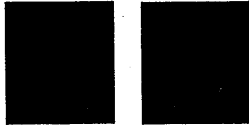


PE

PROGRESSIVE ENGINEERING, INC.
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ALPHA SYSTEMS, INC.

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

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

This test report contains fourteen (14) pages, including the cover sheet.
Any additions to, alterations of, or unauthorized use of excerpts from this
test are expressly forbidden.

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. Listed
by Progressive Engineering, Inc.

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 42½" 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

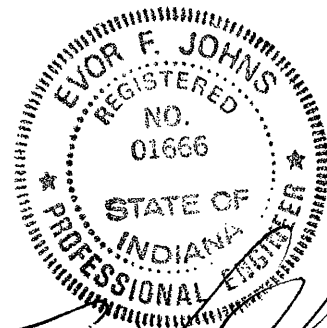
Allowable shear loads under the Manufactured Home Construction and Safety Standards.

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.



3
Evor F. Johns
10/13/98

PROGRESSIVE ENGINEERING, Inc.
WALL TEST -- RACKING LOAD

Average Moisture Content at Construction

Test No.1

Studs - 13.4 %

9/30/98

Plates - 9.3 %

Temperature 70 deg.F.

USG board on ONE side

Humidity 52%

| 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

Average Moisture Content at Construction

Test No.2

9/30/98

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 failure.

PROGRESSIVE ENGINEERING, Inc.

WALL TEST -- RACKING LOAD

Average Moisture Content at Construction

Test No. 3

10/1/1998

Studs - 12.6 %

Temperature 69 deg.F.

Plates - 9.5 %

Humidity 40%

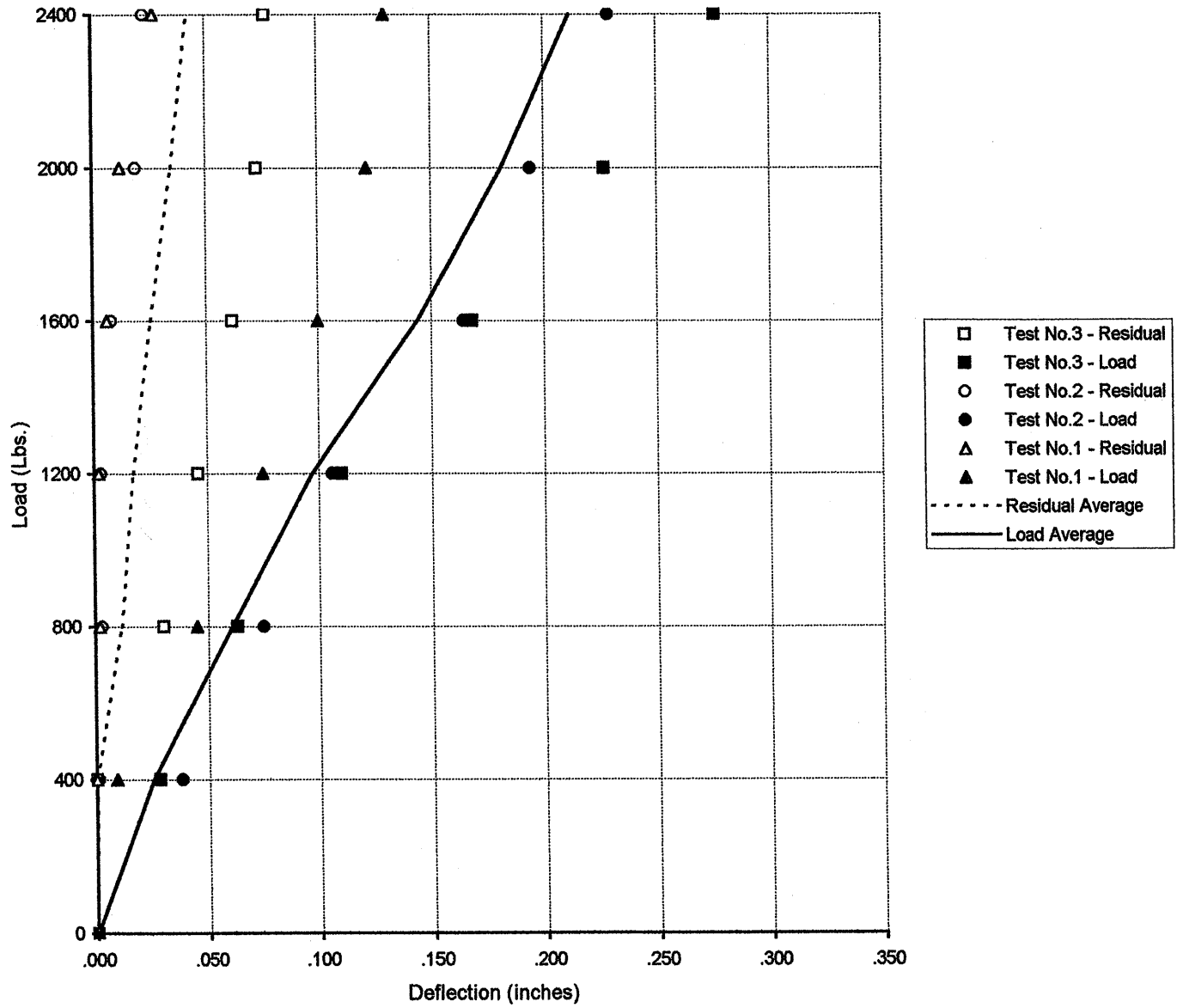
USG board on ONE side

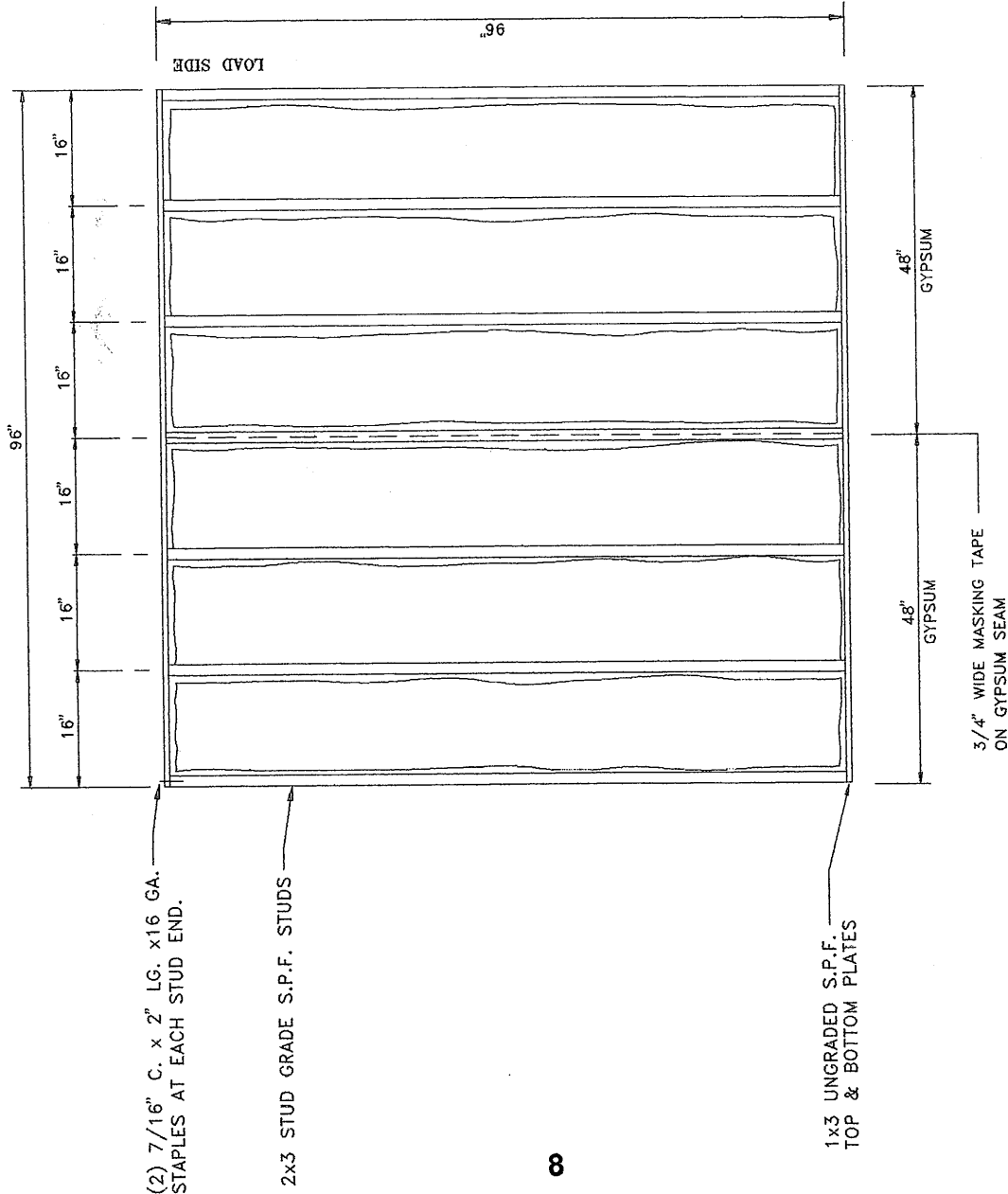
| Time | Load lbs. | Indicator No.1 | | Indicator No.2 | | Indicator No.3 | | RESULTANT Deflection at indicator No.1 |
|------|-----------|----------------|------------|----------------|------------|----------------|------------|--|
| | | reading | deflection | reading | deflection | reading | deflection | |
| 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





(2) 7/16" C. x 2" LG. x16 GA. STAPLES AT EACH STUD END.

2x3 STUD GRADE S.P.F. STUDS

1x3 UNGRADED S.P.F. TOP & BOTTOM PLATES

3/4" WIDE MASKING TAPE ON GYPSUM SEAM


TWO (2) PIECES OF 48" x96" x5/16" BLENDETIX 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"

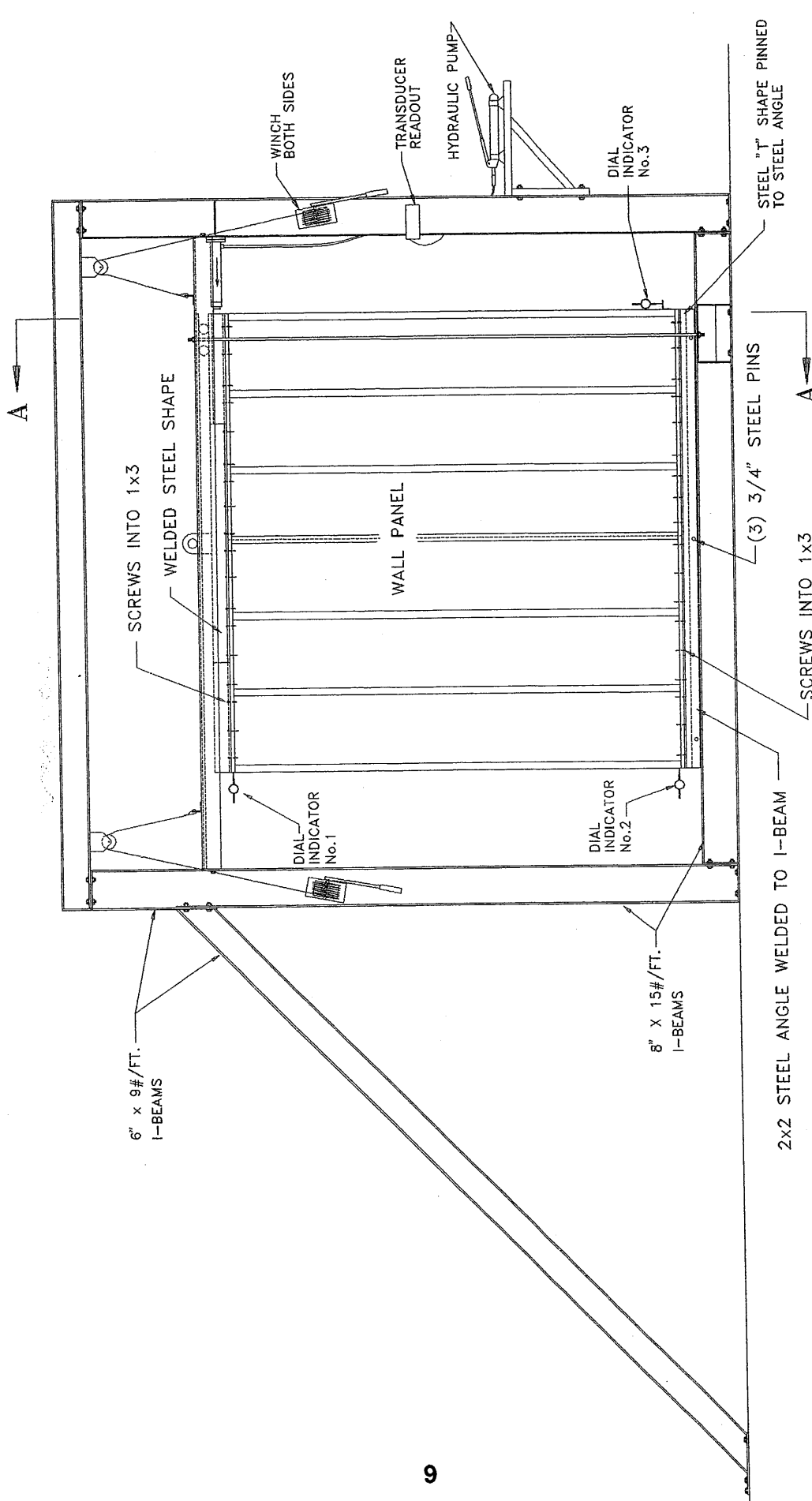
MEASURED GAP OF 0" TO 3/16" BETWEEN GYPSUM & STUDS

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

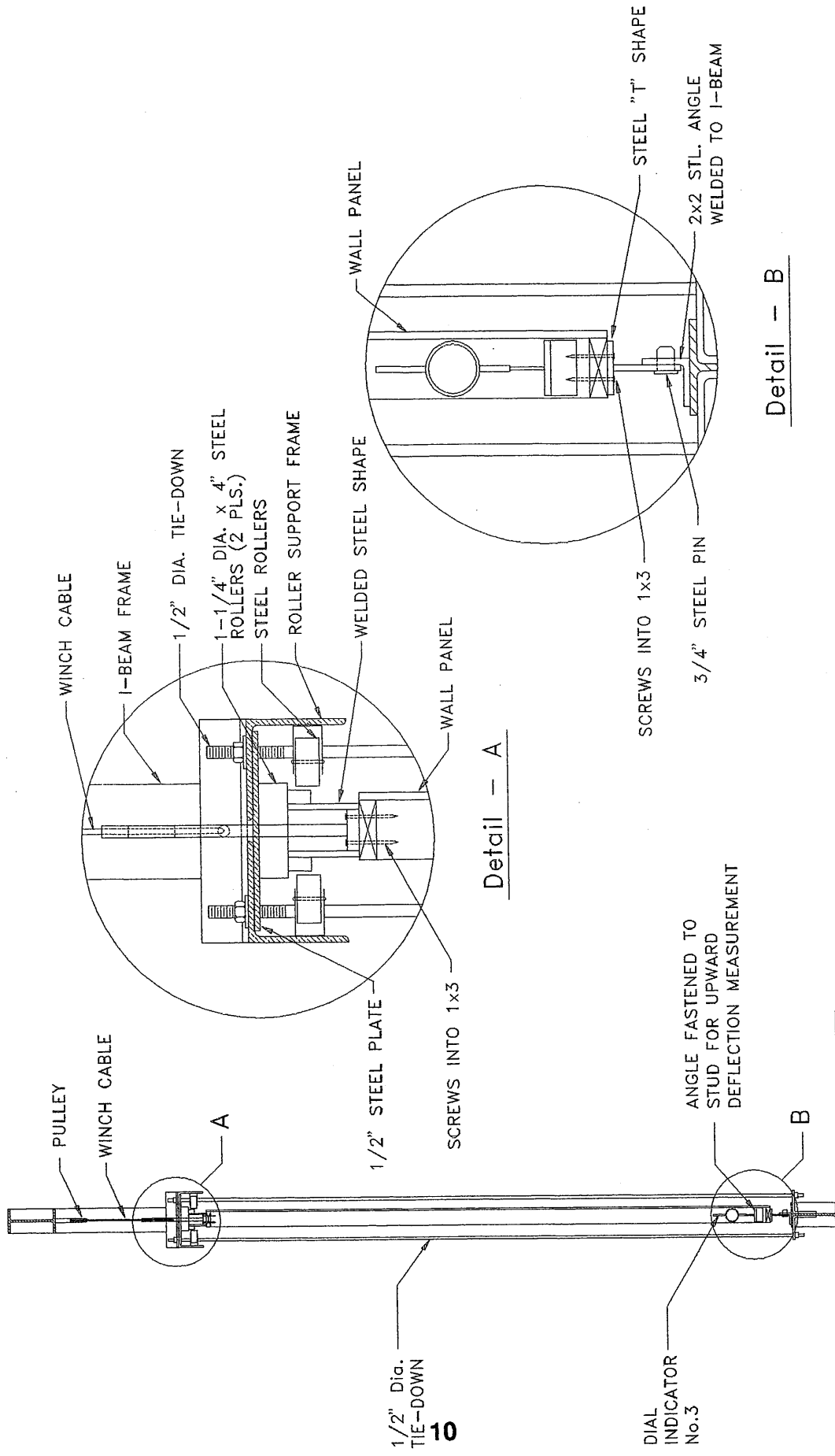
THIS DRAWING IS A PART OF TEST REPORT NO. 98-2966

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|--------------------|------------|------|----------|---------------------------------|--|--|
| DWN. BY: D. LEHMAN | | DATE | REVISION | CLIENT: ALPHA SYSTEMS |  PROGRESSIVE ENGINEERING, INC. TESTING LABORATORY | 68640 State Road 15 GOSHEN, INDIANA 46526 Telephone (219) 533-0337 |
| CHK. BY: | | | | | | |
| DATE: | 10/2/98 | | | TITLE: WALL PANEL | | |
| SCALE: | 3/4" = 12" | | | | | |
| JOB NO.: | 98-2966 | | | | | |
| DWG. NO.: | B2 | | | | | |

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| DWN. BY: D. LEHMAN DATE: 10/2/98 SCALE: NONE DRAWING NUMBER F641 | | | |
| TITLE TEST SET-UP | | | |



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