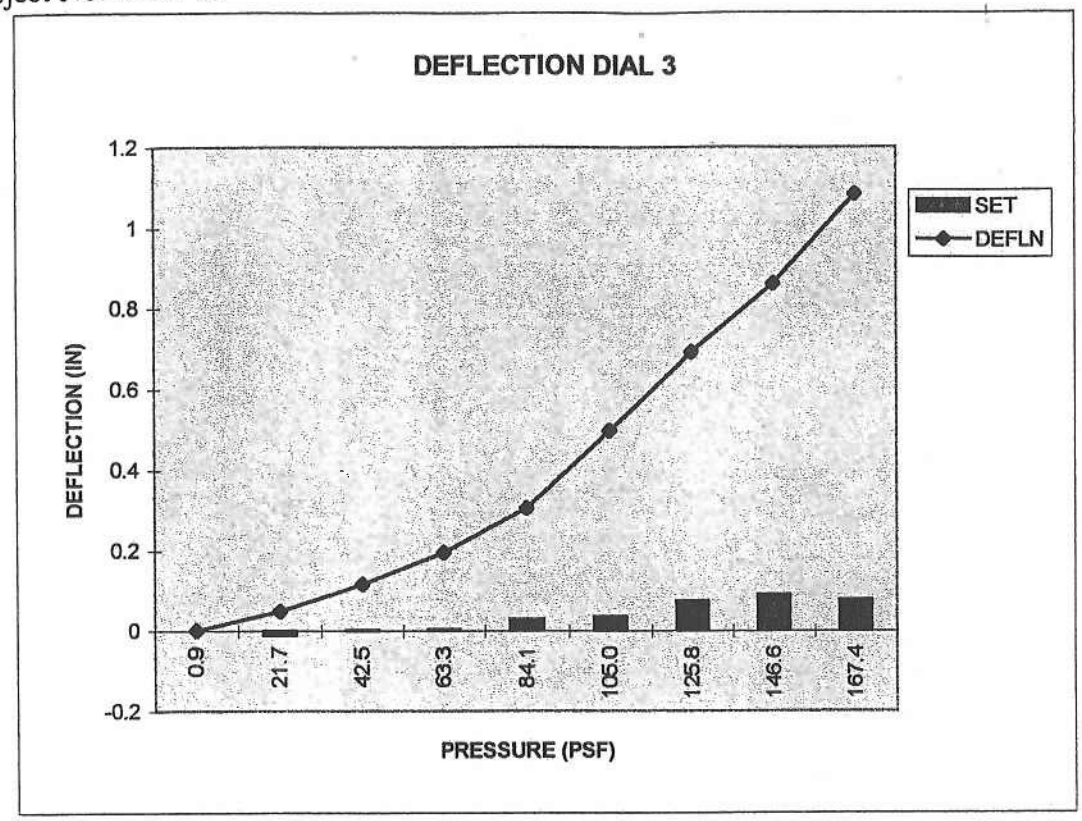

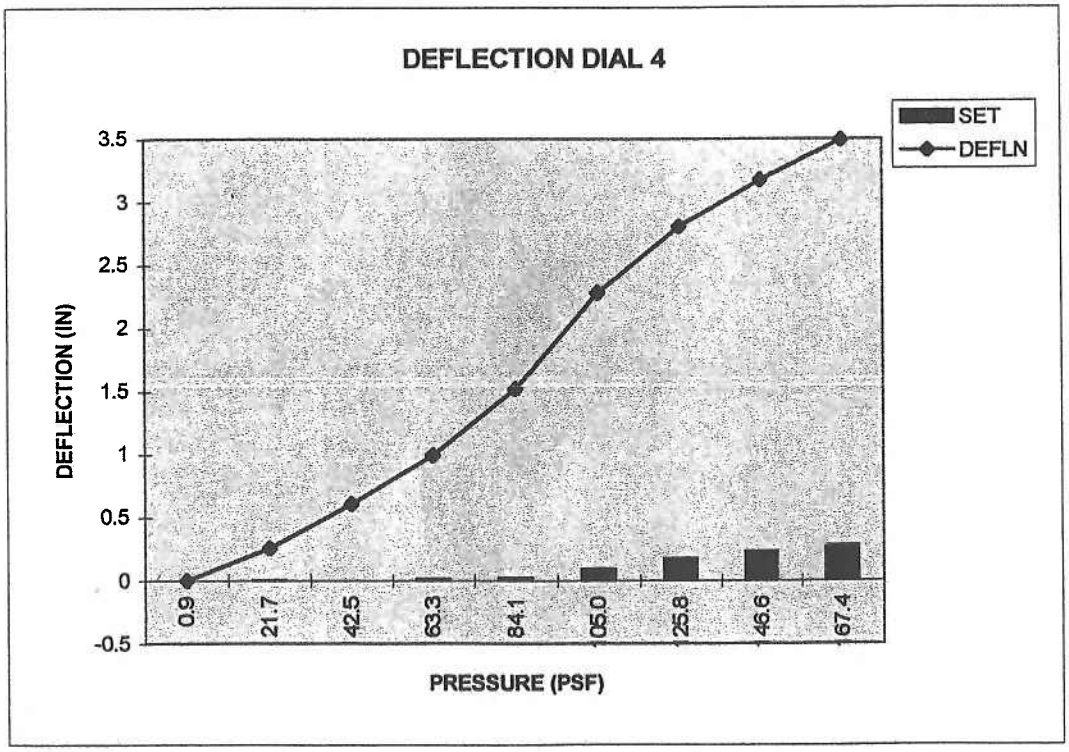

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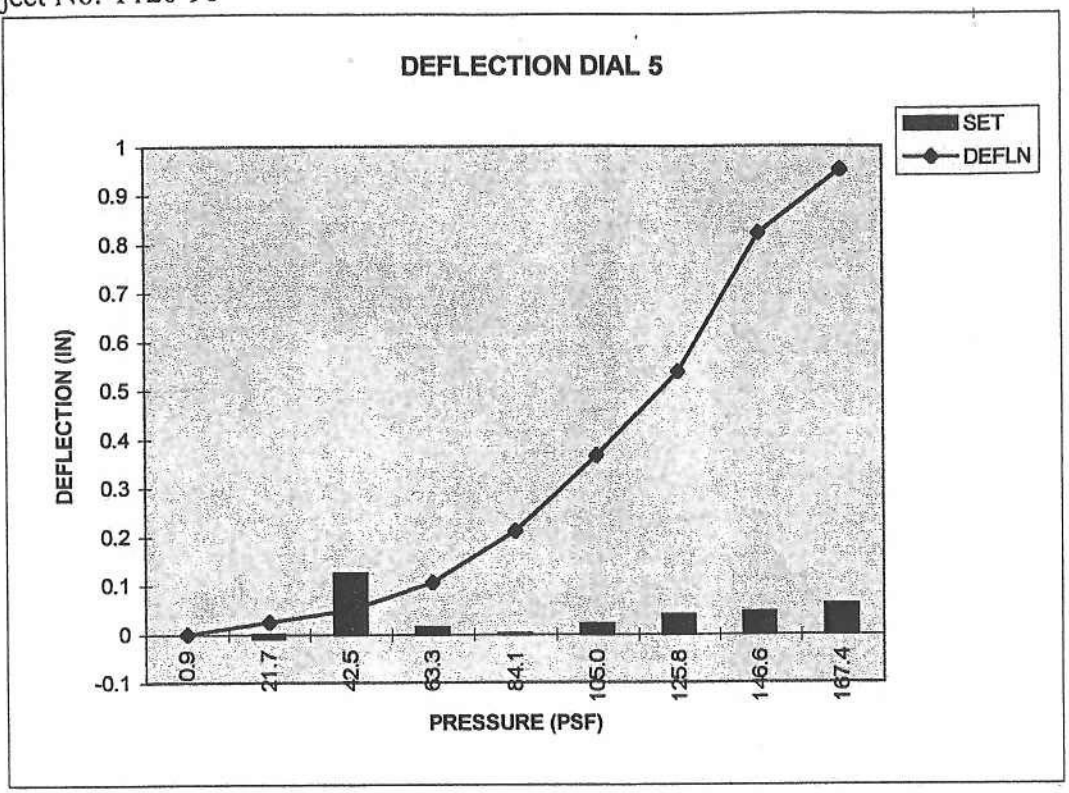
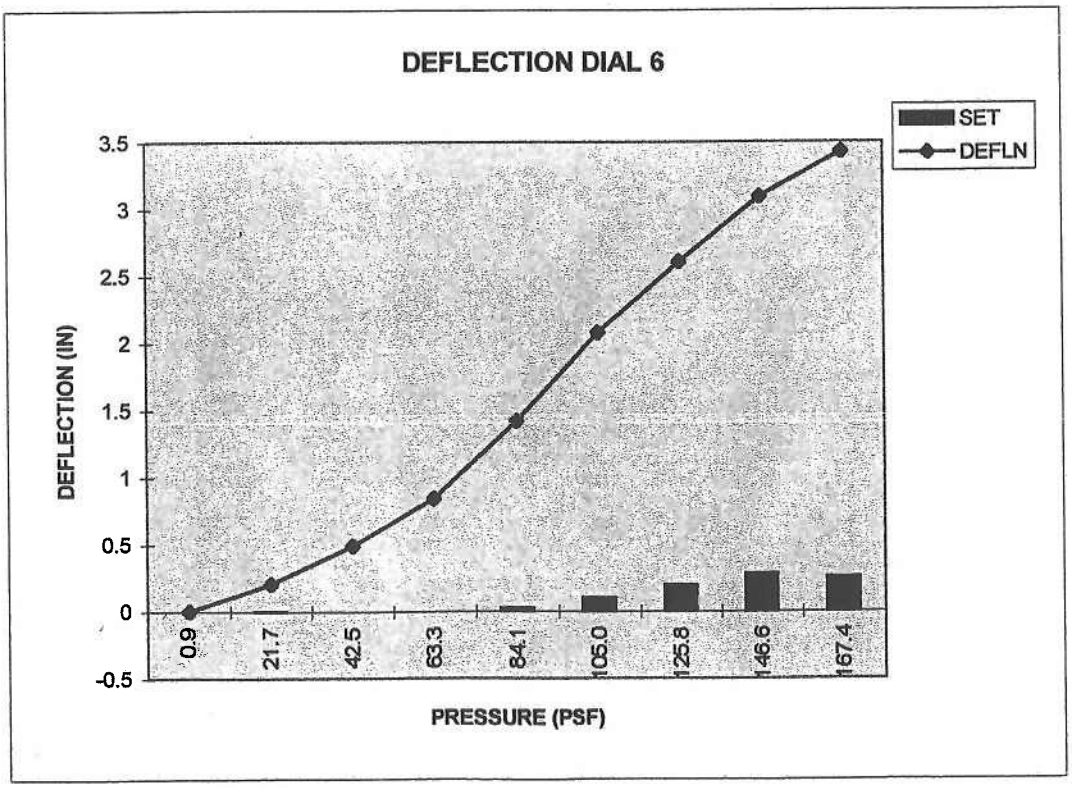
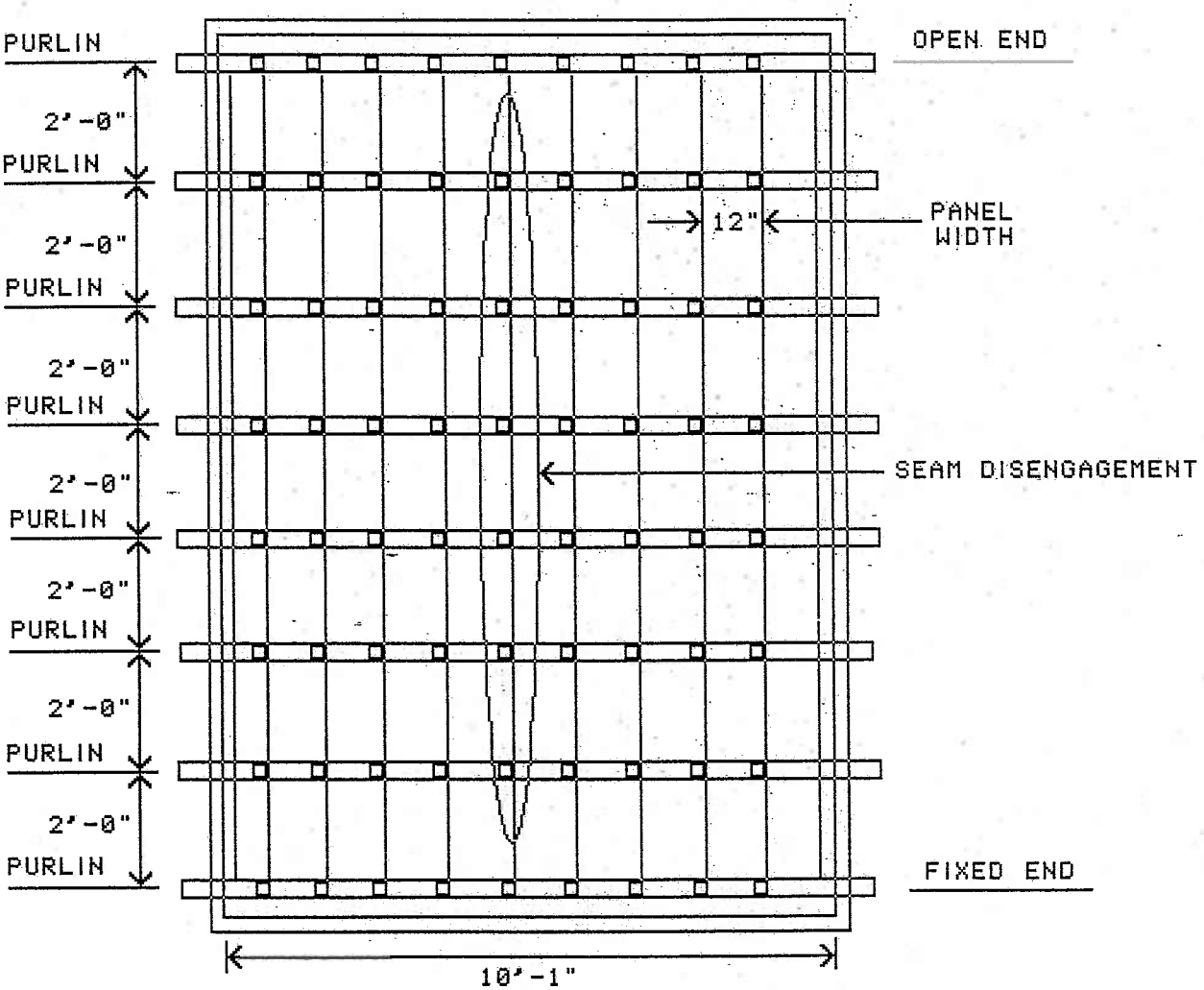





PURLIN
OPEN END
2'-0"
PURLIN
12"
PANEL WIDTH
2'-0"
PURLIN
2'-0"
PURLIN
SEAM DISENGAGEMENT
2'-0"
PURLIN
2'-0"
PURLIN
2'-0"
PURLIN
2'-0"
PURLIN
FIXED END
10'-1"

SKETCH 2

WEST PENN TESTING LABORATORIES, INC.
AN INDEPENDENT INSPECTION BUREAU AND TESTING LABORATORY
Keystone Commons • 501 Braddock Ave. • Turtle Creek, PA 15145-2084
PHONE: (412) 824-1900 • FAX: (412) 824-9785

File No.: WP-9048
Report No.: 057
Date: 3/11/98
Rev.: 3/19/98

REPORT OF TENSILE STRENGTH

Client: Farabaugh Engineering & Testing

Date of Test: March 10, 1998

Test Method: ASTM A-370-97a

Pin #	Dimensions (in.)	Area (sq-in)	Yield Point (lbs)	Tensile Strength (lbs.)	Yield Point (psi)	Tensile Strength (psi)	Elongation (% in 2")	Fracture Location
BEMO 12"w. Al. *	**0.4985 x 0.0390**	**0.0194**	**710**	**798**	**36,520**	**41,050**	**11.0**	**M/3**

* Note: Al. samples were embossed

Yield Point: Aluminum - 0.2 % Offset Method, Steel - Autographic Method
(See attached Load/Strain Plots)

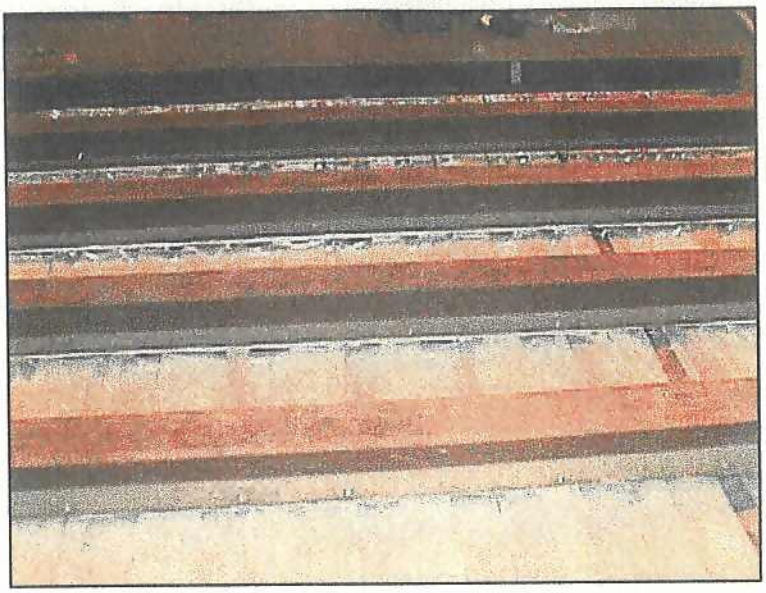
Test Equipment: ATS System 910 #A901779, Extensometer #889036, Recorder #13355

Technician: R. Burgard

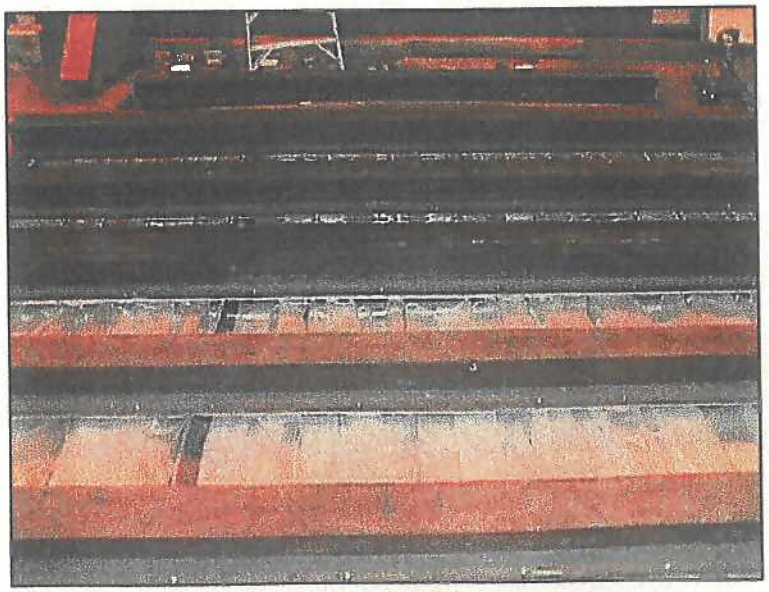
Respectfully submitted,

Todd A. Ault (M.E.T.)
WEST PENN TESTING LABORATORIES, INC.

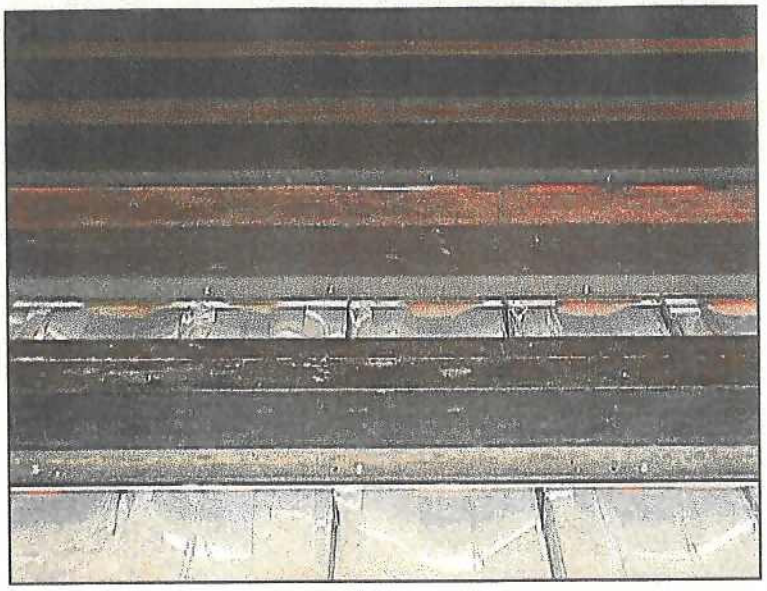
T120-048



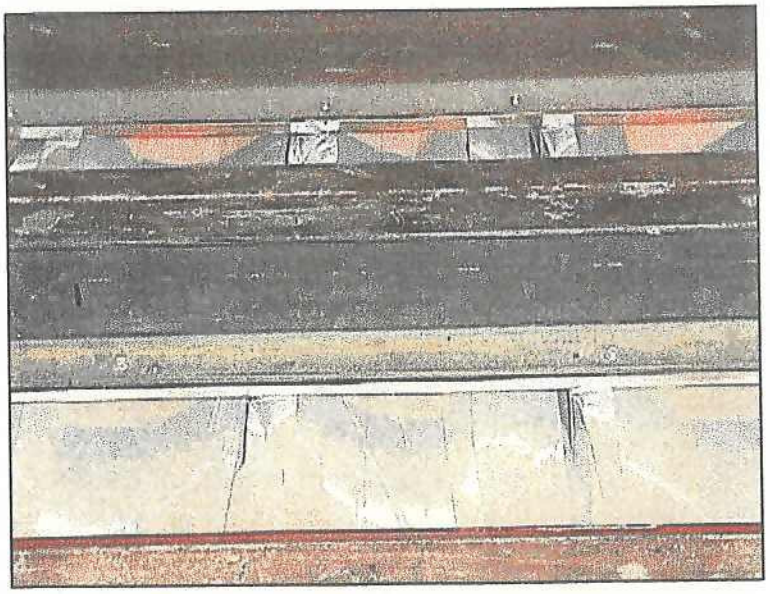
SPECIMEN SETUP



SPECIMEN SETUP



SPECIMEN UNDER LOAD



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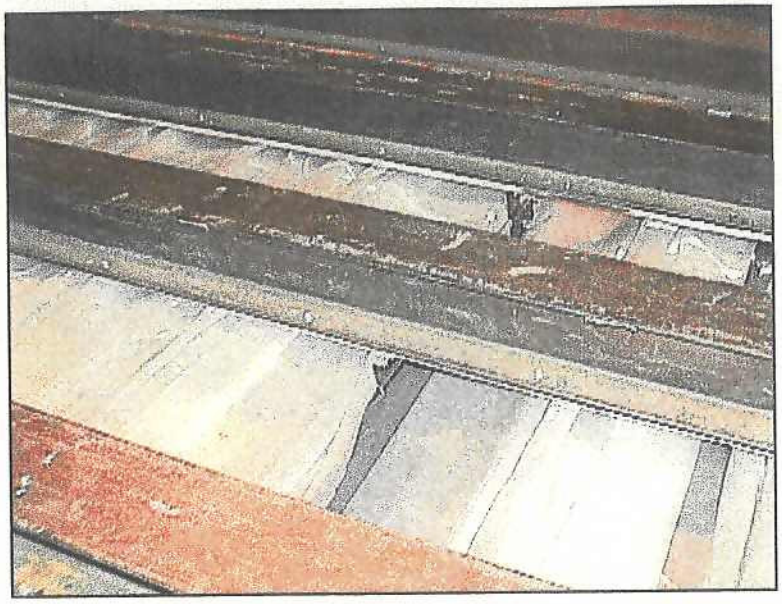
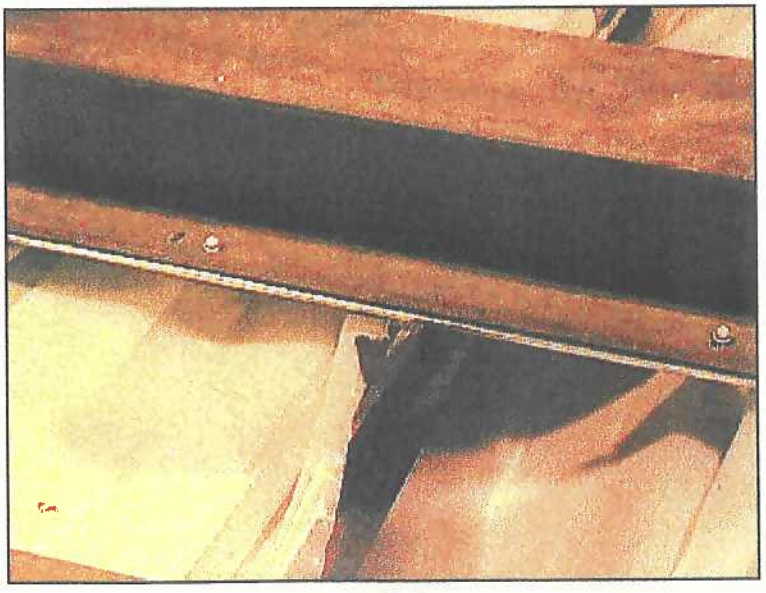


SEAM DISENGAGEMENT



SEAM DISENGAGEMENT