ALPHA SYSTEMS, INC.

Evaluation of Sheathing Materials - Racking Load
Alphaseal 5200 & Georgia-Pacific Gypsum

10/28/98

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

98-3236
(C)
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**

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

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.
   III. 4 ft. x 8 ft x 1/2" thick Georgia-Pacific gypsum board.
   IV. Alphaseal 5200 two-part urethane adhesive.
   V. Georgia-Pacific joint compound with fiberglass mesh.
   VI. Fiberglass mesh joint tape.
   VII. 3/4" masking tape.

   **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 studs were perpendicular to 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. A 3/4" piece of masking tape was used across the seam.

V. Three (3) 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.

VI. The Alphaseal 5200 urethane adhesive was applied by Dave Holdread of Alpha Systems, Inc. according to the process described in its use and application procedure.

VII. The average contact area of the Alphaseal 5200 on the side of the studs was 1/2".
The average contact area of the Alphaseal 5200 on the side of the plates was 1/2"
The average contact area of the Alphaseal 5200 on the gypsum was 7/8".

VIII. 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.

IX. A fiberglass mesh tape was applied to the horizontal seam. One coat of Georgia-Pacific joint compound was mixed and applied to the wall panel per the instructions on the bag.

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 to the steel angle at center and at 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 = 4250 lbs.
Test No. 2 = 4759 lbs.
Test No. 3 = 5162 lbs.
Average = 4723.6 lbs.

Ultimate shear load

4723.6 lbs./8 ft. = 590.4 PLF

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

590.4 PLF/2.5 safety factor = 236.1 PLF

9. CONCLUSION

Based on the data obtained from this test; a design shear, per the Manufactured Home Construction and Safety Standards, of 236.1 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. 1/2" (or thicker) x 48" x 96" Georgia-Pacific gypsum board with seams horizontal.
C. Alphaseal 5200 urethane adhesive applied as shown on attached drawing.
D. Fiberglass mesh tape and joint compound at gypsum seam.
PROGRESSIVE ENGINEERING, Inc.
WALL TEST -- RACKING LOAD

Test No.1
10/28/98
Temperature 69 deg.F.
Humidity 56%

Average Moisture Content at Construction
Studs - 9.4 %
Plates - 8.8 %

Georgia-Pacific board and Alphaseal 5200 on ONE side

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<th>Time</th>
<th>Load lbs.</th>
<th>Indicator No.1 reading</th>
<th>Indicator No.1 deflection</th>
<th>Indicator No.2 reading</th>
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max. load reached 4250 Lbs.

Mode of Failure: Gypsum paper let go from core.
Test No.2

10/28/98

Temperature 69 deg.F.

Humidity 60%

Average Moisture Content at Construction

Studs - 11.7 %

Plates - 8.5 %

Georgia-Pacific board and Alphaseal 5200 on ONE

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<th>Time</th>
<th>Load lbs.</th>
<th>Indicator No.1 reading</th>
<th>Indicator No.1 deflection</th>
<th>Indicator No.2 reading</th>
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max. load reached 4759 Lbs.

Mode of Failure: Gypsum paper let go from core.
Test No. 3

10/28/98

Temperature 68 deg.F.

Humidity 62%

Average Moisture Content at Construction

Studs - 11.7 %

Plates - 9.0 %

Georgia-Pacific board and Alphaseal 5200 on ONE side

<table>
<thead>
<tr>
<th>Time</th>
<th>Load lbs</th>
<th>Indicator No.1 reading</th>
<th>Indicator No.1 deflection</th>
<th>Indicator No.2 reading</th>
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max. load reached 5162 Lbs.

Mode of Failure: Gypsum paper let go from core.
Single Sided Wall using Georgia-Pacific

Load (Lbs.) vs. Deflection (inches)

- 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
- Load Average

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

2x3 STUD GRADE S.P.F. STUDS

GEORGIA PACIFIC SANDABLE 90 SETTING COMPOUNDED WITH FIBERGLASS MESH • JOINT ON FRONT SIDE OF WALL.

3/4" MASKING TAPE • GYPSUM SEAM ON BACK SIDE OF WALL.

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

TWO (2) PIECES OF 48"x96"x1/2" GEORGIA—PACIFIC GYPSUM BOARD FASTENED WITH ALPHASEAL 5200 TWO PART URETHANE ADHESIVE.

AMOUNT OF ALPHASEAL 5200 CONTACT AREA:
ON THE STUDS = 1/2"
ON THE PLATES = 1/2"
ON THE GYPSUM = 7/8"

AVERAGE MEASURED GAP OF 1/16" BETWEEN GYPSUM & PLATES
Test Set-up

Test No. 2 at Failed Area
Test Set-up

Test No. 3 at Failed Area