



ALPHA SYSTEMS

Ceiling Dead Load Tests
Using 5/16" USG Sheetrock MH

3/1/2002

This test report contains thirteen (13) pages, including the cover sheet. Any additions to, alterations of, or unauthorized use of excerpts from this report are expressly forbidden.

2002-358
(A)

1. TITLE

Ceiling board dead load test per PEI Standard No. 93-8.

2. OBJECTIVE

To apply load to a ceiling sample, representative of a dead load on ceiling board, until a failure is reached

3. TESTED FOR

Alpha Systems
5120 Beck Dr
Elkhart, IN 46516

4. TESTING ORGANIZATION

Progressive Engineering, Inc.
58640 State Road 15
Goshen, IN 46528

5. TESTING PERSONNEL

Test Engineer	- Evor F. Johns, P.E.
Director of Testing	- Greg A. Weeden
Laboratory Manager	- Jason R. Holdeman
Technician	- Rodd Lehman
Technician	- Lonnie Camp
Technician	- Ben Kasa

6. TEST SPECIMEN

A. Materials

- I. Gypsum - 48" x 96" x 5/16" USG Sheetrock MH Panel
- II. Joist - 2 x 6 No. 2 grade SPF
- III. Alpha Systems Alphaseal 5200 two-part polyurethane adhesive.

B. Construction Steps

- I. One (1) piece of gypsum was laid flat.
- II. Three (3) 2 x 6s were laid on the gypsum at 24" o.c. Both ends of the 2 x 6 had 0" gap along the gypsum. #8 washer head screws, 1-1/2" lg were used along each 2 x 6, at a spacing of 12" o.c., to achieve a 0" gap.

III. The average bead size of the Alphaseal 5200 on the wood was 1/2", using a stitch pattern.

IV. The average bead size of the Alphaseal 5200 on the gypsum was 7/8", using a stitch pattern.

V. The samples remained flat for a minimum of 24 hours until they were tested. The temporary fasteners were removed prior to testing.

7. PROCEDURE

A. The samples were placed in a vacuum test fixture. Polyethylene film was applied over the samples, in a manner such that load was applied directly to the gypsum, then enclosed by taping the film to the fixture. See drawings for details.

B. Dial indicators were placed at the center line of the ceiling sample, one at each 2 x 6 and one on the gypsum between each 2 x 6.

C. A vacuum load was applied with a Shop Vac and measured with a water manometer. Load was applied in 2 PSF increments to the samples, with a residual deflection measurement taken between each increment. Deflection measurements were taken up to 14 PSF. The load was applied until a failure was reached.

8. Test Results

See the attached deflection charts for actual deflections measured.

Average ultimate load reached

Test No. 1 = 35.3 PSF

Test No. 2 = 30.1 PSF

Test No. 3 = 30.1 PSF

Average = 31.8 PSF

Allowable load under the Manufactured Home Construction and Safety Standards

$31.8 / 2.5 \text{ safety factor} = 12.7 \text{ PSF}$

9. CONCLUSION

Based on the data obtained from this test; a ceiling dead load of **12.7 PSF** can be obtained from a ceiling constructed as follows:

- A. 5/16" USG Sheetrock MH brand gypsum. Gypsum was applied with the 8' edge parallel to the 2 x 6 framing.
- B. Alpha Systems Alphaseal 5200 two-part urethane adhesive. (stitch pattern)
- C. A gap of 0" between joist or truss and gypsum was used in this test. Zero gap is considered worst case.

A circular professional engineer seal for Elvor F. Johns, Registered Professional Engineer, State of Indiana, No. 01578. The seal is stamped over a handwritten signature and the date 3/7/02.

PROGRESSIVE ENGINEERING, Inc.

CEILING DEAD LOAD TEST

Gap Between Wood and Gypsum: **Zero**

Gypsum Brand Used: USG Sheetrock MH

Gypsum Thickness: 5/16"

Truss Spacing: 2' o.c.

Date: 3/1/2002

Test No. 1

Test Sample Size: 49-1/2"x98

Gypsum Clear Span: 96"

Temperature: 71 degree F.

Humidity: 20%

Time	TRUSS		GYPSUM		TRUSS		GYPSUM		TRUSS		INDICATOR No. 2 RESULTANT DEFL.		INDICATOR No. 4 RESULTANT DEFL.	
	Load Increments	Indicator No.1 Reading	Indicator No.1 Defl.	Indicator No.2 Reading	Indicator No.2 Defl.	Indicator No.3 Reading	Indicator No.3 Defl.	Indicator No.4 Reading	Indicator No.4 Defl.	Indicator No.5 Reading	Indicator No.5 Defl.	Resultant Defl.	Resultant Defl.	
10:00	No Load	1.841	----	1.873	----	1.898	----	1.736	----	1.869	----	----	----	
10:05	2 PSF	1.837	.004	1.847	.026	1.888	.010	1.706	.030	1.861	.008	.019	.021	
10:10	No Load	1.841	.000	1.872	.001	1.898	.000	1.735	.001	1.868	.001	.001	.000	
10:15	4 PSF	1.828	.013	1.814	.059	1.873	.025	1.671	.065	1.852	.017	.040	.044	
10:20	No Load	1.841	.000	1.872	.001	1.898	.000	1.734	.002	1.868	.001	.001	.002	
10:25	6 PSF	1.819	.022	1.776	.097	1.857	.041	1.628	.108	1.840	.029	.066	.073	
10:30	No Load	1.839	.002	1.868	.005	1.896	.002	1.729	.007	1.866	.003	.003	.004	
10:35	8 PSF	1.811	.030	1.741	.132	1.845	.053	1.592	.144	1.830	.039	.090	.098	
10:40	No Load	1.839	.002	1.864	.009	1.895	.003	1.725	.011	1.865	.004	.006	.007	
10:45	10 PSF	1.806	.035	1.714	.159	1.835	.063	1.563	.173	1.823	.046	.110	.119	
10:50	No Load	1.838	.003	1.861	.012	1.894	.004	1.723	.013	1.864	.005	.009	.008	
10:55	12 PSF	1.800	.041	1.683	.190	1.873	.025	1.526	.210	1.815	.054	.157	.171	
11:00	No Load	1.838	.003	1.858	.015	1.894	.004	1.717	.019	1.864	.005	.012	.015	
11:05	14 PSF	1.789	.052	1.629	.244	1.811	.087	1.466	.270	1.802	.067	.175	.193	
11:10	No Load	1.836	.005	1.846	.027	1.893	.005	1.705	.031	1.862	.007	.022	.025	

Ultimate Load: 35.3 PSF

Failure: Gypsum core truss #3

PROGRESSIVE ENGINEERING, Inc.

CEILING DEAD LOAD TEST

Gap Between Wood and Gypsum: **Zero**
 Gypsum Brand Used: USG Sheetrock MH
 Gypsum Thickness: 5/16"
 Truss Spacing: 2' o.c.
 Date: 3/1/2002

Test Sample Size: 49-1/2"x98
 Gypsum Clear Span: 96"
 Temperature: 71 degree F.
 Humidity: 20%

Test No. 2

Time	Load Increments	TRUSS Indicator No.1		GYPSUM Indicator No.2		TRUSS Indicator No.3		GYPSUM Indicator No.4		TRUSS Indicator No.5		INDICATOR No. 2	INDICATOR No. 4
		Reading	Defl.	Reading	Defl.	Reading	Defl.	Reading	Defl.	Reading	Defl.	RESULTANT DEF.	RESULTANT DEF.
10:00	No Load	1.895	----	1.857	----	1.926	----	1.757	----	1.861	----	----	----
10:05	2 PSF	1.885	.010	1.822	.035	1.912	.014	1.730	.027	1.854	.007	.023	.017
10:10	No Load	1.895	.000	1.856	.001	1.926	.000	1.757	.000	1.860	.001	.001	.000
10:15	4 PSF	1.874	.021	1.783	.074	1.896	.030	1.694	.063	1.847	.014	.049	.041
10:20	No Load	1.894	.001	1.855	.002	1.925	.001	1.755	.002	1.859	.002	.001	.001
10:25	6 PSF	1.861	.034	1.741	.116	1.879	.047	1.651	.106	1.838	.023	.075	.071
10:30	No Load	1.893	.002	1.849	.008	1.924	.002	1.751	.006	1.858	.003	.006	.004
10:35	8 PSF	1.852	.043	1.701	.156	1.866	.060	1.614	.143	1.831	.030	.105	.098
10:40	No Load	1.891	.004	1.843	.014	1.922	.004	1.746	.011	1.857	.004	.010	.007
10:45	10 PSF	1.844	.051	1.668	.189	1.854	.072	1.583	.174	1.824	.037	.128	.120
10:50	No Load	1.890	.005	1.841	.016	1.922	.004	1.745	.012	1.857	.004	.012	.008
10:55	12 PSF	1.835	.060	1.631	.226	1.841	.085	1.543	.214	1.818	.043	.154	.150
11:00	No Load	1.889	.006	1.834	.023	1.921	.005	1.739	.018	1.855	.006	.018	.012
11:05	14 PSF	1.826	.069	1.566	.291	1.826	.100	1.488	.269	1.812	.049	.207	.195
11:10	No Load	1.888	.007	1.821	.036	1.921	.005	1.728	.029	1.853	.008	.030	.023

Ultimate Load: 30.1 PSF

Failure: Truss #1 gypsum core failure

PROGRESSIVE ENGINEERING, Inc.

CEILING DEAD LOAD TEST

Gap Between Wood and Gypsum: **Zero**
 Gypsum Brand Used: USG Sheetrock MH
 Gypsum Thickness: 5/16"
 Truss Spacing: 2' o.c.
 Date: 3/1/2002

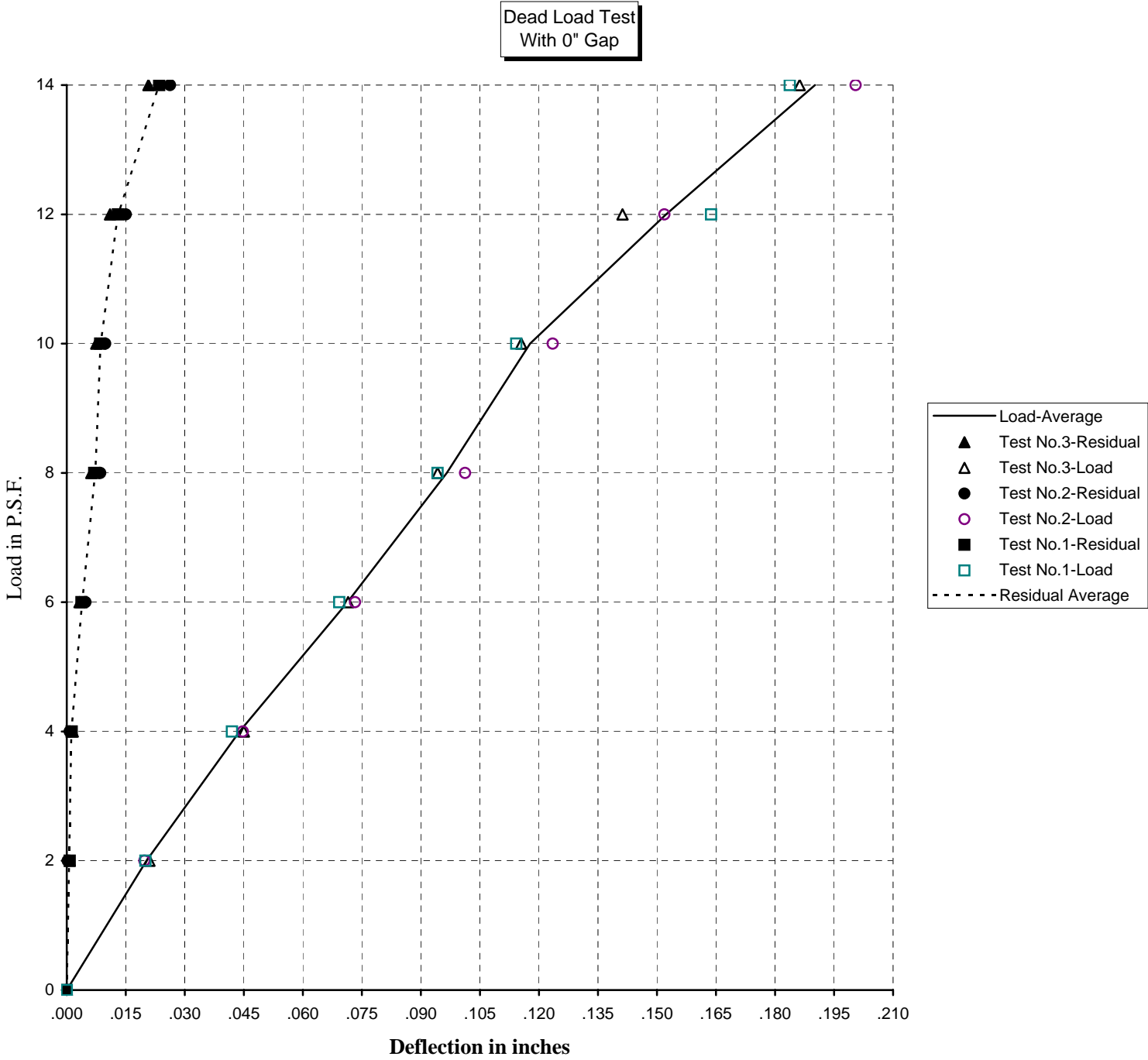
Test Sample Size: 49-1/2"x98
 Gypsum Clear Span: 96"
 Temperature: 71 degree F.
 Humidity: 20%

Test No. 3

Time	Load Increments	TRUSS		GYPSUM		TRUSS		GYPSUM		TRUSS		INDICATOR No. 2 RESULTANT DEFL.	INDICATOR No. 4 RESULTANT DEFL.
		Indicator No.1 Reading	Defl.	Indicator No.2 Reading	Defl.	Indicator No.3 Reading	Defl.	Indicator No.4 Reading	Defl.	Indicator No.5 Reading	Defl.		
3:00	No Load	1.930	----	1.915	----	1.892	----	1.816	----	1.917	----	----	----
3:05	2 PSF	1.920	.010	1.883	.032	1.875	.017	1.781	.035	1.911	.006	.019	.024
3:10	No Load	1.929	.001	1.913	.002	1.891	.001	1.814	.002	1.915	.002	.001	.001
3:15	4 PSF	1.912	.018	1.847	.068	1.856	.036	1.741	.075	1.901	.016	.041	.049
3:20	No Load	1.929	.001	1.912	.003	1.890	.002	1.812	.004	1.914	.003	.002	.001
3:25	6 PSF	1.901	.029	1.807	.108	1.835	.057	1.695	.121	1.888	.029	.065	.078
3:30	No Load	1.928	.002	1.909	.006	1.888	.004	1.809	.007	1.914	.003	.003	.004
3:35	8 PSF	1.893	.037	1.773	.142	1.818	.074	1.657	.159	1.877	.040	.087	.102
3:40	No Load	1.926	.004	1.904	.011	1.886	.006	1.805	.011	1.914	.003	.006	.007
3:45	10 PSF	1.887	.043	1.742	.173	1.804	.088	1.624	.192	1.868	.049	.108	.124
3:50	No Load	1.926	.004	1.903	.012	1.886	.006	1.803	.013	1.913	.004	.007	.008
3:55	12 PSF	1.881	.049	1.706	.209	1.789	.103	1.586	.230	1.859	.058	.133	.150
4:00	No Load	1.925	.005	1.898	.017	1.886	.006	1.800	.016	1.912	.005	.012	.011
4:05	14 PSF	1.871	.059	1.649	.266	1.768	.124	1.524	.292	1.853	.064	.175	.198
4:10	No Load	1.924	.006	1.888	.027	1.885	.007	1.789	.027	1.912	.005	.021	.021
Ultimate Load:		30.1 PSF											

Failure: Gypsum core failure at truss #3 at every adhesive location

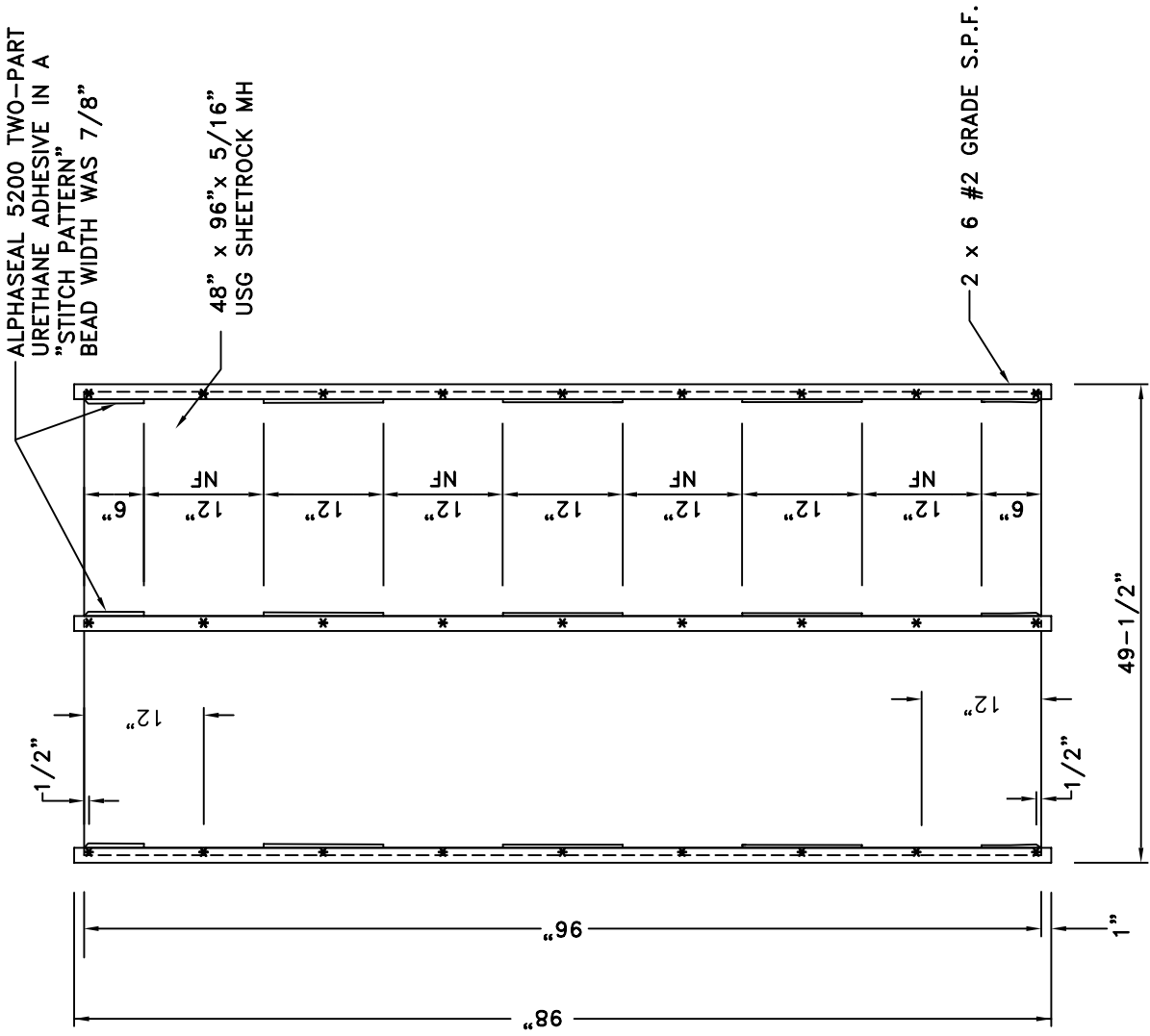
PROGRESSIVE ENGINEERING, Inc.



ALPHASEAL 5200 TWO-PART URETHANE ADHESIVE IN A "STITCH PATTERN" BEAD WIDTH WAS 7/8"

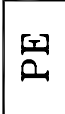
48" x 96" x 5/16" USG SHEETROCK MH

2 x 6 #2 GRADE S.P.F.

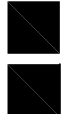


THIS DRAWING IS A PART OF TEST REPORT NO. 2002-358(A)

DWN. BY: D.TYSON	REVISED ON:	CLIENT: ALPHA SYSTEMS
DATE: 2/28/02		TITLE: CEILING SAMPLE
SCALE:		
JOB NO. 2002-358		
DWG. NO. B1		



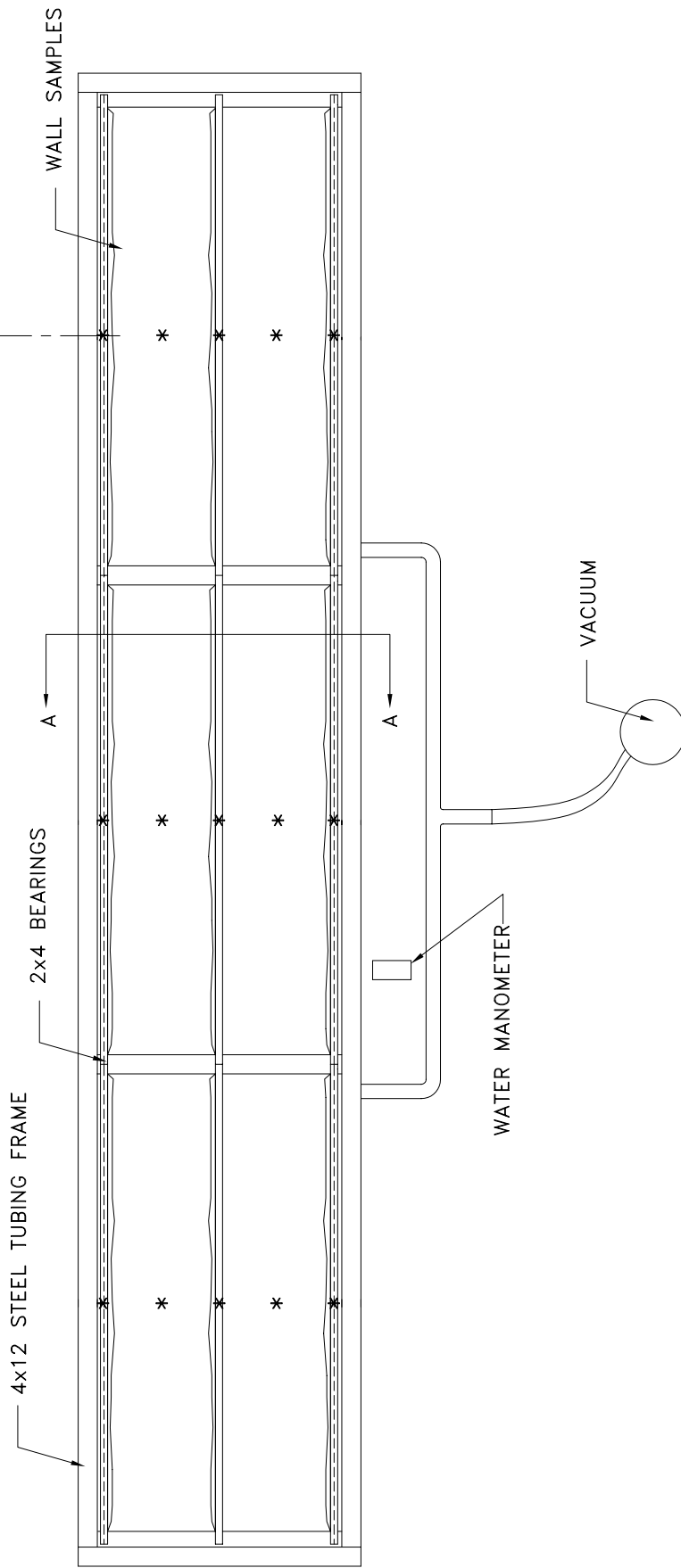
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PROGRESSIVE ENGINEERING, INC.
TESTING LABORATORY
58640 State Road 15
GOSHEN, INDIANA 46528
Telephone (219) 533-0337

* - TEMPORARY FASTENERS
NF - NO FOAM

CENTER-LINE
OF CLEAR SPAN



NOTES:

* - DEFLECTION GAUGE LOCATIONS

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DWN. BY: MORRIS
DATE: 8/15/94
SCALE: 1/2" = 12"

DRAWING NUMBER

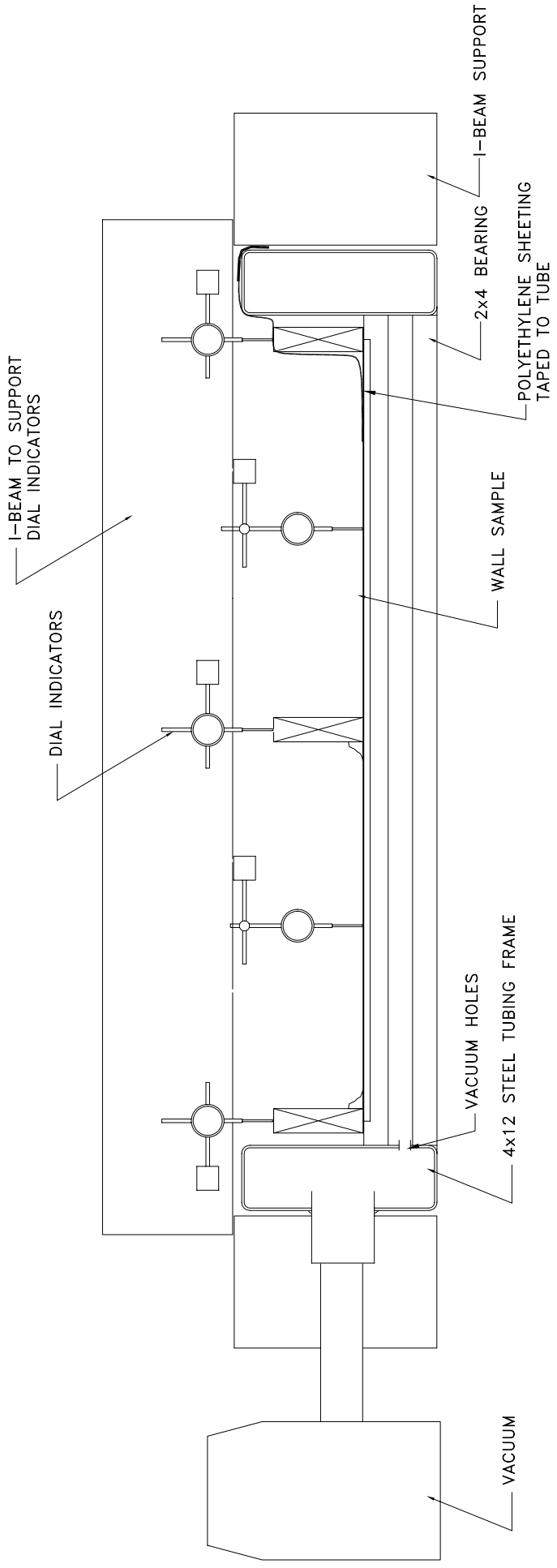
F361

TITLE: TEST SET-UP

PROGRESSIVE ENGINEERING, INC.
Testing Laboratory

PE

58640 State Road 15
COSHEN, INDIANA 46526
Telephone (219) 533-0337

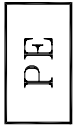


SECTION A-A

DWN. BY: EVERINGHAM
DATE: 8/8/94
SCALE: NONE
DRAWING NUMBER
F362

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COSHEN, INDIANA 46526
Telephone (219) 533-0337



Test Set-Up



Test #1 at Failure