

**Report for:**

**ASTM E-1592 TESTING**

**Structural Performance of**

**Sheet Metal Roof and Siding Systems**

**by Uniform Static Air Pressure Difference**

Ultra Seam US-200S-16  
24-gage Steel Roof Panels,  
Double Seam

Report: Ultra-Seam Test #2037

December 12, 2003

Fairbanks, Alaska

## INTRODUCTION

Testing of Ultra-Seam US-200S-16 Roofing Panels was conducted to determine their load response characteristics and ultimate failure load under uplift conditions per ASTM E-1592-01 methods (Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference). Wind uplift on the panels was simulated by producing suction pressure in a vacuum chamber.

Testing was performed December 12, 2003 at the Ultra-Seam test facility in Fairbanks, Alaska.

## TESTING APPARATUS

The sample panels were tested on a frame made of W4 rolled steel and 14-gage zee cold formed steel sections spaced 5'0" o.c. (on center). A 6 mil thickness polyethylene sheet was placed between the panels and framing to seal the panel assembly against air leakage. The plastic film was pleated and inserted between the ribs and the perimeter of the test panels.

Edge restraints consisted of a 22 gage continuous Starter Clip and a 16 gage Starter Channel. One end of the sample panel was attached to the 14 gage framing to simulate an eave condition. The opposite end was an open-ended condition with a stiffener in the flats and a seam fastener per Paragraph 8.5.1 (ASTM E-1592-01). The roof attachment clips were attached to framing supports at 5'0" o.c.

The testing frame and sample were inverted onto a vacuum chamber and the plastic film sealed to the chamber. Twelve-inch Mitutoyo Digital Depth gages, accurate to .0015 inch, were installed on independently supported beams at the locations specified by Paragraph 6.6.2-3 (ASTM E-1592-01).

The vacuum chamber pressure was measured at diagonal corners of the chamber using water manometers accurate to 0.1 inch of water.

### SPECIMEN PREPARATION

The specimen tested was an assembly of Ultra-Seam US-200S-16 roofing system. Panels were made of 24-gage ASTM A792 Galvalume painted steel. Panel width was 16 inches. Panel configuration is shown on the attached panel detail. Each panel was attached to the zee sections of the testing apparatus using an Ultra-Seam 2-part attachment clip 5'0" o.c. Ultra-Seam Clips are constructed of ASTM A653 G-90 Galvanized Steel: 22 gage Grade 33 top and 18 gage Grade 50 base. Clips were attached to each zee with three #12 x 3/4" self-drilling pancake head screws. This specimen was constructed with a double seam.

### TEST PROCEDURE

A nominal pressure was applied to pre-set the roofing per ASTM E-1592. The load was then reduced to zero for a recovery period and initial readings were taken. A load was then applied at the next load increment, where it was maintained for a minimum of 60 seconds and panel deflections read. The load was returned to a zero load for a recovery period and set deflections were then read. This procedure was repeated for eight cycles before the load was increased to the point of failure.

Failure occurred at a pressure of about 114 PSF (pounds per square foot). Total load on panels therefore was the panel weight of 1.33 PSF added to the test pressure, which totals about 115 PSF, which was considered the end point for this test. The failure mode for this specimen was clip failure.

## LIMITATIONS

This report was prepared by Lanning Engineering solely for the use of Ultra Seam. The test was performed under our observation in general accordance with ASTM E-1592-01 (Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference) as described in this report. This report describes the results of one test performed on a single specimen that was specially prepared by the staff of Ultra Seam. This document reports the test results obtained under the referenced standard and is not a statement regarding product performance in actual applications.

Lanning Engineering does not imply any warranty or statement of suitability for the product. It is the responsibility of the specifying engineer or architect to determine the suitability of the product for a given installation. It is the responsibility of the design engineer to determine and apply an appropriate safety factor to this result as part of determining a design capacity in uplift for this roof. Other tests, industry standards, building code provisions, an appreciation for statistical variation and other issues unknown to these investigators could be used to determine a safety factor.

This report may be superseded by later testing.  
Contact Ultra Seam, PO Box 75054, Fairbanks, AK, 99707 to obtain the most current results.

## SUMMARY

Test No: Ultra Seam Test #2037

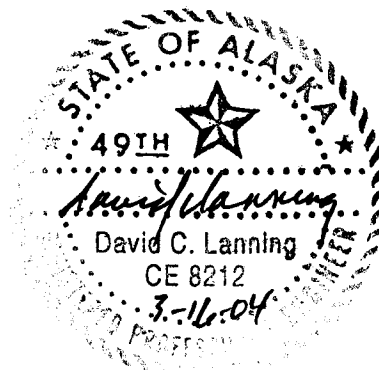
Specimen: Ultra-Seam US 200S-16 Panels -16" wide  
ASTM A792 Galvalume 24 ga steel  
double seam  
Ultra-Seam Clips – ASTM A653 G-90 Galv  
0.030" Grade 33 top  
0.060" Grade 50 base  
attached to supports at 5'0" on center

Highest Test Load: 114 PSF

Mode of Failure: Clip Failure

### Test observed by:

David C. Lanning, PE  
Principal Structural Engineer  
Lanning Engineering  
Ester, Alaska

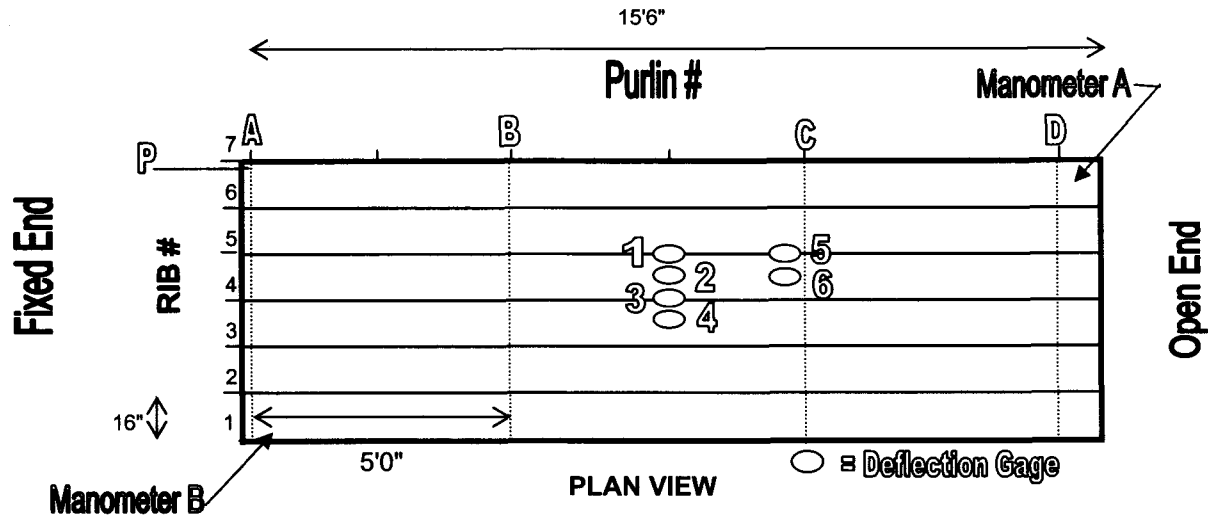


# ASTM E-1592 TEST DATA SHEET

## Ultra Seam Test #2037

Panel Type: US-200S-16, 24 ga. Double Seam  
 Support Spacing: 5'-0" o.c. Clip: 0.060 base, 0.030 top

Test Date: 12.12.03  
 Screws: 3 ea #12x3/4"



Recorded By: J. Clark

Observed By: Dave Lanning, P.E.

Maximum Test Pressure: **114**  
PSF

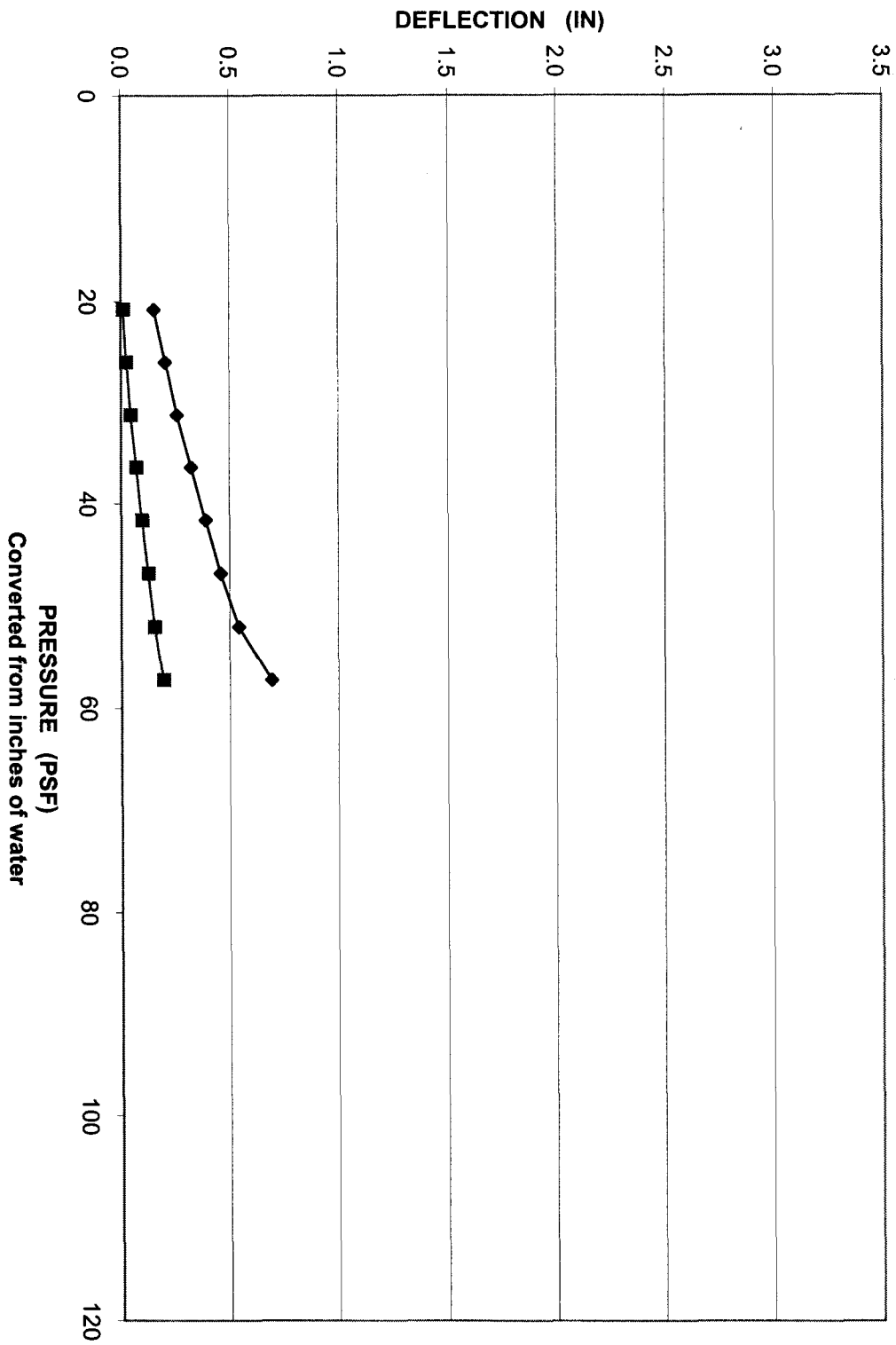
Panel Weight: 1.33 psf of coverage

**Manometers (inch H2O)**

**Deflection (inches)**

A	B	PSF	1	2	3	4	5	6	
0	0	0	0	0	0	0	0	0	
2+2	2+2	21	0.1545	1.4495	0.1815	1.3300	0.1730	1.2725	
0	0	0	0.0115	0.0465	0.0150	0.0360	0.0145	0.0295	
2.5+2.5	2.5+2.5	26	0.2060	1.6865	0.2390	1.5690	0.2255	1.5020	
0	0	0	0.0260	0.0640	0.0295	0.0675	0.0260	0.0520	
3+3	3+3	31	0.2585	1.9150	0.2990	1.7845	0.2850	1.7160	
0	0	0	0.0440	0.1075	0.0510	0.1135	0.0460	0.0885	
3.5+3.5	3.5+3.5	36	0.3240	2.1540	0.3720	2.0255	0.3565	1.9465	
0	0	0	0.0710	0.1465	0.0750	0.1635	0.0680	0.1265	
4+4	4+4	42	0.3900	2.3910	0.4475	2.2545	0.4280	2.1650	
0	0	0	0.0955	0.2010	0.1045	0.2310	0.0880	0.1820	
4.5+4.5	4.5+4.5	47	0.4590	2.5990	0.5260	2.4670	0.5015	2.3760	
0	0	0	0.1240	0.2605	0.1320	0.3005	0.1110	0.2445	
5+5	5+5	52	0.5440	2.8640	0.6255	2.7285	0.5980	2.6295	
0	0	0	0.1540	0.3525	0.1615	0.4015	0.1435	0.3190	
5.5+5.5	5.5+5.5	57	0.6930	3.2335	0.7650	3.0655	0.7390	2.9645	
0	0	0	0.1935	0.4785	0.1910	0.5245	0.1865	0.4290	
11+11	11+11	114	Failure due to clip separation						
			Pressure at Failure (psf)		114				
			Self-Weight (psf)		1.33				
			Total Load (psf)		115				

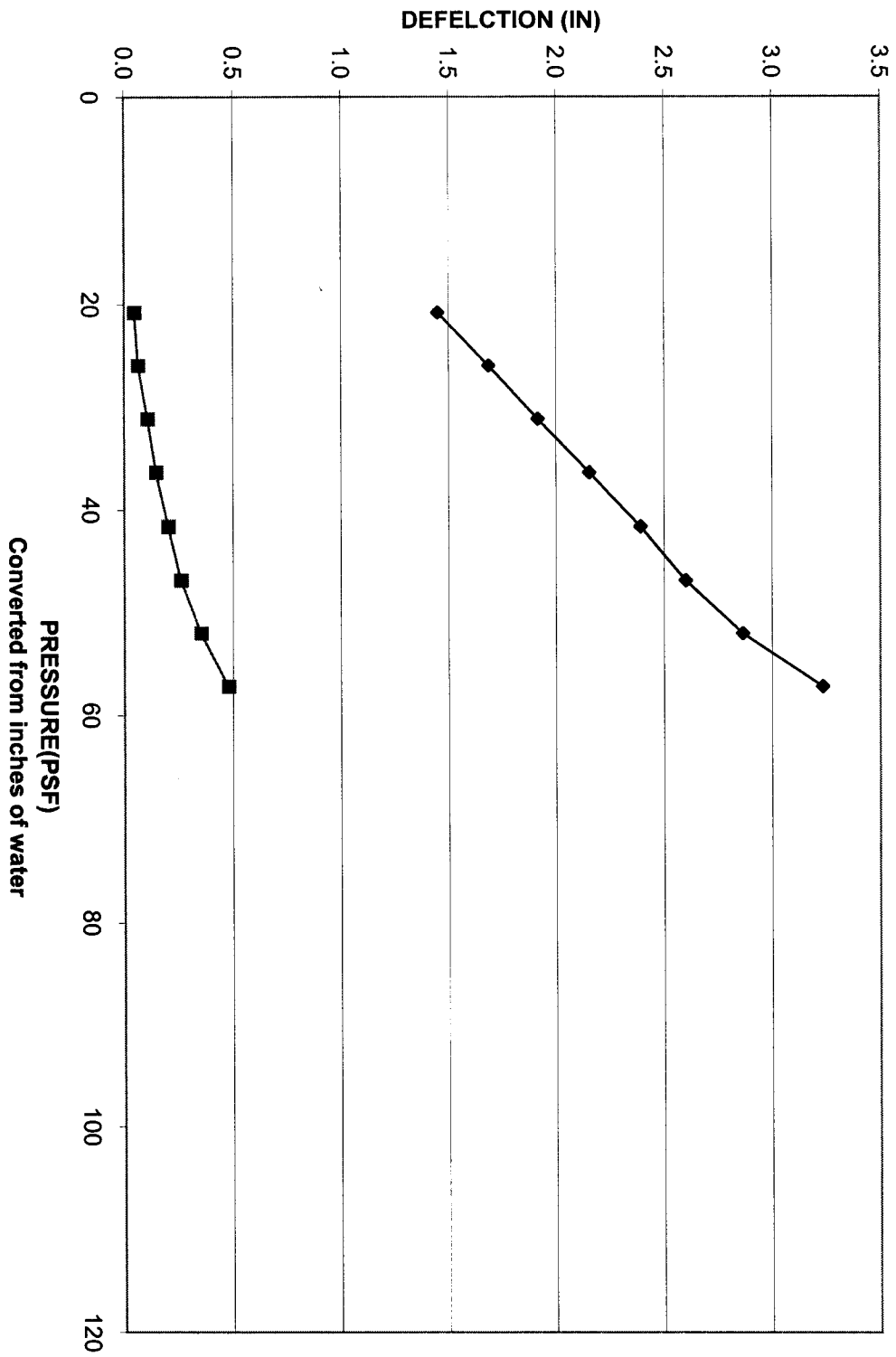
**DEFLECTION GAGE #1**  
**Ultra Seam Test #2037**  
**ASTM E 1592 Roof Panel Uplift Load Test**



◆ DEFLECTION  
■ SET

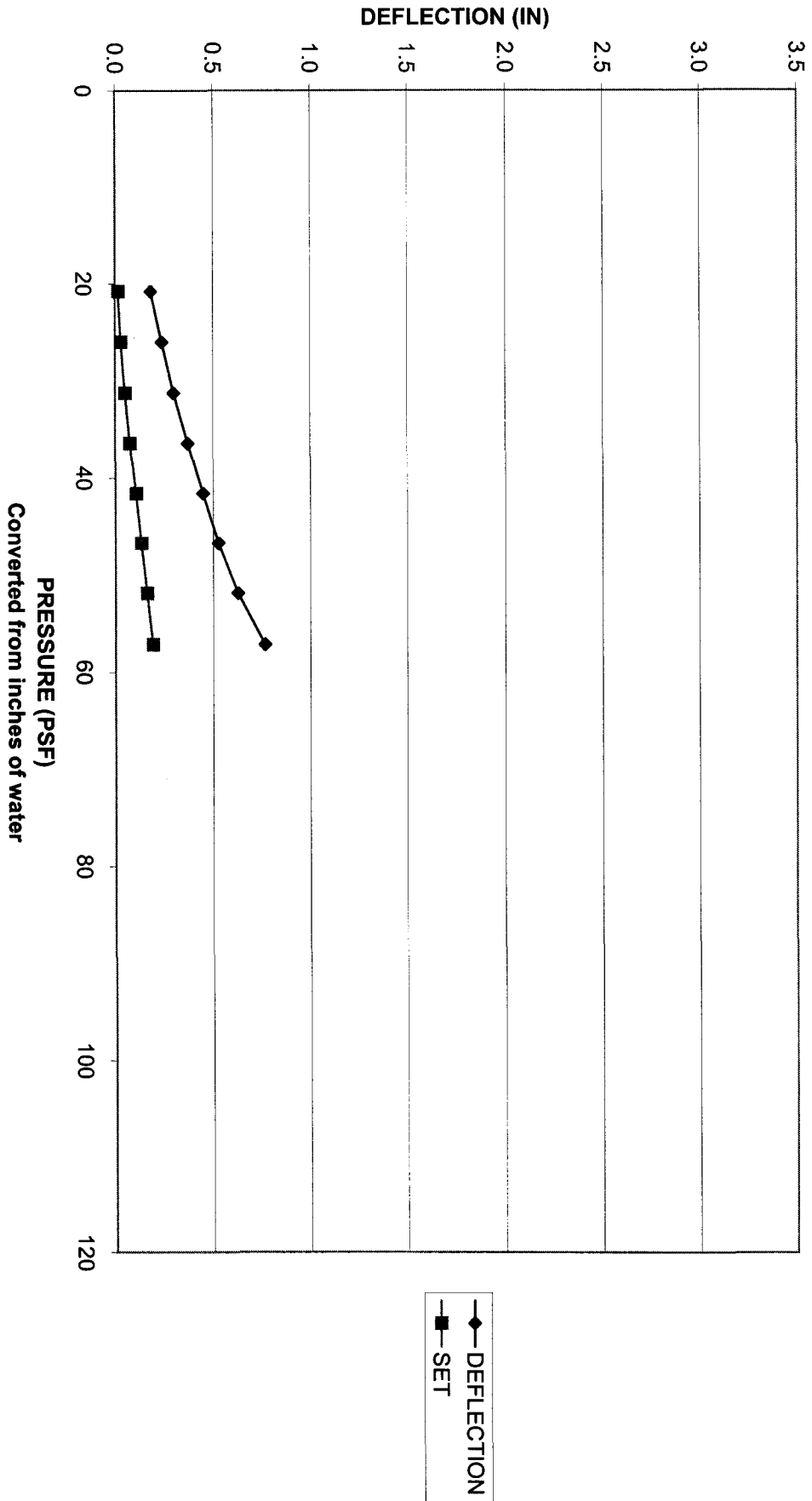
Converted from inches of water

**DEFLECTION GAGE #2**  
**Ultra Seam Test #2037**  
**ASTM E 1592 Roof Panel Uplift Load Test**

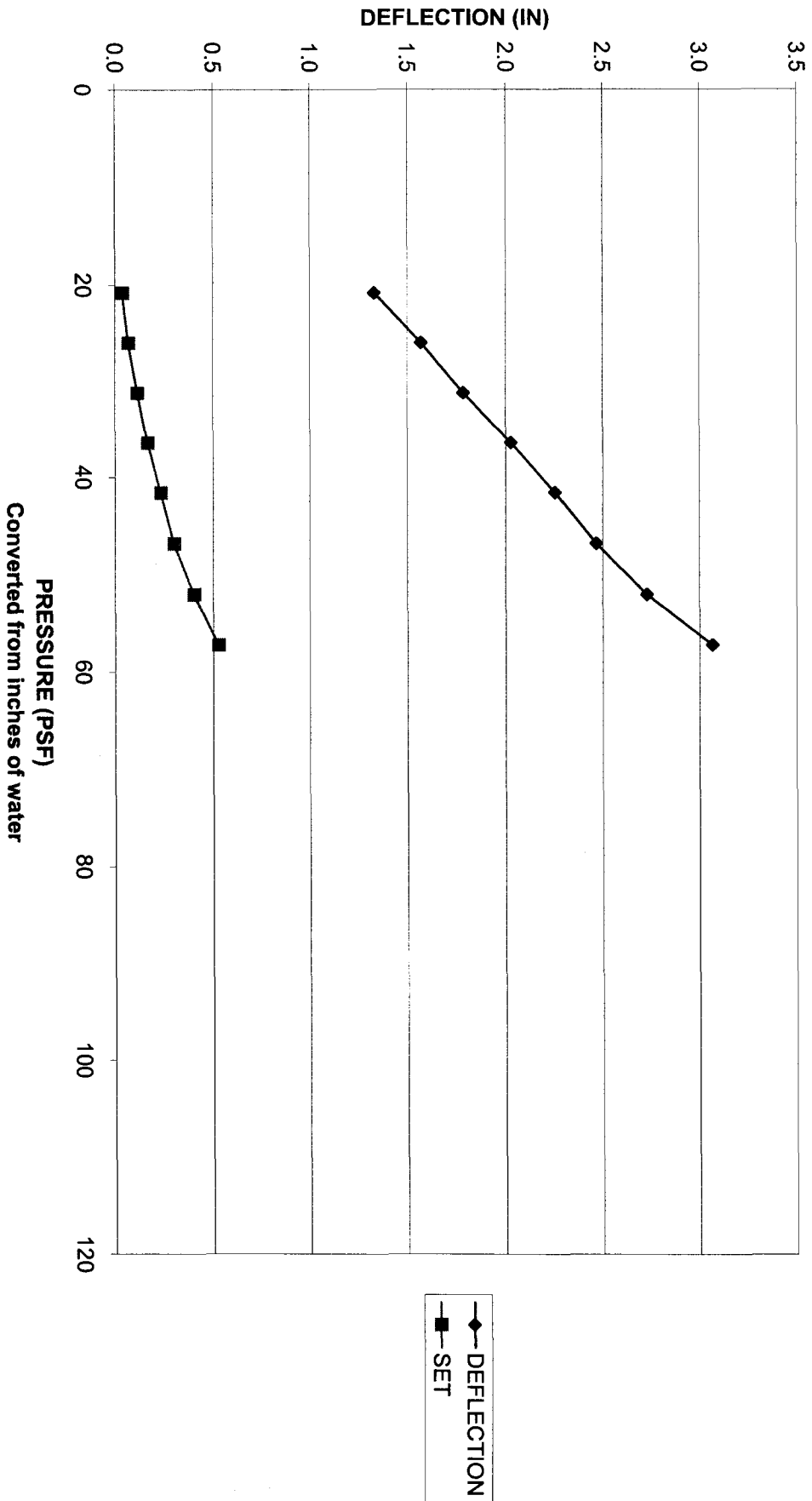


◆ DEFLECTION  
■ SET

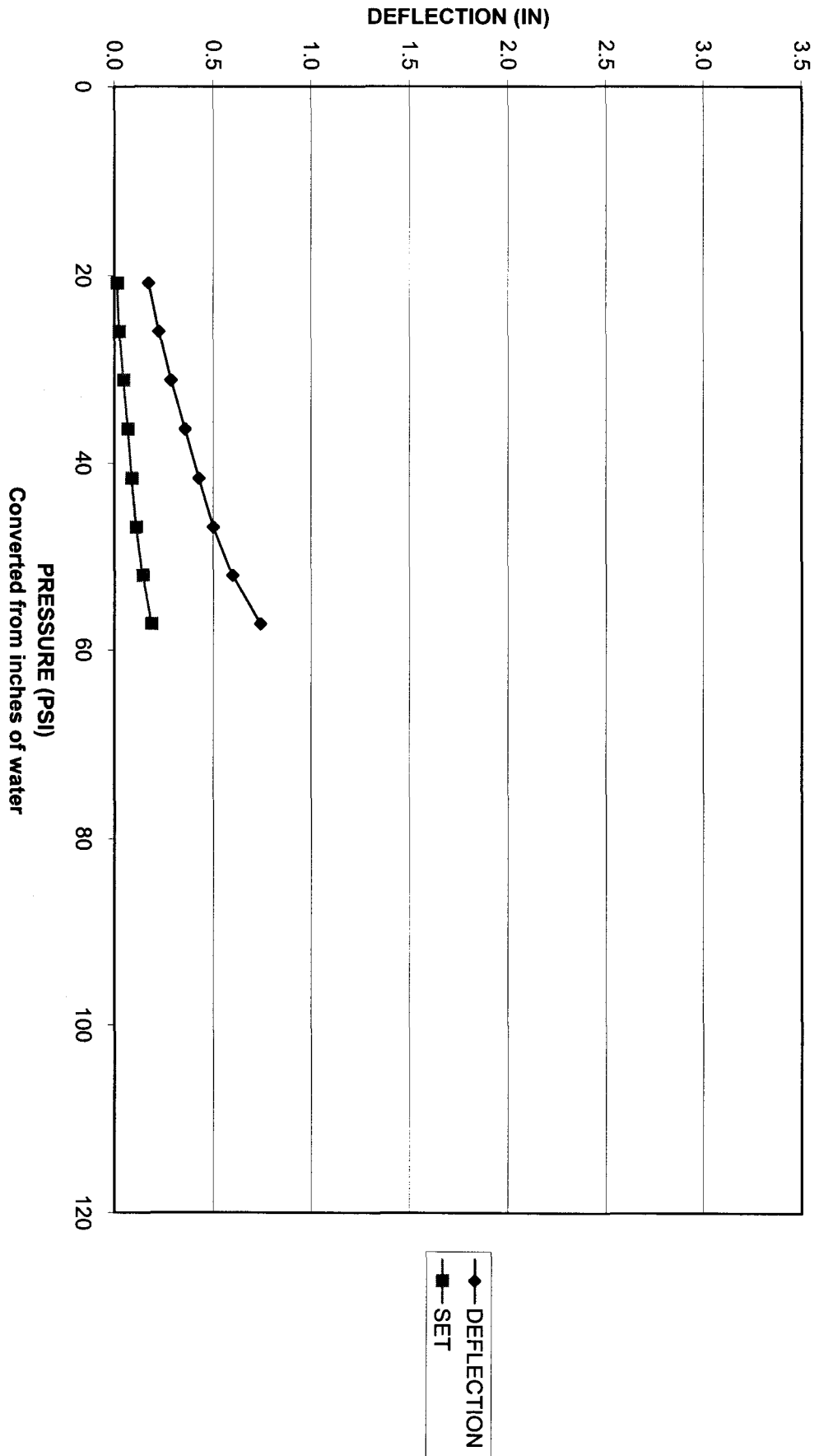
**DEFLECTION GAGE #3**  
**Ultra Seam Test #2037**  
**ASTM E 1592 Roof Panel Uplift Load Test**



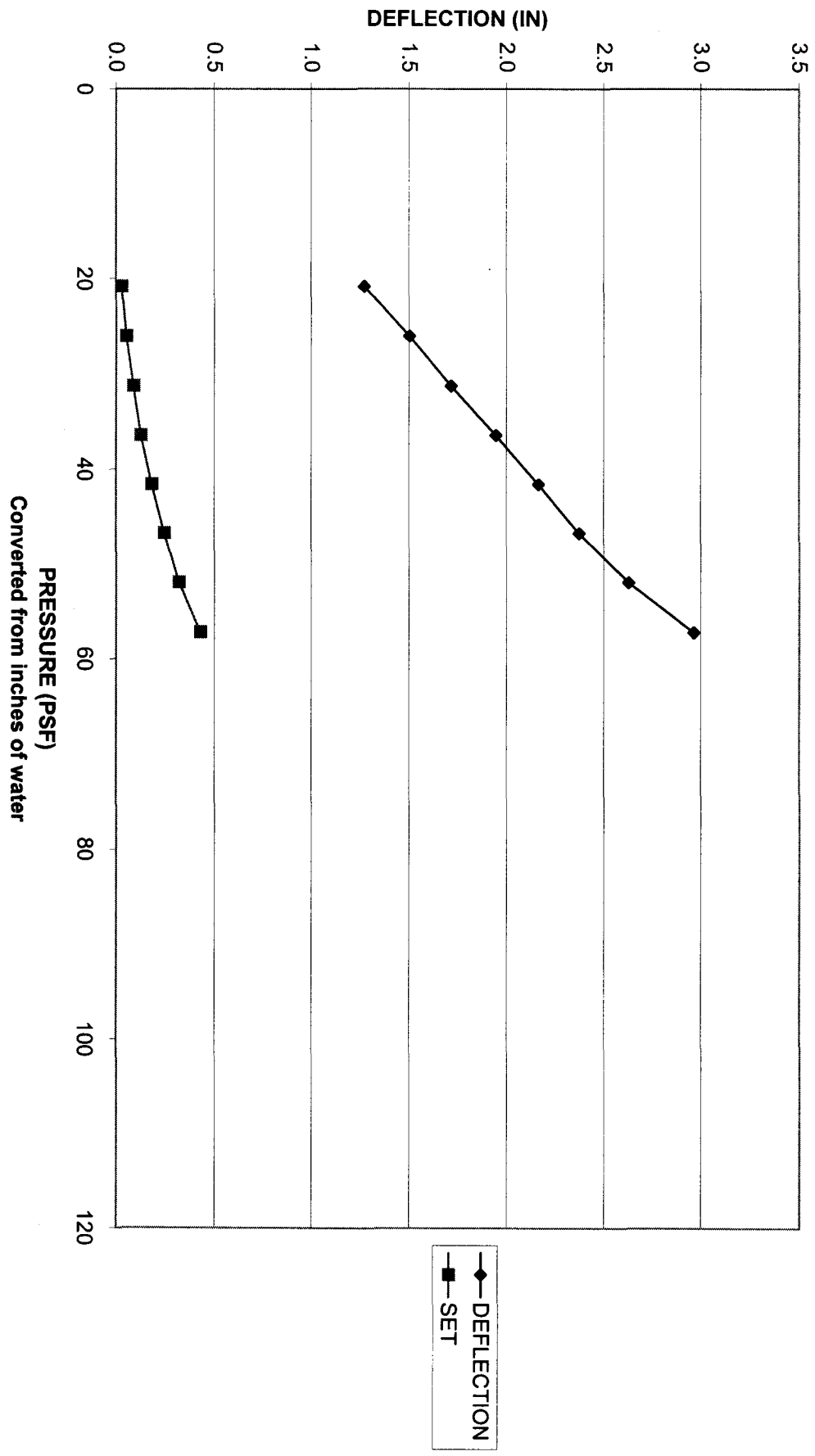
**DEFLECTION GAGE #4**  
**Ultra Seam Test #2037**  
**ASTM E 1592 Roof Panel Uplift Load Test**

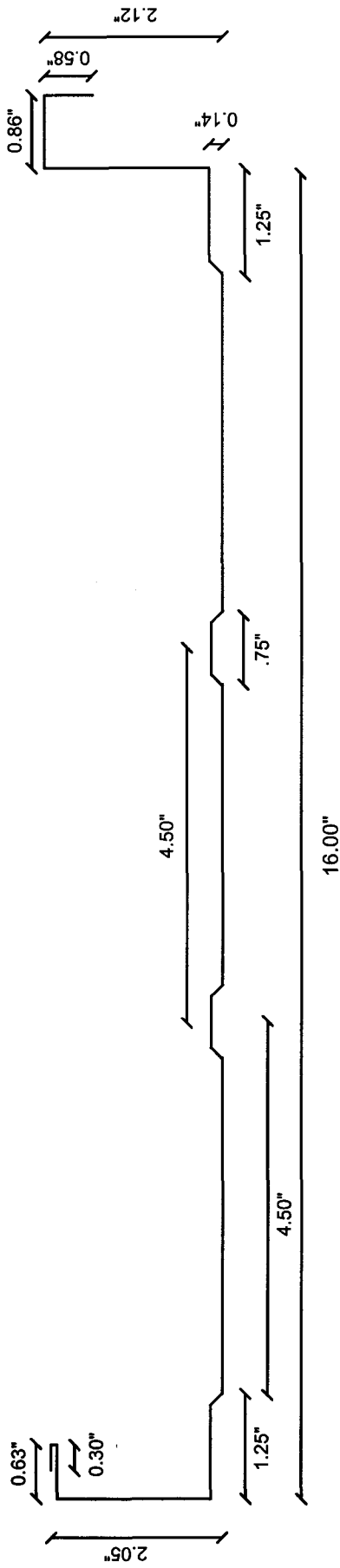


**DEFLECTION GAGE #5**  
**Ultra Seam Test #2037**  
**ASTM E 1592 Roof Panel Uplift Load Test**



**DEFLECTION GAGE #6**  
**Ultra Seam Test #2037**  
**ASTM E 1592 Roof Panel Uplift Load Test**

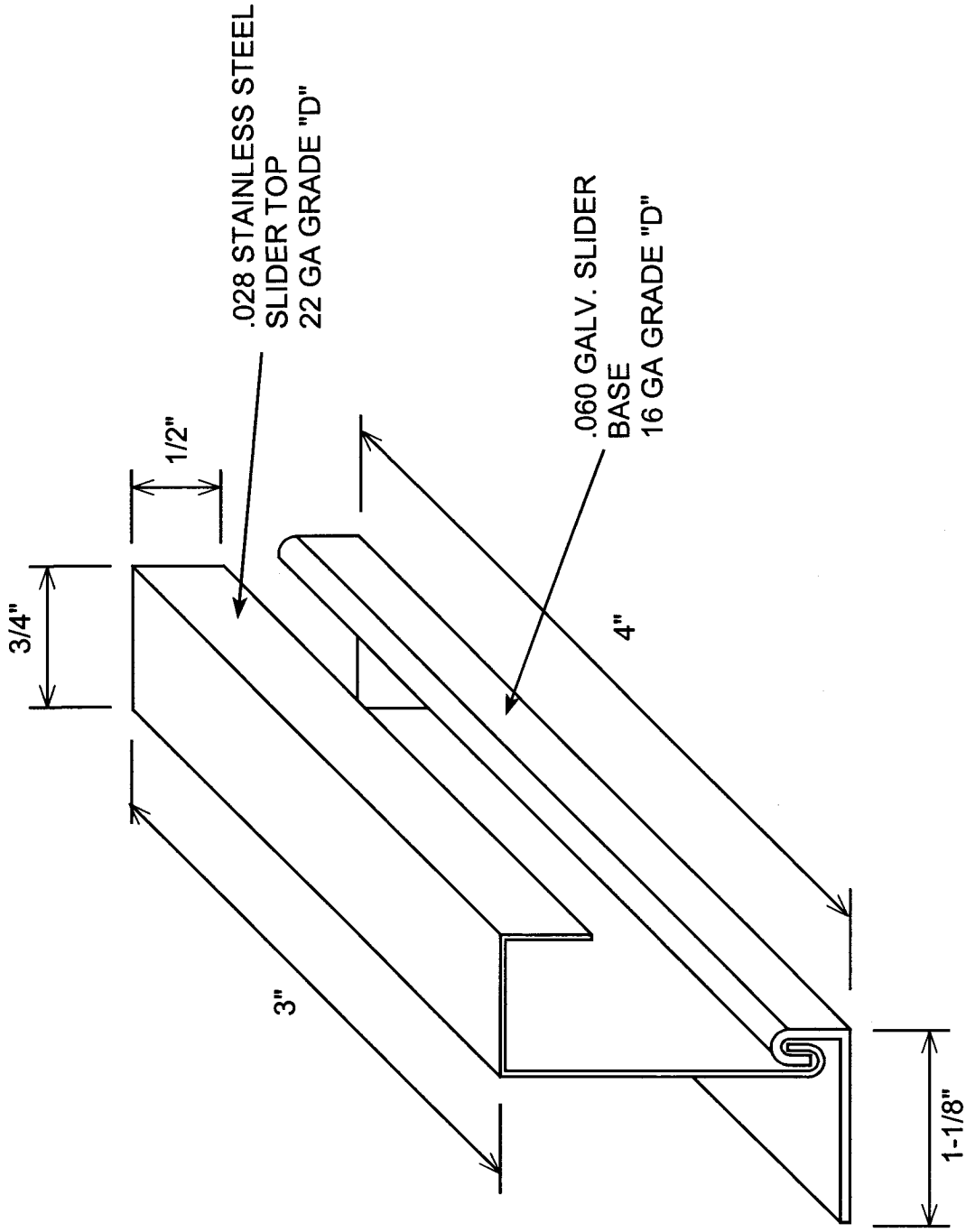




PRODUCT: ULTRA SEAM US-200  
 MANUFACTURED BY:  
 ARCHITECTURAL METAL PRODUCTS  
 FAIRBANKS, ALASKA 99701

**ULTRA SEAM US-200 ROOFING PANEL 16" WIDE**

**ULTRA SEAM TEST #2037**



## SLIDER CLIP

6 MIL PLASTIC TAPED TO CHAMBER WALL

6 MIL PLASTIC PLEATED IN BETWEEN PANEL RIBS AND UNDER PAN

4" I BEAM

14 GA ZEE PURLINS

VACUUM CHAMBER

DOUBLE SEAMED TEST PANELS

CHAMBER FLOOR

ZEE PURLINS

6 MIL PLASTIC TAPED TO CHAMBER WALL

6 MIL PLASTIC TAPED TO CHAMBER WALL

CONT. 22 GA GALVANIZED STARTER CLIP

DOUBLE SEAMED TEST PANELS

DOUBLE SEAMED TEST PANELS

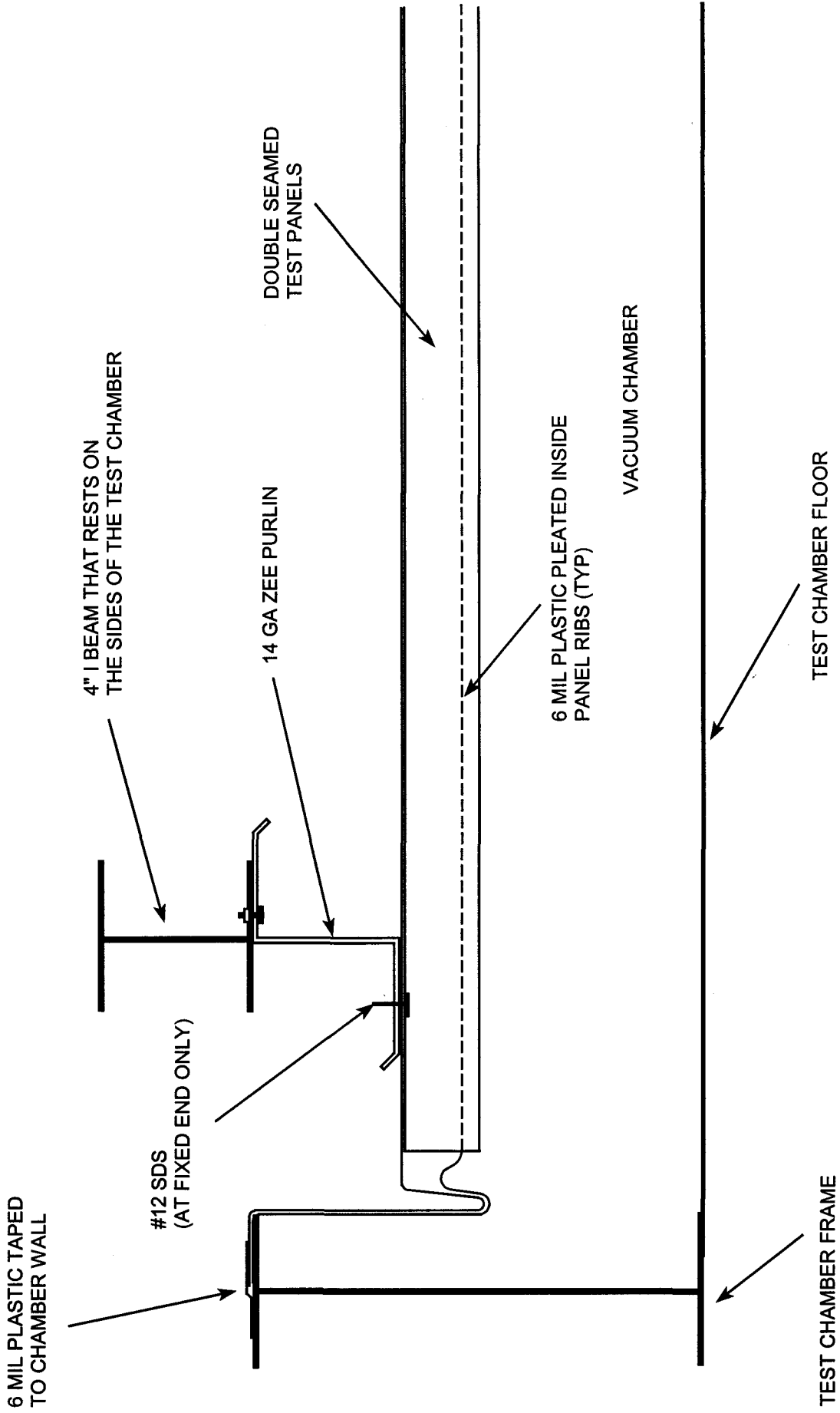
I BEAM TEST CHAMBER FRAME

2" X 2" 18 GA ANGLE

I BEAM TEST CHAMBER FRAME

CONT. 16 GA GALVANIZED STARTER CHANNEL

# CROSS SECTION OF VACUUM CHAMBER TESTING SET UP



**END DETAIL OF VACUUM  
CHAMBER TESTING SET-UP**

# West Penn Material Evaluation

1010 Industrial Blvd, New Kensington, PA 15068

Voice: (724)334-1900 Fax: (724)334-9785 E-mail: info@wptnba.com

Date: 16-Mar-04  
Page No.: 1 of 1

## Summary Page: Tensile Strength Testing

Client: Architectural Metal Products..

PIN #	Dimensions (in.) Width x Thickness	Area (sq. in.)	Yield Point (lbs.)	Tensile Strength (lbs.)	Yield Strength (psi.)	Tensile Strength (psi.)	Elongation (% in 2 in.)	n-Value
2037 Taloe Blue	0.5028 x 0.0214	0.0108	640	764	59280	70700	26.5	0.200

Test Method: ASTM E-8-01 (Yield point determined by 0.2% offset)

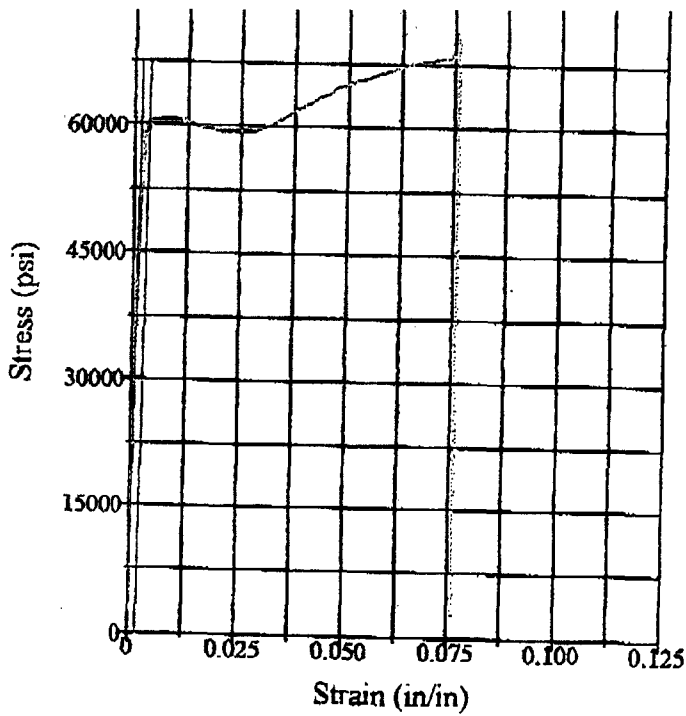
Equipment Used: Satec Vertex/60 HL V #1602, Extensometer # SE2-12.5/1231

Test Performed by: W.Motes

Respectfully Submitted,



WEST PENN MATERIAL EVALUATION



**Test Results**

Width: 0.5028 in  
 Thickness: 0.0214 in  
 Area: 0.0108 in<sup>2</sup>  
 Tensile Strength: 70700 psi  
 Peak Load: 764 lbf  
 Tangent Modulus: 35.555 Msi  
 Load @ Yield: 640 lbf  
 Yield Strength: 59280 psi  
 Total Elongation: 26.5 %  
 n Value: 0.200  
 Yield Point Elongation: 0.01 %

**Test Summary**

Counter: 6244  
 Elapsed Time: 00:01:23  
 Specimen Identification: 2037 Tahoe Blue  
 Operator: W.Motes  
 Customer: Architectural Metal Produ  
 Procedure Name: N-value  
 Start Date: 3/16/04  
 Start Time: 1:33:16 PM  
 End Date: 3/16/04  
 End Time: 1:34:39 PM  
 Workstation: WPME-1  
 Tested By: TODD