PEI

Progressive Engineering, Inc.

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ALPHA SYSTEMS

Ceiling Dead Load Tests
Using 1/2" Fiberock

2/28/2000

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.

2000-326

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 Drive
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
Technician	-	Scott Gruver
Technician	-	Bradd Weddell

6. TEST SPECIMEN

A. Materials

I. Gypsum - 48" x 96" x 1/2" Fiberock Brand MH gypsum fiber panel.
II. Joists - 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 on a flat jig.
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.

III. The average bead size of the Alphaseal 5200 on the wood was 1/2".
The average bead size of the Alphaseal 5200 on the gypsum was 7/8".
The ceiling samples remained on the jig for 5 minutes. After the 5 minutes, the samples were moved and stacked where they remained for a minimum of 24 hours until they were tested.

7. TEST 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 for 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 = 48.9 PSF

Test No. 2 = 52.0 PSF

Test No. 3 = 52.0 PSF

Average = 50.9 PSF

Allowable load under the Manufactured Home Construction and Safety Standards.

50.9/2.5 safety factor = 20.3 PSF

9. CONCLUSION

Based on the data obtained from this test; a ceiling dead load of 20.3 PSF can be obtained from a ceiling constructed as follows:

A. 1/2" Fiberock Brand MH gypsum fiber panel.
B. Alpha Systems Alphaseal 5200 two-part urethane adhesive.
C. A gap of 0" between joist or truss and gypsum.

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PROGRESSIVE ENGINEERING, Inc.

CEILING DEAD LOAD TEST

Gap Between Wood and Gypsum: **Zero**
Gypsum Brand Used: USG Fiberock
Gypsum Thickness: 1/2"
Truss Spacing: 2' o.c.
Date: 2/28/2000

Test Sample Size: 4' x 8'
Gypsum Clear Span: 96"
Temperature: 65 degree F.
Humidity: 25%

Test No. 1

		TRUSS		GYPSUM		TRUSS		GYPSUM		TRUSS		INDICATOR No. 2	INDICATOR No. 4
	Load	Indicator No.1		Indicator No.2		Indicator No.3		Indicator No.4		Indicator No.5		RESULTANT	RESULTANT
Time	Increments	Reading	Defl.	Reading	Defl.	Reading	Defl.	Reading	Defl.	Reading	Defl.	DEFL.	DEFL.
3:00	No Load	.915	----	1.898	----	.925	----	1.867	----	.925	----	----	----
3:05	2 PSF	.909	.006	1.885	.013	.916	.009	1.855	.012	.919	.006	.005	.005
3:10	No Load	.914	.001	1.898	.000	.925	.000	1.866	.001	.925	.000	-.001	.001
3:15	4 PSF	.896	.019	1.856	.042	.893	.032	1.829	.038	.905	.020	.016	.012
3:20	No Load	.914	.001	1.898	.000	.925	.000	1.865	.002	.925	.000	-.001	.002
3:25	6 PSF	.885	.030	1.834	.064	.878	.047	1.810	.057	.894	.031	.025	.018
3:30	No Load	.914	.001	1.894	.004	.922	.003	1.863	.004	.922	.003	.002	.001
3:35	8 PSF	.881	.034	1.826	.072	.872	.053	1.803	.064	.892	.033	.028	.021
3:40	No Load	.912	.003	1.893	.005	.922	.003	1.862	.005	.922	.003	.002	.002
3:45	10 PSF	.868	.047	1.802	.096	.855	.070	1.781	.086	.880	.045	.037	.029
3:50	No Load	.910	.005	1.888	.010	.918	.007	1.858	.009	.920	.005	.004	.003
3:55	12 PSF	.858	.057	1.782	.116	.843	.082	1.762	.105	.871	.054	.046	.037
4:00	No Load	.909	.006	1.888	.010	.918	.007	1.856	.011	.918	.007	.004	.004
4:05	14 PSF	.851	.064	1.767	.131	.832	.093	1.748	.119	.864	.061	.052	.042
4:10	No Load	.908	.007	1.885	.013	.916	.009	1.855	.012	.918	.007	.005	.004
												.000	.000
Ultimate Load:		48.9 PSF										.000	.000

Failure: Fiber failure along center stud.

PROGRESSIVE ENGINEERING, Inc.

CEILING DEAD LOAD TEST

Gap Between Wood and Gypsum: **Zero**
Gypsum Brand Used: USG Fiberock
Gypsum Thickness: 1/2"
Truss Spacing: 2' o.c.
Date: 2/28/2000

Test Sample Size: 4' x 8'
Gypsum Clear Span: 96"
Temperature: 65 degree F.
Humidity: 25%

Test No. 2

		TRUSS		GYPSUM		TRUSS		GYPSUM		TRUSS		INDICATOR No. 2	INDICATOR No. 4
	Load	Indicator No.1		Indicator No.2		Indicator No.3		Indicator No.4		Indicator No.5		RESULTANT	RESULTANT
Time	Increments	Reading	Defl.	Reading	Defl.	Reading	Defl.	Reading	Defl.	Reading	Defl.	DEFL.	DEFL.
3:00	No Load	.848	----	1.938	----	.878	----	1.941	----	.845	----	----	----
3:05	2 PSF	.842	.006	1.925	.013	.868	.010	1.928	.013	.837	.008	.005	.004
3:10	No Load	.848	.000	1.938	.000	.878	.000	1.942	-.001	.845	.000	.000	-.001
3:15	4 PSF	.828	.020	1.895	.043	.842	.036	1.894	.047	.816	.029	.015	.015
3:20	No Load	.848	.000	1.937	.001	.878	.000	1.942	-.001	.845	.000	.001	-.001
3:25	6 PSF	.815	.033	1.871	.067	.823	.055	1.868	.073	.802	.043	.023	.024
3:30	No Load	.844	.004	1.935	.003	.875	.003	1.938	.003	.845	.000	-.001	.002
3:35	8 PSF	.811	.037	1.863	.075	.818	.060	1.862	.079	.798	.047	.027	.026
3:40	No Load	.843	.005	1.932	.006	.873	.005	1.937	.004	.843	.002	.001	.001
3:45	10 PSF	.799	.049	1.840	.098	.799	.079	1.834	.107	.782	.063	.034	.036
3:50	No Load	.840	.008	1.929	.009	.870	.008	1.932	.009	.839	.006	.001	.002
3:55	12 PSF	.790	.058	1.821	.117	.785	.093	1.812	.129	.772	.073	.042	.046
4:00	No Load	.839	.009	1.928	.010	.869	.009	1.931	.010	.839	.006	.001	.003
4:05	14 PSF	.781	.067	1.802	.136	.772	.106	1.792	.149	.762	.083	.049	.055
4:10	No Load	.837	.011	1.925	.013	.868	.010	1.928	.013	.838	.007	.002	.005
												.000	.000
												.000	.000

Ultimate Load: 52.0 PSF

Failure: Fiberock broke in center of bay

PROGRESSIVE ENGINEERING, Inc.

CEILING DEAD LOAD TEST

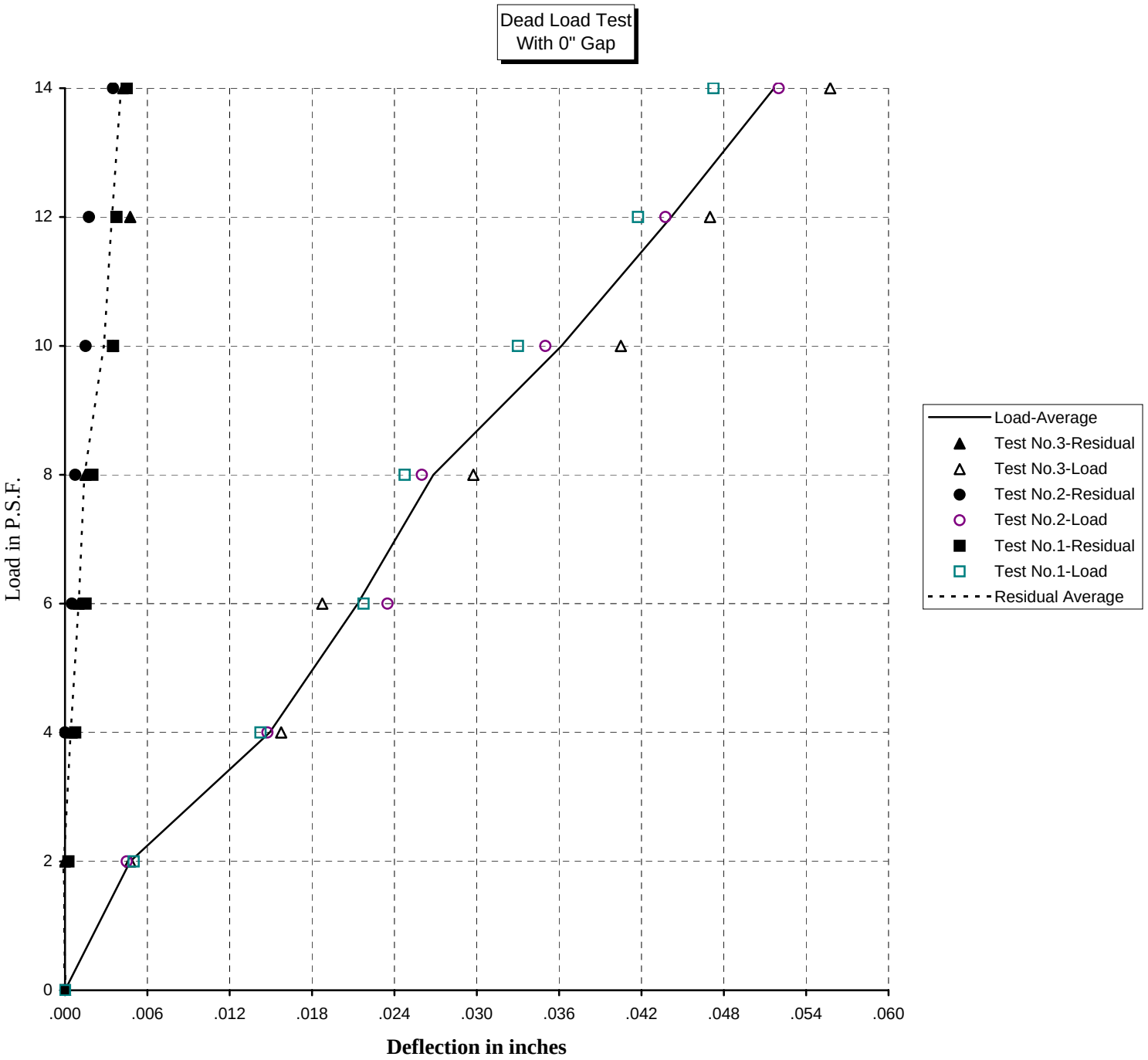
Gap Between Wood and Gypsum: **Zero**
Gypsum Brand Used: USG Fiberock
Gypsum Thickness: 1/2"
Truss Spacing: 2' o.c.
Date: 2/28/2000

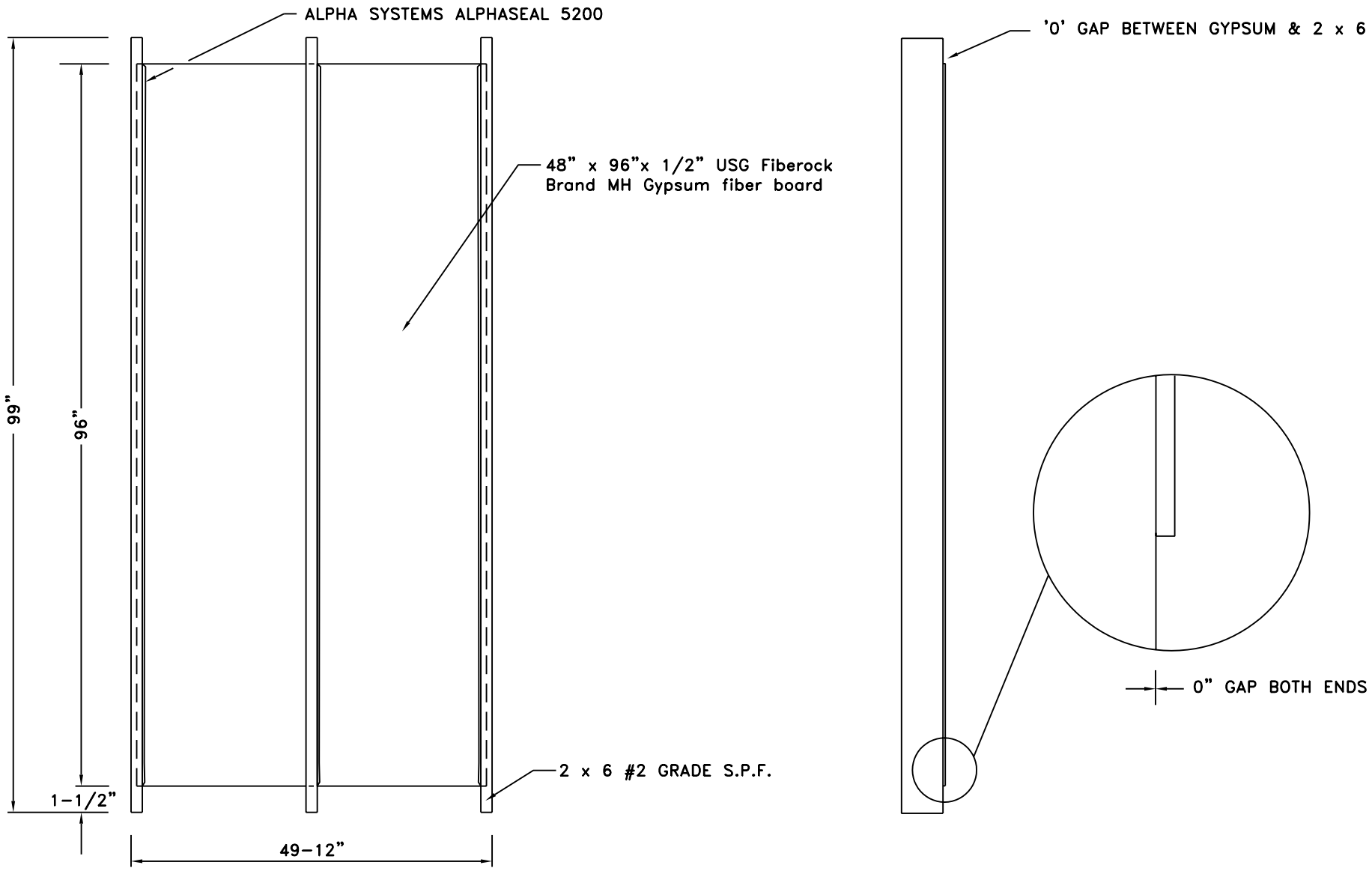
Test Sample Size: 4' x 8'
Gypsum Clear Span: 96"
Temperature: 65 degree F.
Humidity: 25%

Test No. 3

		TRUSS		GYPSUM		TRUSS		GYPSUM		TRUSS		INDICATOR No. 2	INDICATOR No. 4
	Load	Indicator No.1		Indicator No.2		Indicator No.3		Indicator No.4		Indicator No.5		RESULTANT	RESULTANT
Time	Increments	Reading	Defl.	Reading	Defl.	Reading	Defl.	Reading	Defl.	Reading	Defl.	DEFL.	DEFL.
3:00	No Load	.749	----	1.926	----	.743	----	1.874	----	.710	----	----	----
3:05	2 PSF	.745	.004	1.917	.009	.734	.009	1.860	.014	.705	.005	.002	.007
3:10	No Load	.749	.000	1.926	.000	.743	.000	1.874	.000	.710	.000	.000	.000
3:15	4 PSF	.734	.015	1.891	.035	.710	.033	1.827	.047	.690	.020	.011	.021
3:20	No Load	.749	.000	1.925	.001	.742	.001	1.873	.001	.710	.000	.000	.001
3:25	6 PSF	.724	.025	1.867	.059	.689	.054	1.814	.060	.680	.030	.019	.018
3:30	No Load	.748	.001	1.924	.002	.740	.003	1.870	.004	.709	.001	.000	.002
3:35	8 PSF	.724	.025	1.860	.066	.683	.060	1.791	.083	.676	.034	.023	.036
3:40	No Load	.747	.002	1.923	.003	.739	.004	1.868	.006	.708	.002	.000	.003
3:45	10 PSF	.712	.037	1.835	.091	.660	.083	1.760	.114	.665	.045	.031	.050
3:50	No Load	.745	.004	1.919	.007	.735	.008	1.862	.012	.706	.004	.001	.006
3:55	12 PSF	.704	.045	1.818	.108	.645	.098	1.741	.133	.657	.053	.036	.058
4:00	No Load	.745	.004	1.917	.009	.734	.009	1.860	.014	.705	.005	.002	.007
4:05	14 PSF	.698	.051	1.801	.125	.631	.112	1.720	.154	.650	.060	.044	.068
4:10	No Load	.745	.004	1.915	.011	.731	.012	1.859	.015	.703	.007	.003	.006
												.000	.000
Ultimate Load:		52.0 PSF										.000	.000

Failure: Fiber failure along center stud.


Dead Load Test
With 0" Gap
Load in P.S.F.
0
2
4
6
8
10
12
14
.000
.006
.012
.018
.024
.030
.036
.042
.048
.054
.060
Deflection in inches
Load-Average
Test No.3-Residual
Test No.3-Load
Test No.2-Residual
Test No.2-Load
Test No.1-Residual
Test No.1-Load
Residual Average



THIS DRAWING IS A PART OF TEST REPORT NO. 2000-326

DWN. BY: S. GRUVER	DATE	REVISIONS	CLIENT: ALPHA SYSTEMS
CHK. BY:			
DATE: 3/2/00			
SCALE: 3"=12"			TITLE: 0" GAP CEILING SAMPLE
JOB NO. 2000-326			
DWG. NO. B1			

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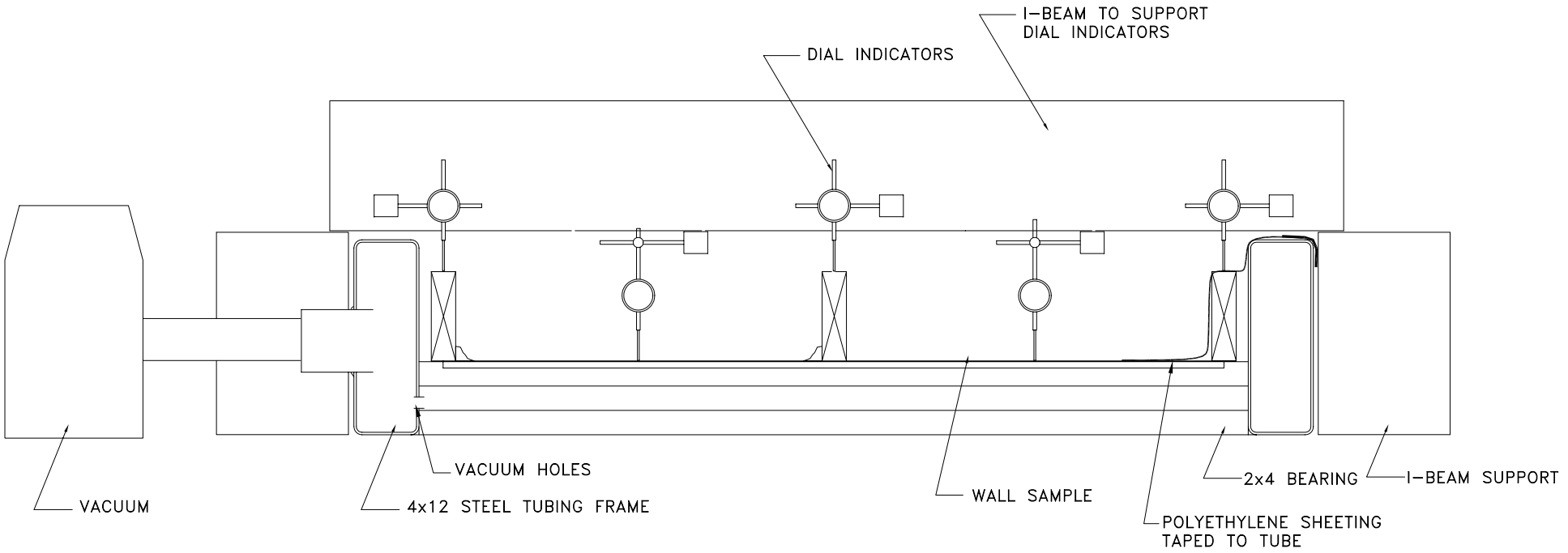
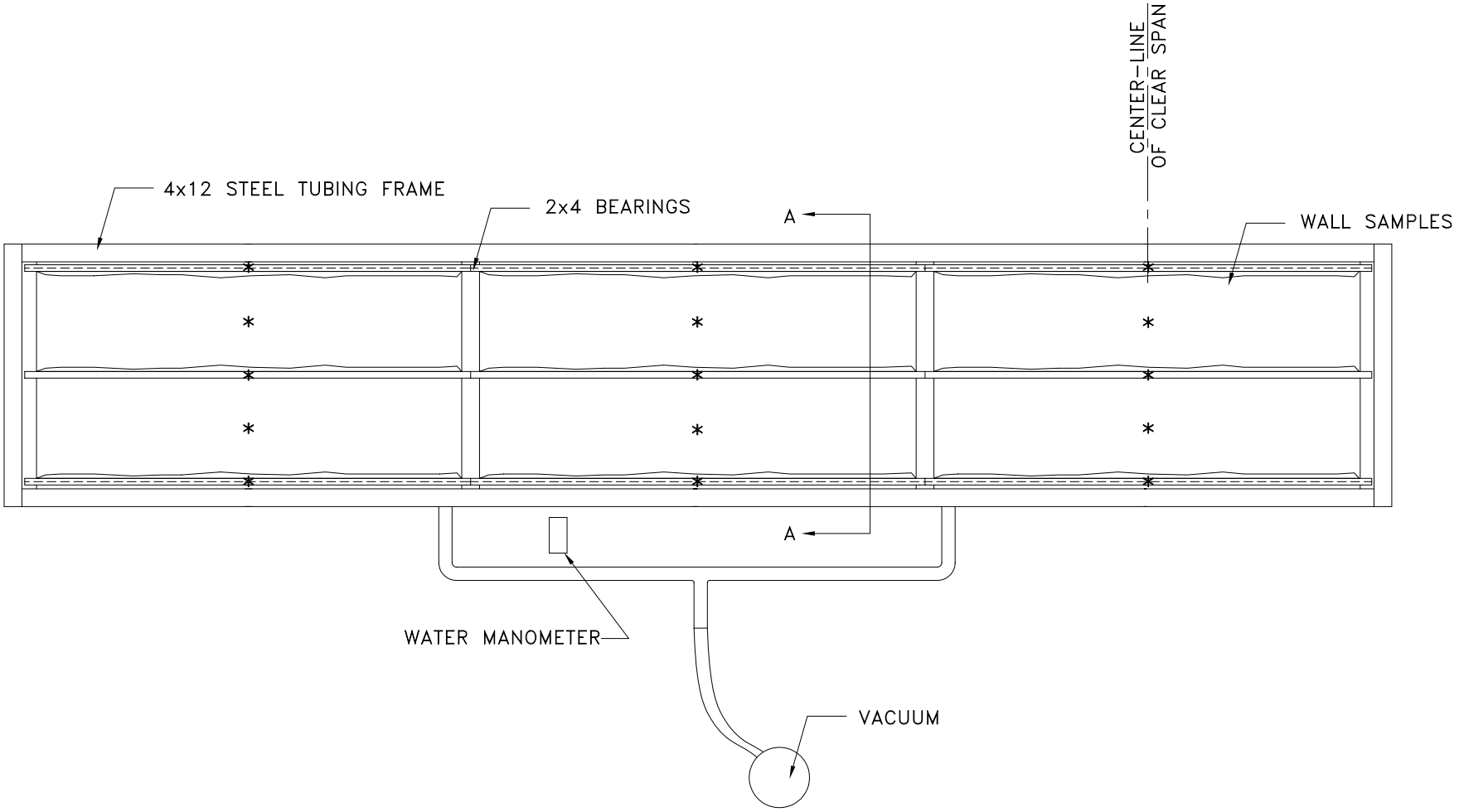


SECTION A-A

DWN. BY: EVERINGHAM DATE: 8/8/94 SCALE: NONE DRAWING NUMBER F362	 TITLE: TEST SET–UP	PE PROGRESSIVE ENGINEERING, INC. Testing Laboratory 58640 State Road 15 GOSHEN, INDIANA 46526 Telephone (219) 533–0337



NOTES:

✳ – DEFLECTION GAUGE LOCATIONS

DWN. BY: MORRIS DATE: 8/15/94 SCALE: 1/2"=12" DRAWING NUMBER F361	 TITLE: TEST SET-UP	PE PROGRESSIVE ENGINEERING, INC. Testing Laboratory 58640 State Road 15 GOSHEN, INDIANA 46526 Telephone (219) 533-0337

Test Set-up

Test No. 1 at Failure

Test No. 2 at Failure

Test No. 3 at Failure