



**ALPHA SYSTEMS, INC.**

Evaluation of Sheathing Materials - Racking Load  
Alphaseal 5200 & Gold Bond Gypsum

10/1/98

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98-2966  
(C)

## 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 Gold Bond 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 7/16".  
The average contact area of the Alphaseal 5200 on the side of the plates, center stud and outside studs was 9/16".  
The average contact area of the Alphaseal 5200 on the gypsum for field studs was 5/8".  
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 = 5587 lbs.  
Test No. 2 = 5173 lbs.  
Test No. 3 = 5215 lbs.  
Average = 5325.0 lbs.

Ultimate shear load

5325.0 lbs./8 ft. = 656.6 PLF

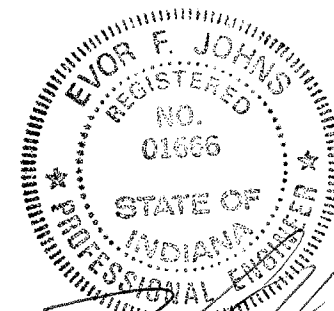
Allowable shear loads under the Manufactured Home Construction and Safety Standards.

656.6 PLF/2.5 safety factor = 266.3 PLF

**9. CONCLUSION**

Based on the data obtained from this test; a design shear, per the Manufactured Home Construction and Safety Standards, of 266.3 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" Gold Bond gypsum board with seams vertical.
- C. Alphaseal 5200 two-part urethane adhesive applied as shown on attached drawing.



*Evor F. Johns*  
10/13/98

**PROGRESSIVE ENGINEERING, Inc.**

**WALL TEST -- RACKING LOAD**

Test No.1 Average Moisture Content at Construction

9/30/1998 Studs - 14.1 %

Temperature 73 deg.F. Plates - 9.3 %

Humidity 52% GB 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 |  |
| 1:30 | 0         | .109           | ----       | .109           | ----       | .505           | ----       | ----                                   |
| 1:31 | 400       | .132           | .023       | .112           | .003       | .490           | .015       | .005                                   |
| 1:32 | 0         | .109           | .000       | .110           | .001       | .504           | .001       | -.002                                  |
| 1:34 | 800       | .221           | .112       | .111           | .002       | .446           | .059       | .051                                   |
| 1:35 | 0         | .115           | .006       | .110           | .001       | .503           | .002       | .003                                   |
| 1:38 | 1200      | .292           | .183       | .110           | .001       | .430           | .075       | .107                                   |
| 1:39 | 0         | .124           | .015       | .110           | .001       | .503           | .002       | .012                                   |
| 1:43 | 1600      | .361           | .252       | .112           | .003       | .415           | .090       | .159                                   |
| 1:44 | 0         | .133           | .024       | .110           | .001       | .499           | .006       | .017                                   |
| 1:49 | 2000      | .407           | .298       | .115           | .006       | .401           | .104       | .188                                   |
| 1:50 | 0         | .137           | .028       | .110           | .001       | .497           | .008       | .019                                   |
| 1:56 | 2400      | .443           | .334       | .115           | .006       | .386           | .119       | .209                                   |
| 1:57 | 0         | .143           | .034       | .110           | .001       | .496           | .009       | .024                                   |

max. load reached 5587 Lbs.

Mode of Failure: Foam shear from the gypsum near the bottom plate on the load side of center stud.

**PROGRESSIVE ENGINEERING, Inc.**

**WALL TEST -- RACKING LOAD**

Test No.2 Average Moisture Content at Construction

9/30/1998

Studs - 13.4 %

Temperature 72 deg.F.

Plates - 9.3 %

Humidity 52%

GB 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 |  |
| 2:30 | 0         | .092           | ----       | .160           | ----       | .465           | ----       | ----                                   |
| 2:31 | 400       | .126           | .034       | .161           | .001       | .462           | .003       | .030                                   |
| 2:32 | 0         | .095           | .003       | .160           | .000       | .463           | .002       | .001                                   |
| 2:34 | 800       | .192           | .100       | .159           | -.001      | .459           | .006       | .095                                   |
| 2:35 | 0         | .101           | .009       | .160           | .000       | .460           | .005       | .004                                   |
| 2:38 | 1200      | .272           | .180       | .163           | .003       | .410           | .055       | .122                                   |
| 2:39 | 0         | .106           | .014       | .158           | -.002      | .478           | .013       | .003                                   |
| 2:43 | 1600      | .307           | .215       | .165           | .005       | .402           | .063       | .147                                   |
| 2:44 | 0         | .110           | .018       | .158           | -.002      | .455           | .010       | .010                                   |
| 2:49 | 2000      | .341           | .249       | .168           | .008       | .392           | .073       | .168                                   |
| 2:50 | 0         | .119           | .027       | .158           | -.002      | .468           | .003       | .026                                   |
| 2:56 | 2400      | .370           | .278       | .178           | .018       | .376           | .089       | .171                                   |
| 2:57 | 0         | .126           | .034       | .159           | -.001      | .458           | .007       | .028                                   |

max. load reached 5173 Lbs.

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

**PROGRESSIVE ENGINEERING, Inc.**

**WALL TEST -- RACKING LOAD**

Test No. 3 Average Moisture Content at Construction

10/1/1998

Studs - 13.6 %

Temperature 69 deg.F.

Plates - 8.8 %

Humidity 42%

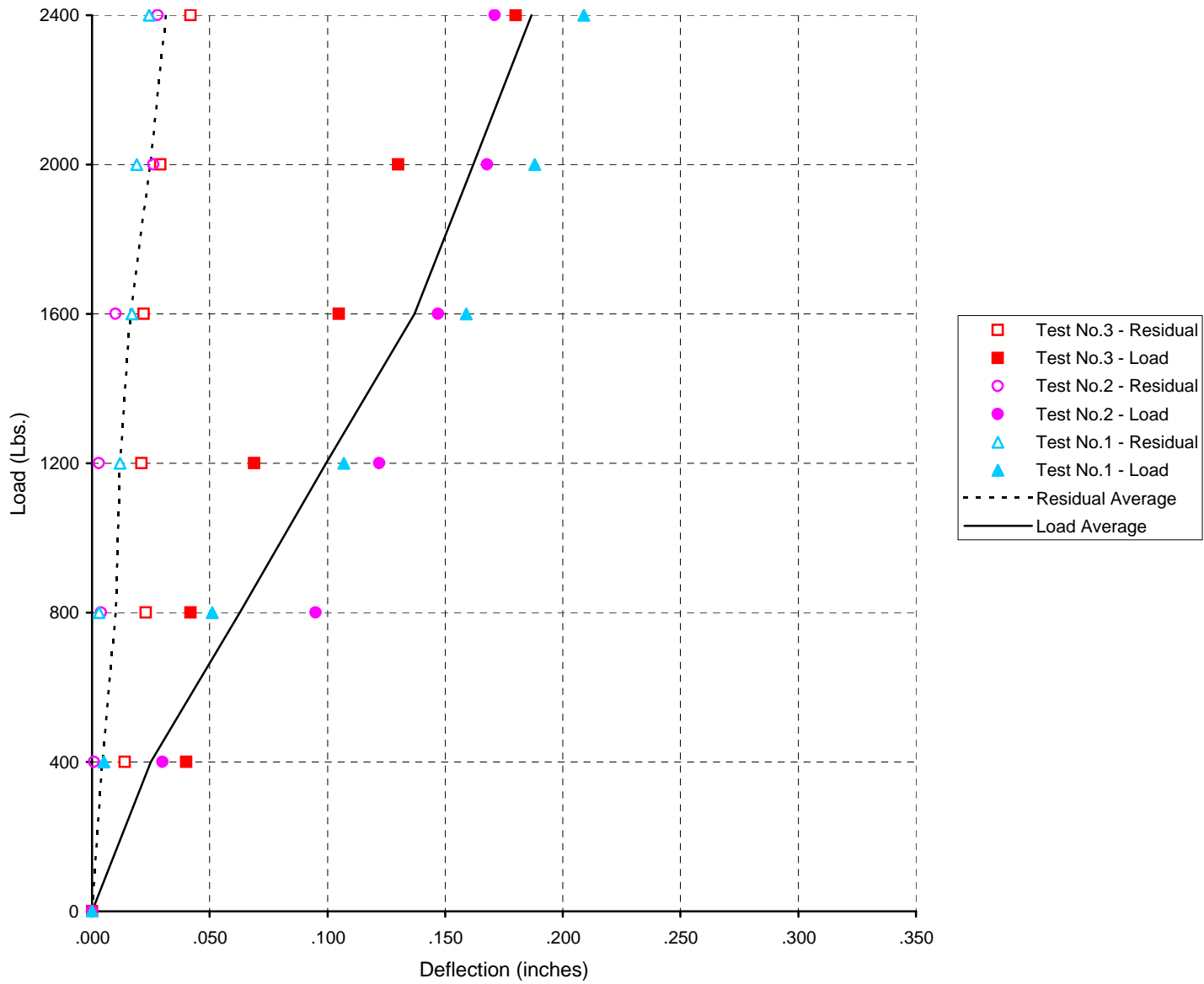
GB board on ONE side

| Time | Load lbs. | Indicator No.1 |            | Indicator No.2 |            | Indicator No.3 |            | RESULTANT Deflection at indicator No.1 |
|------|-----------|----------------|------------|----------------|------------|----------------|------------|--|
|      |           | reading        | deflection | reading        | deflection | reading        | deflection |  |
| 9:30 | 0         | .091           | ----       | .278           | ----       | .376           | ----       | ----                                   |
| 9:31 | 400       | .140           | .049       | .280           | .002       | .369           | .007       | .040                                   |
| 9:32 | 0         | .106           | .015       | .278           | .000       | .377           | .001       | .014                                   |
| 9:34 | 800       | .169           | .078       | .288           | .010       | .350           | .026       | .042                                   |
| 9:35 | 0         | .116           | .025       | .279           | .001       | .375           | .001       | .023                                   |
| 9:38 | 1200      | .223           | .132       | .292           | .014       | .327           | .049       | .069                                   |
| 9:39 | 0         | .117           | .026       | .280           | .002       | .373           | .003       | .021                                   |
| 9:43 | 1600      | .277           | .186       | .295           | .017       | .312           | .064       | .105                                   |
| 9:44 | 0         | .123           | .032       | .285           | .007       | .373           | .003       | .022                                   |
| 9:49 | 2000      | .328           | .237       | .300           | .022       | .291           | .085       | .130                                   |
| 9:50 | 0         | .136           | .045       | .290           | .012       | .372           | .004       | .029                                   |
| 9:56 | 2400      | .400           | .309       | .307           | .029       | .276           | .100       | .180                                   |
| 9:57 | 0         | .153           | .062       | .295           | .017       | .373           | .003       | .042                                   |

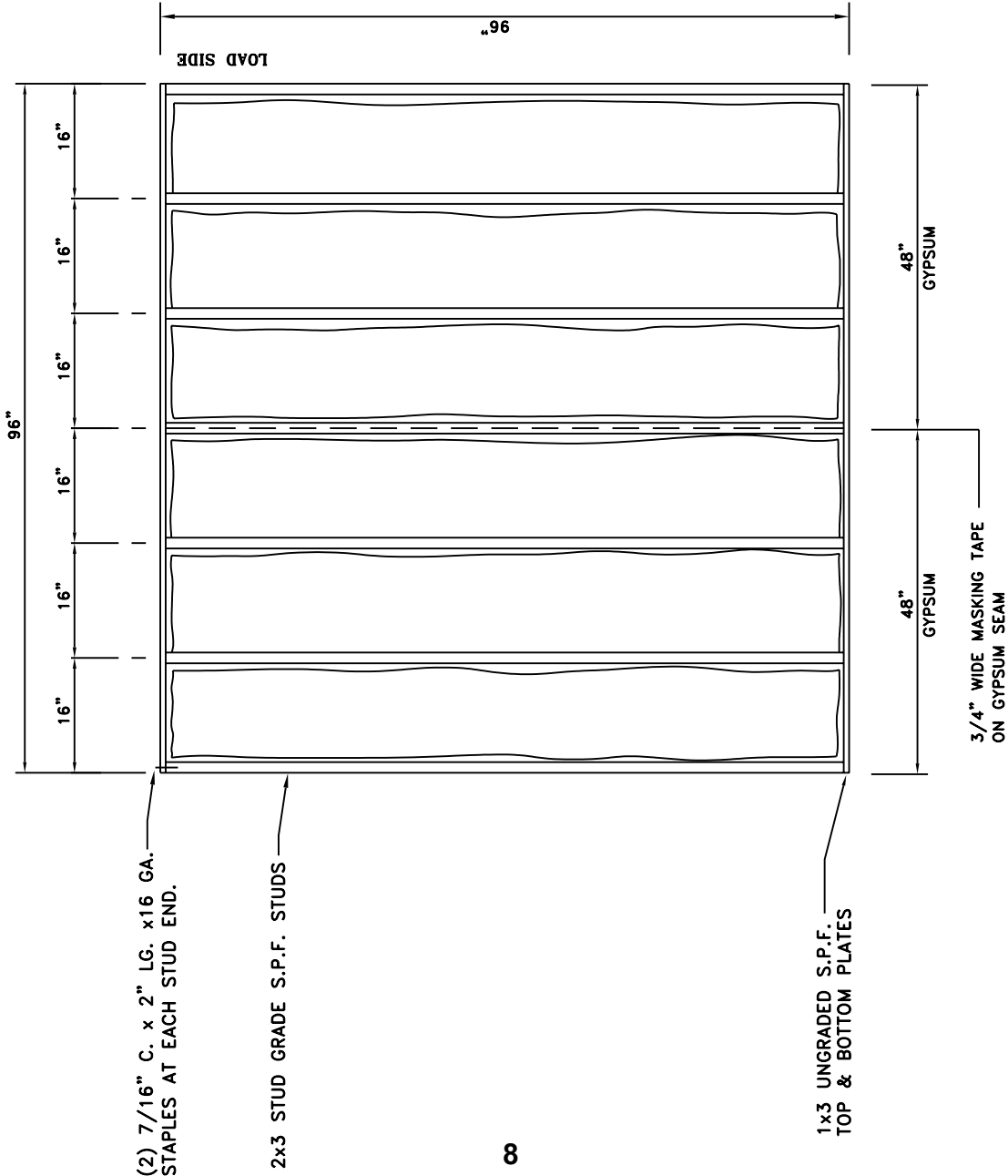
max. load reached 5215 Lbs.

Mode of Failure: Foam shear from the bottom plate on the non-load side of the center stud

Single Sided Wall







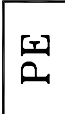
TWO (2) PIECES OF 48"x96"x5/16" GOLD BOND GYPSUM-GYPSUM WAS FASTENED WITH ALPHASEAL 5200 TWO-PART URETHANE ADHESIVE.

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



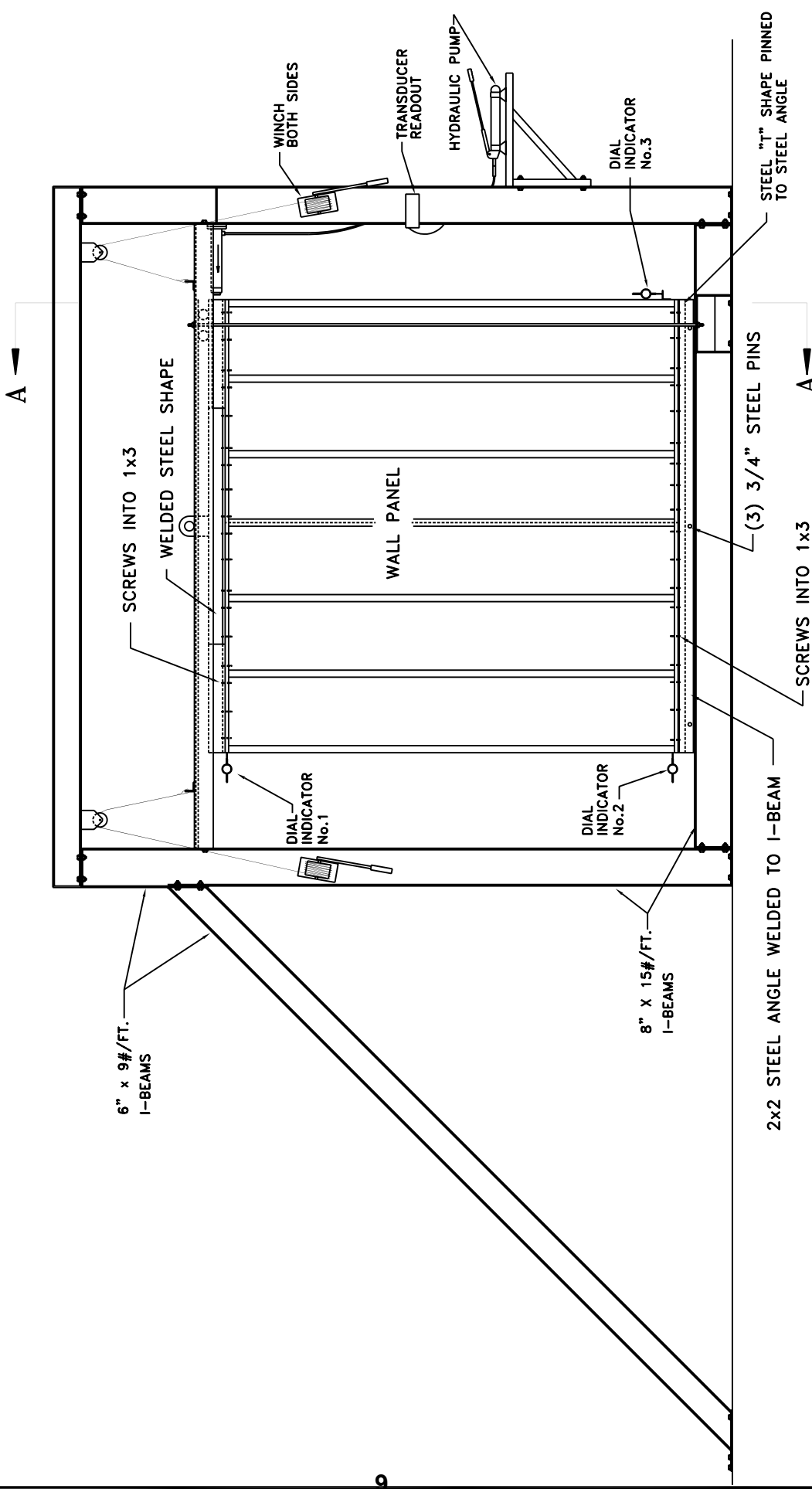
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CLIENT: ALPHA SYSTEMS  
 TITLE: WALL PANEL

| DWN. BY: | D. LEHMAN | DATE | REVISION |
|----------|-----------|------|----------|
| CHK. BY: |           |      |          |
| DATE:    | 10/2/98   |      |          |
| SCALE:   | 3/4"=12"  |      |          |
| JOB NO.  | 98-2966   |      |          |
| DWG. NO. | B3        |      |          |

PROGRESSIVE ENGINEERING, INC.  
 TESTING LABORATORY

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



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

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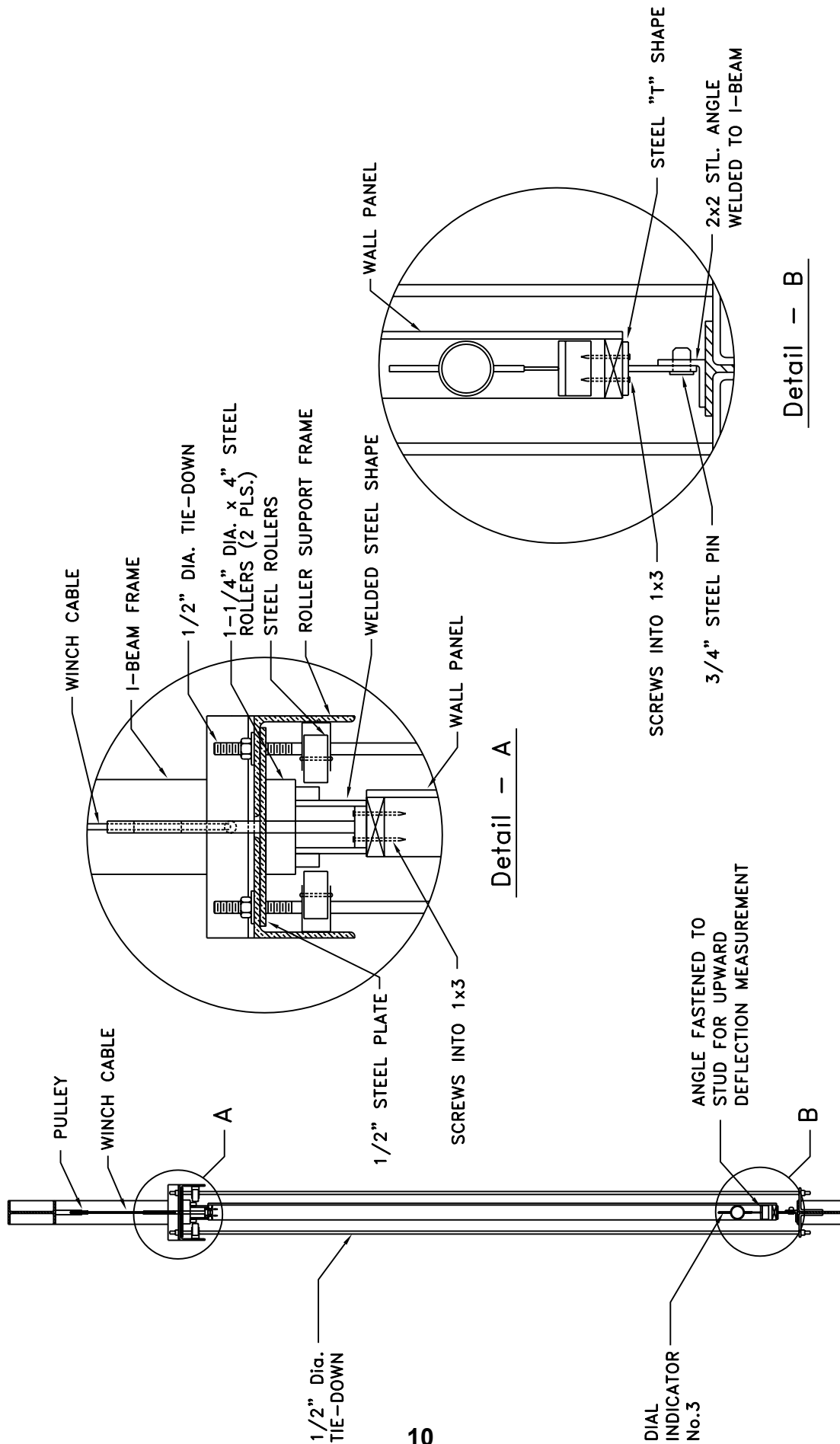


**PROGRESSIVE ENGINEERING, INC.**  
 Testing Laboratory



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



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 COSHEM, INDIANA 46536  
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TITLE:  
 TEST SET-UP



**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**