



ALPHA SYSTEMS, INC.

Evaluation of Sheathing Materials - Racking Load
Alphaseal 5200 & USG Gypsum

10/1/98
Revised on 1/18/2001

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98-2966
(B)

WALL TEST - RACKING LOAD

1. TITLE

Evaluation of sheathing materials on a modified wood frame as described in ASTM E 72-80, Section 14 Racking Load.

2. TESTED FOR

Alpha Systems, Inc.
5120 Beck Drive
Elkhart, IN 46516

3. TESTING ORGANIZATION

Alpha Systems, Inc.
5120 Beck Drive
Elkhart, IN 46516

4. TESTING PERSONNEL

Dave Young of Alpha Systems, Inc.
Joe Merryman of Alpha Systems, Inc.
Test Engineer - Evor F. Johns, P.E.
Director of Testing - Greg A. Weeden
Technician - Jason Holdeman

5. TEST SPECIMEN CONSTRUCTION

A. Materials

- I. Studs - 2 x 3 stud grade SPF at 16" o.c.
- II. Plates - 1 x 3 ungraded SPF plates.
- III. 4 ft. x 8 ft. x 5/16" thick USG gypsum board.
(bundle labeled)
- IV. Alphaseal 5200 two-part urethane adhesive.

B. Fasteners

- I. Plate to studs with two (2) 7/16" c. x 2" lg. x 16 Ga. staples per stud end.

C. Construction Steps

- I. Two (2) pieces of gypsum were laid on a flat wall jig.
- II. The previously constructed framework was laid on the gypsum such that the center 2 x 3 stud was parallel with and directly over the gypsum seam.
- III. A 1/16" wood spacer was placed between the top plate and the gypsum at the center location and both ends. The wood spacers were approximately 3/4" x 1/2" and the measured thickness ranged between .062" to .065".
- IV. Four (4) clamps were used along each plate to pull the plates and gypsum tight to the wall jig. No direct attempt was made to gap the studs.
- V. The Alphaseal 5200 two-part urethane adhesive was applied by Dave Holdread of Alpha Systems, Inc. according to the process described in it's use and application procedure.
- VI. The average contact area of the Alphaseal 5200 on the side of the field studs was 3/8".
The average contact area of the Alphaseal 5200 on the side of the plates, center stud and outside studs was 1/2".
The average contact area of the Alphaseal 5200 on the gypsum for field studs was 3/4".
The average contact area of the Alphaseal 5200 on the gypsum for the plates, center studs and outside studs was 1".
- VII. The walls remained clamped in the jig for 5 minutes. After the 5 minutes, the clamps were taken off and the walls were raised up to the vertical position where they remained for a minimum of 24 hours until they were tested.

6. TEST SAMPLE SECUREMENT

A steel beam, with a steel plate welded to the ends, was screwed to the top plate using 2" lg. hex head screws. A t-shaped beam was fastened to the bottom plate using 2" hex head screws. The screws were used in a pattern of 6" - 6" - 4", with a stagger of 1". The bottom I-beam of the fixture has a 2" x 2" x 96" lg. steel angle welded to it. There are three (3) steel pegs 3/4" diameter welded the steel angle at center and a 4 1/2" in either direction. The bottom beam has three (3) 3/4" diameter holes that fit the pegs. C-clamps were used at each end of the bottom beam to restrict the wall from falling off the pegs. See attached drawings for further details.

7. **PROCEDURE**

A. Load was applied horizontally to the steel beam which was fastened to the top plate of the wall. Dial indicators were placed at the end of the top and bottom plates opposite the load side of the wall. A dial indicator was also placed on the load side of the wall at the bottom of the first stud. See attached drawing for details.

B. Loads in 400 pound increments, up to 2,400 pounds, were applied at 400 lbs./minute and released while taking load deflections and residual deflections. Load was then applied at 400 lbs./minute until a failure was reached.

8. **TEST RESULTS**

Test No. 1 = 5404 lbs.
Test No. 2 = 5438 lbs.
Test No. 3 = 6135 lbs.
Average = 5659 lbs.

Ultimate shear load

5659 lbs./8 ft. = 707.4 PLF

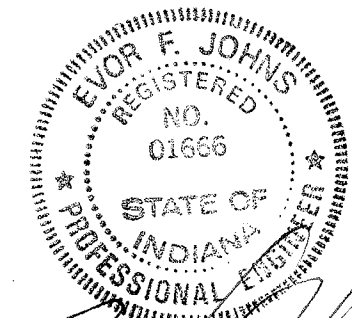
Allowable shear loads under the Manufactured Home Construction and Safety Standards.

707.4 PLF/2.5 safety factor = 283.0 PLF

9. **CONCLUSION**

Based on the data obtained from this test; a design shear, per the Manufactured Home Construction and Safety Standards, of 283.0 PLF can be obtained from a shear wall constructed as follows:

- A. 2 x 3 studs at 16" o.c. with 1 x 3 top and bottom plates as framing.
- B. 5/16" (or thicker) x 48" x 96" USG gypsum board with seams vertical.
- C. Alphaseal 5200 two-part urethane adhesive applied as shown on attached drawing.



Evor F. Johnson
10/31/98

PROGRESSIVE ENGINEERING, Inc.

WALL TEST -- RACKING LOAD

Average Moisture Content at Construction

Test No.1

9/30/1998

Studs - 13.4 %

Temperature 70 deg.F.

Plates - 9.3 %

Humidity 52%

USG board on ONE side

Time	Load lbs.	Indicator No.1		Indicator No.2		Indicator No.3		RESULTANT Deflection at indicator No.1
		reading	deflection	reading	deflection	reading	deflection	
10:15	0	.129	----	.300	----	.502	----	----
10:16	400	.143	.014	.304	.004	.501	.001	.009
10:17	0	.129	.000	.300	.000	.502	.000	.000
10:19	800	.198	.069	.312	.012	.490	.012	.045
10:20	0	.132	.003	.300	.000	.501	.001	.002
10:23	1200	.250	.121	.322	.022	.478	.024	.075
10:24	0	.134	.005	.300	.000	.499	.003	.002
10:28	1600	.291	.162	.328	.028	.468	.034	.100
10:29	0	.139	.010	.300	.000	.498	.004	.006
10:34	2000	.326	.197	.328	.028	.455	.047	.122
10:35	0	.145	.016	.300	.000	.498	.004	.012
10:41	2400	.349	.220	.330	.030	.442	.060	.130
10:42	0	.160	.031	.300	.000	.498	.004	.027

max. load reached 5404 Lbs.

Mode of Failure: Foam shear from bottom plate load side of center stud.

PROGRESSIVE ENGINEERING, Inc.

WALL TEST -- RACKING LOAD

Test No.2 Average Moisture Content at Construction

9/30/1998 Studs - 13.0 %

Temperature 70 deg.F. Plates - 8.0 %

Humidity 52% USG board on ONE side

Time	Load lbs.	Indicator No.1		Indicator No.2		Indicator No.3		RESULTANT Deflection at indicator No.1
		reading	deflection	reading	deflection	reading	deflection	
11:30	0	.140	----	.151	----	.651	----	----
11:31	400	.188	.048	.154	.003	.644	.007	.038
11:32	0	.141	.001	.151	.000	.651	.000	.001
11:34	800	.262	.122	.162	.011	.615	.036	.075
11:35	0	.143	.003	.151	.000	.651	.000	.003
11:38	1200	.305	.165	.163	.012	.604	.047	.106
11:39	0	.147	.007	.151	.000	.647	.004	.003
11:43	1600	.392	.252	.170	.019	.582	.069	.164
11:44	0	.157	.017	.152	.001	.643	.008	.008
11:49	2000	.431	.291	.162	.011	.565	.086	.194
11:50	0	.168	.028	.152	.001	.643	.008	.019
11:56	2400	.477	.337	.157	.006	.549	.102	.229
11:57	0	.174	.034	.152	.001	.641	.010	.023

max. load reached 5438 Lbs.

Mode of Failure: Foam shear from the top plate on the load side of the center stud, 60% wood and 40% paper

PROGRESSIVE ENGINEERING, Inc.

WALL TEST -- RACKING LOAD

Test No. 3 Average Moisture Content at Construction

10/1/1998

Studs - 12.6 %

Temperature 69 deg.F.

Plates - 9.5 %

Humidity 40%

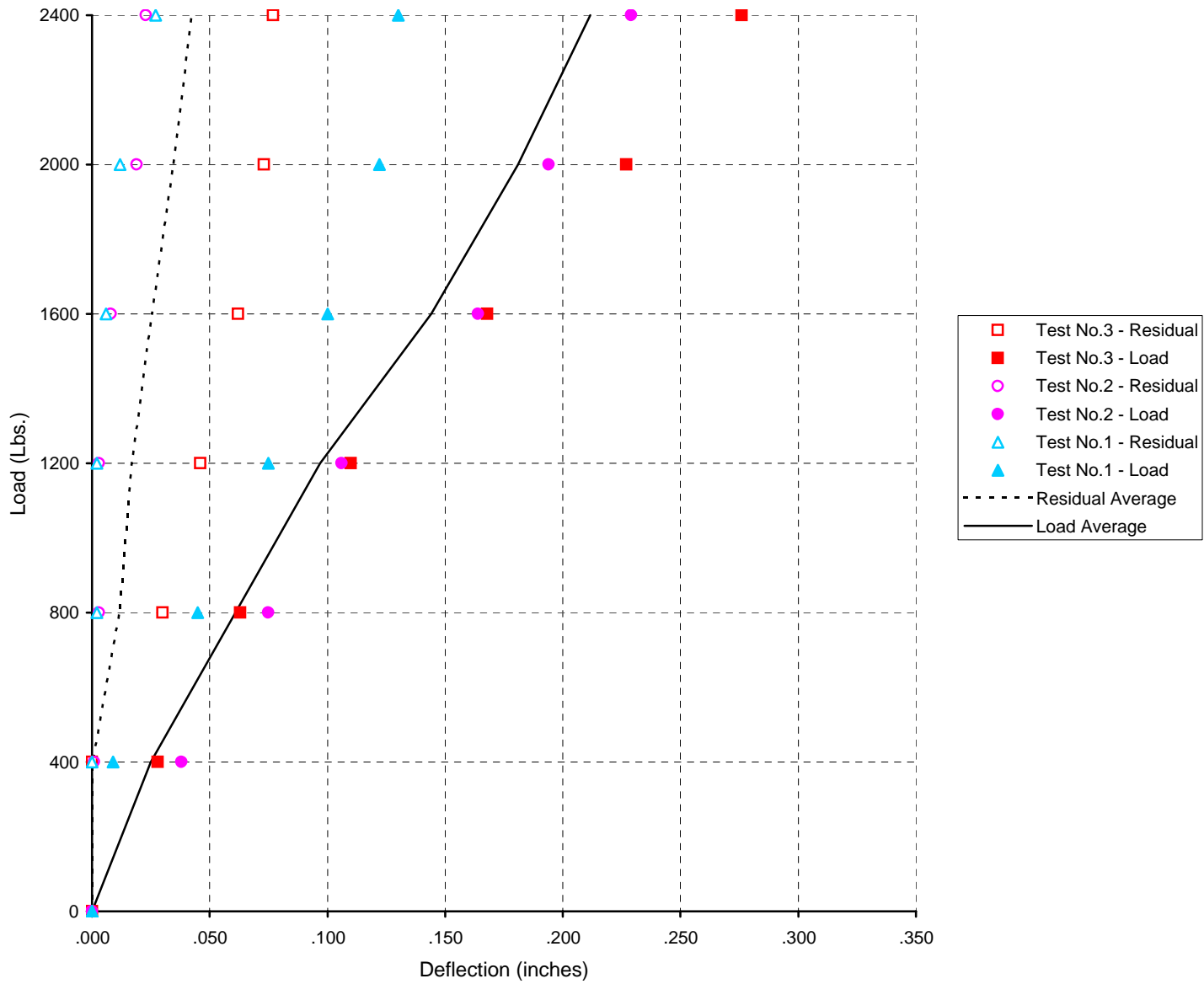
USG board on ONE side

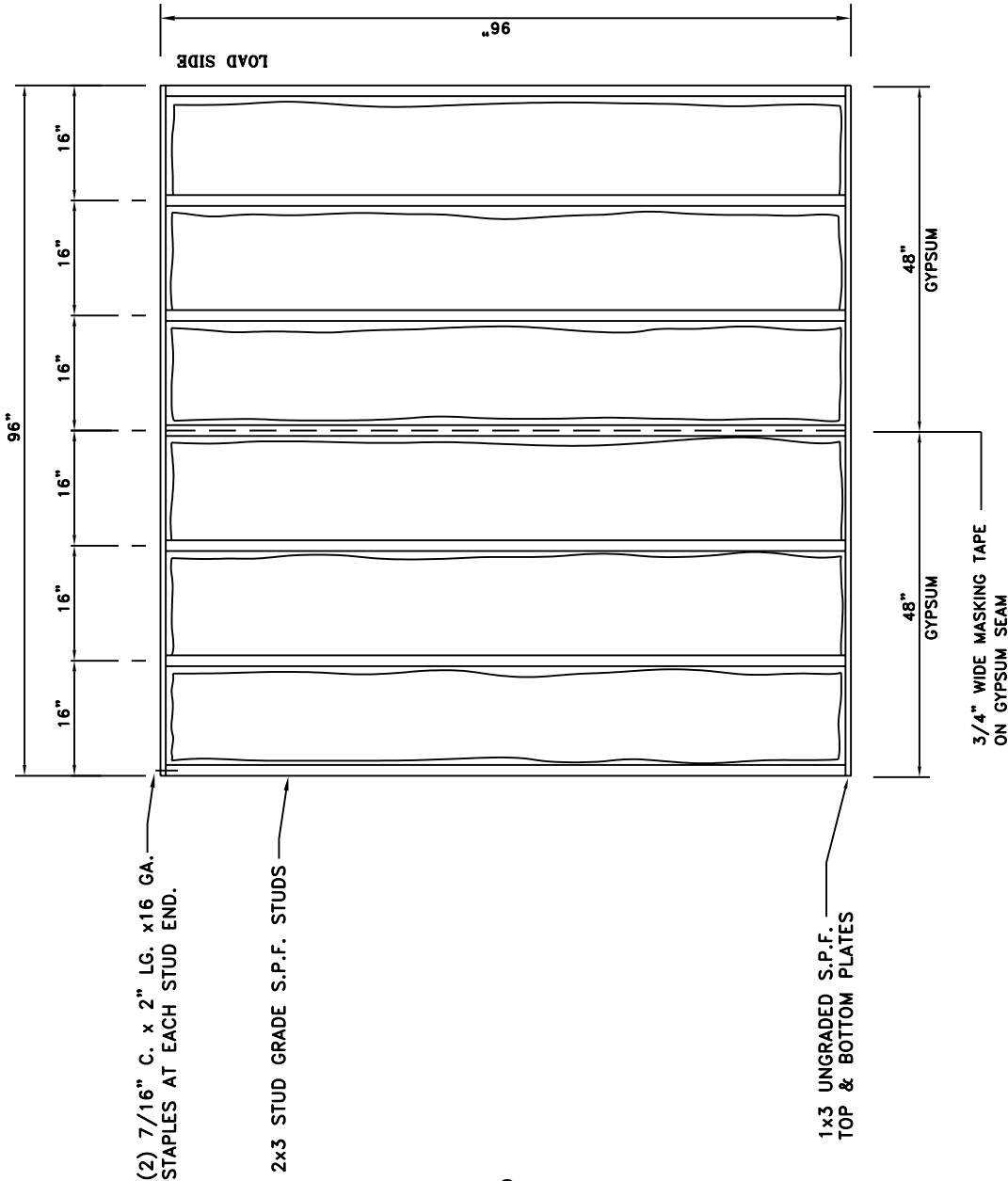
Time	Load lbs.	Indicator No.1		Indicator No.2		Indicator No.3		RESULTANT Deflection at indicator No.1
		reading	deflection	reading	deflection	reading	deflection	
8:45	0	.081	----	.448	----	.919	----	----
8:46	400	.110	.029	.449	.001	.919	.000	.028
8:47	0	.081	.000	.448	.000	.919	.000	.000
8:49	800	.155	.074	.445	-.003	.905	.014	.063
8:50	0	.114	.033	.449	.001	.917	.002	.030
8:53	1200	.221	.140	.443	-.005	.884	.035	.110
8:54	0	.130	.049	.449	.001	.917	.002	.046
8:58	1600	.294	.213	.443	-.005	.869	.050	.168
8:59	0	.145	.064	.449	.001	.918	.001	.062
9:04	2000	.362	.281	.441	-.007	.858	.061	.227
9:05	0	.156	.075	.449	.001	.918	.001	.073
9:11	2400	.422	.341	.443	-.005	.849	.070	.276
9:12	0	.161	.080	.449	.001	.917	.002	.077

max. load reached 6135 Lbs.

Mode of Failure: Foam shear from the top plate on the load side of the center stud

Single Sided Wall





TWO (2) PIECES OF 48"x96"x5/16" BLENDET
 GYPSUM PANELS FROM UNITED STATES GYPSUM
 CORP.-GYPSUM WAS FASTENED WITH ALPHASEAL
 5200 TWO-PART URETHANE ADHESIVE.

AVERAGE AMOUNT OF 5200 CONTACT AREA:
 ON THE STUDS = 1/2"
 ON THE PLATES = 1/2"
 ON THE GYPSUM = 3/4"

MEASURED GAP OF 0" TO 3/16"
 BETWEEN GYPSUM & STUDS

AVERAGE MEASURED GAP OF 1/16"
 BETWEEN GYPSUM & PLATES

THIS DRAWING IS A PART OF TEST REPORT NO. 98-2966

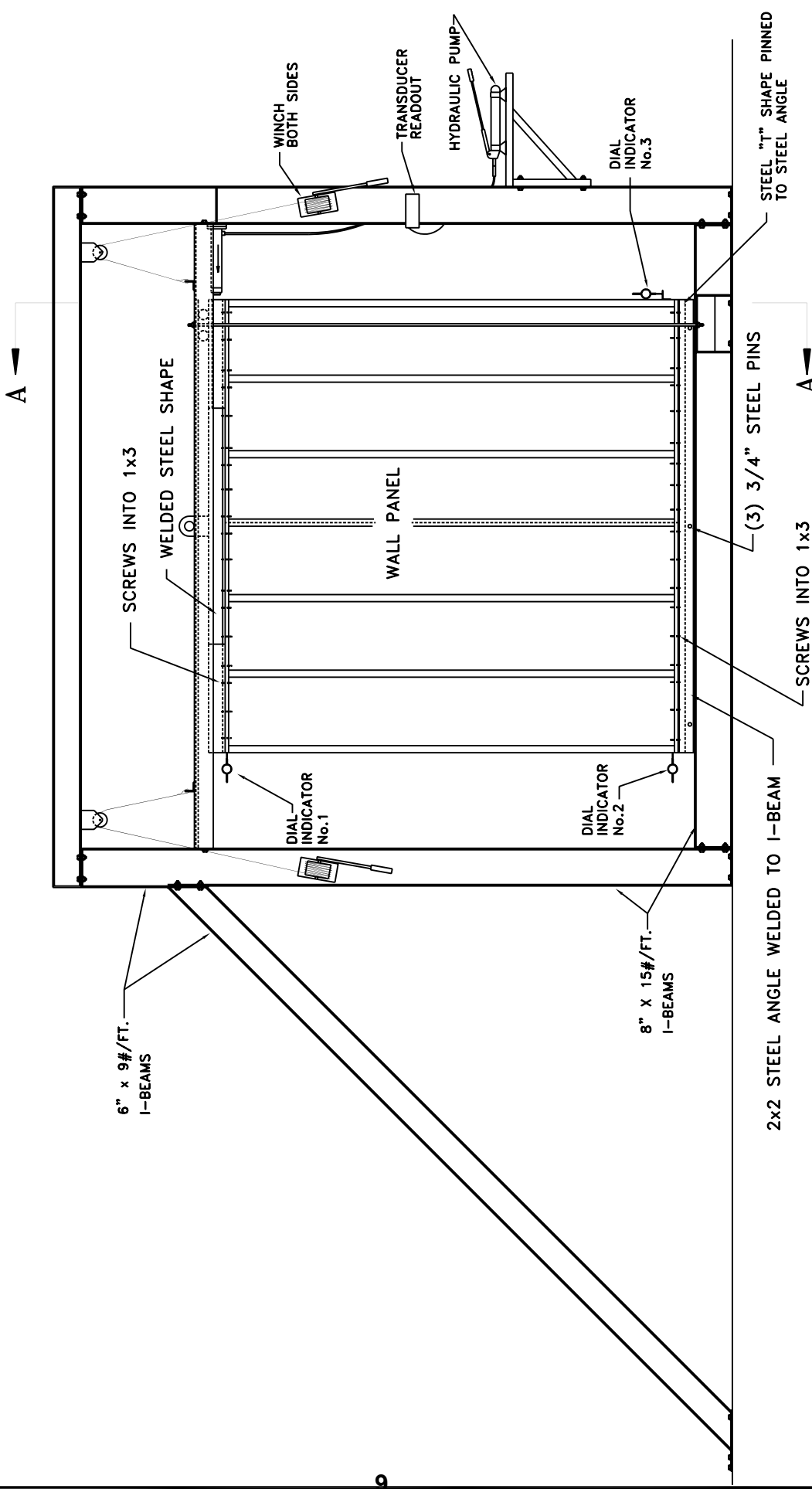
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PROGRESSIVE ENGINEERING, INC.
 TESTING LABORATORY

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

DWN. BY:	DATE	REVISION	CLIENT:
D. LEHMAN			ALPHA SYSTEMS
CHK. BY:			TITLE:
DATE:	10/2/98		WALL PANEL
SCALE:	3/4"=12"		
JOB NO.	98-2966		
DWG. NO.	B2		



DWN. BY: D. LEHMAN
 DATE: 10/2/98
 SCALE: NONE
 DRAWING NUMBER
F641

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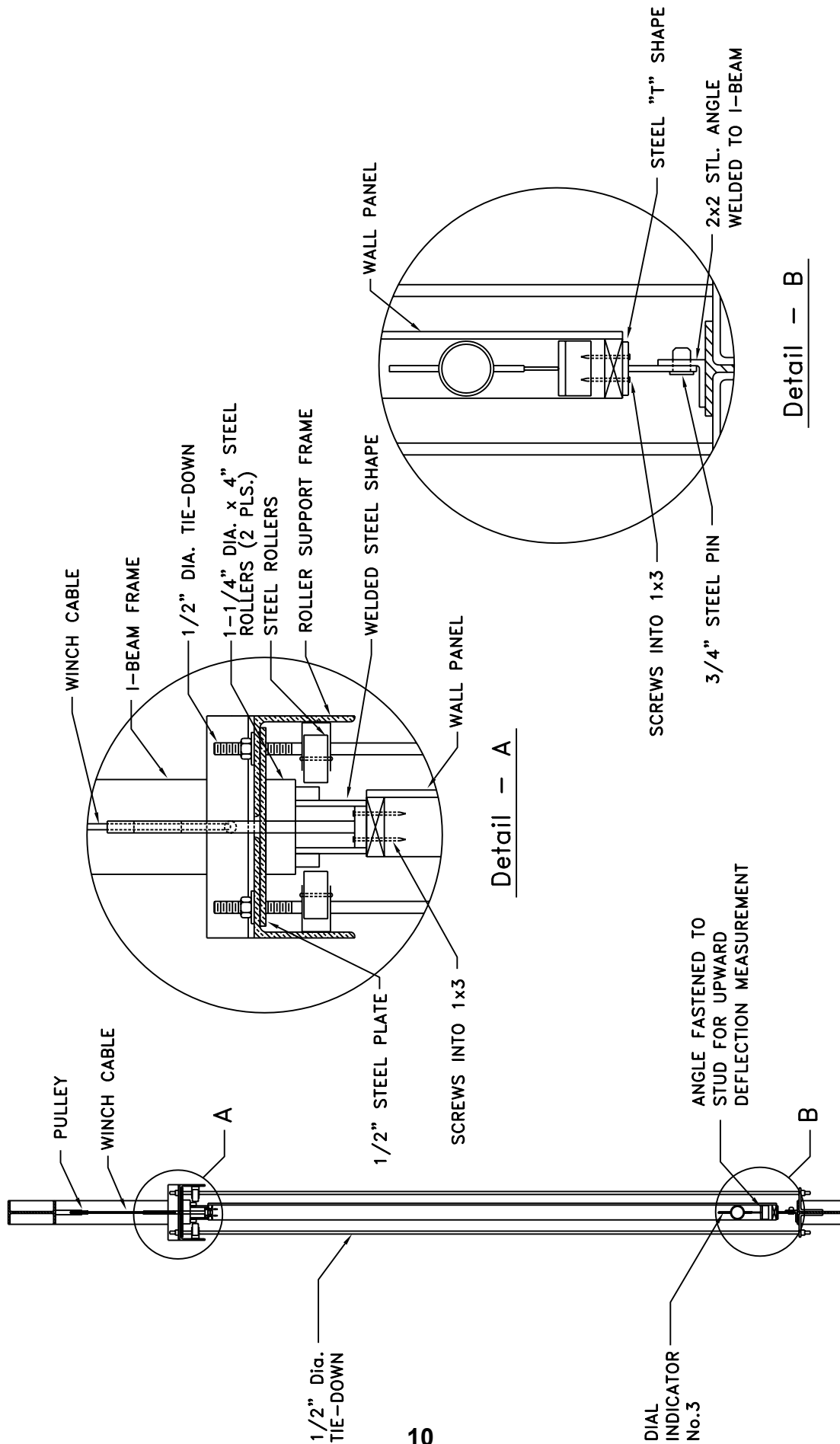


PROGRESSIVE ENGINEERING, INC.
 Testing Laboratory



59640 State Road 15
 GOSHEN, INDIANA 46526
 Telephone (219) 533-0337

TITLE: **TEST SET-UP**



SECTION A-A

OWN. BY: D. LEHMAN
 DATE: 10/2/98
 SCALE: 3/4" = 12"
 DRAWING NUMBER
 F642

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 Testing Laboratory



TITLE: TEST SET-UP

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Test Set-Up



Test No. 1 at Failed Area



Test Set-up



Test No. 2 at Failed Area



Test Set-Up



Test No. 3 at Failed Area