ALPHA SYSTEMS

Ceiling Dead Load Tests
Using 5/8" USG Sheetrock Firecode Core Type X

3/1/2002

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.

2002-358

(B)
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 Dr  
   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  
   Laboratory Manager - Jason R. Holdeman  
   Technician - Rodd Lehman  
   Technician - Lonnie Camp  
   Technician - Ben Kasa

6. **TEST SPECIMEN**
   
   A. Materials
      
      I. Gypsum - 48" x 96" x 5/8" USG Sheetrock Firecode Core Type X Panel
      
      II. Joist - 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 flat.
      
      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. #8 washer head screws, 1-1/2" lg. were used along each 2 x 6, at a spacing of 12" o.c., to achieve a 0" gap.
III. The average bead size of the Alphaseal 5200 on the wood was 1/2", using a stitch pattern.

IV. The average bead size of the Alphaseal 5200 on the gypsum was 7/8", using a stitch pattern.

V. The samples remained flat for a minimum of 24 hours until they were tested. The temporary fasteners were removed prior to testing.

7. 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 to 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 = 30.1 PSF
Test No. 2 = 30.1 PSF
Test No. 3 = 35.3 PSF

Average = 31.8 PSF

Allowable load under the Manufactured Home Construction and Safety Standards

31.8 / 2.5 safety factor = 12.7 PSF
9. CONCLUSION

Based on the data obtained from this test; a ceiling dead load of 12.7 PSF can be obtained from a ceiling constructed as follows:

A. 5/8" USG Sheetrock Firecode Core Type X brand gypsum. Gypsum was applied with the 8' edge parallel to the 2 x 6 framing.

B. Alpha Systems Alphaseal 5200 two-part urethane adhesive. (stitch pattern)

C. A gap of 0" between joist or truss and gypsum was used in this test. Zero gap is considered worst case.
**CEILING DEAD LOAD TEST**

**Gap Between Wood and Gypsum:** Zero

**Gypsum Brand Used:** USG Sheetrock Firecode Core Type X Gyp. Wallboard

**Gypsum Thickness:** 5/8"

**Truss Spacing:** 2' o.c.

**Test Sample Size:** 49-1/2"x98"

**Gypsum Clear Span:** 96"

**Temperature:** 71 degree F.

**Humidity:** 20%

**Date:** 3/1/2002

**Test No. 1**

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<th>Indicator No.2</th>
<th>Indicator No.3</th>
<th>Indicator No.4</th>
<th>Indicator No.5</th>
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**Ultimate Load:** 30.1 PSF

**Failure:** Gypsum core failure truss #3
## CEILING DEAD LOAD TEST

**Gap Between Wood and Gypsum:** Zero

**Gypsum Brand Used:** USG Sheetrock Firecode Core Type X Gyp. Wallboard

**Test Sample Size:** 49-1/2"x98"

**Gypsum Thickness:** 5/8"

**Truss Spacing:** 2’ o.c.

**Temperature:** 71 degree F.

**Humidity:** 20%

**Date:** 3/1/2002

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**Ultimate Load:** 30.1 PSF

**Failure:** Paper shear along center truss.
## CEILING DEAD LOAD TEST

**Gap Between Wood and Gypsum:** Zero  
**Gypsum Brand Used:** USG Sheetrock Firecode Core Type X Gyp. Wallboard  
**Test Sample Size:** 49-1/2"x98"  
**Gypsum Thickness:** 5/8"  
**Truss Spacing:** 2' o.c.  
**Temperature:** 71 degree F.  
**Date:** 3/1/2002  
**Humidity:** 20%

### Test No. 3

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**Ultimate Load:** 35.3 PSF  
**Failure:** Gypsum core along truss #3 at each adhesive location
ALPHASEAL S200 TWO-PART URETHANE ADHESIVE IN A "STITCH PATTERN" BEAD WIDTH WAS 7/8".

48" x 96" x 5/8" USG SHEETROCK FIRECODE CORE TYPE X GYPSUM WALLBOARD

2 x 6 #2 GRADE S.P.F.

'O' GAP BETWEEN GYPSUM & 2 x 6

8

96" 98"

1/2"

12"

12"

6"

1/2"

1"

49-1/2"

12"

12"

12"

12"

NF

NF

NF

NF

1/2"
Test Set-Up

Test # 1 at Failure

Alpha Systems
3/1/02
Cailing Dead Load Test #1
5/8" USG Gypsum
2.45 P
Test #2 at Failure

Alpha Systems
3/1/02
Ceiling Dead Load Test #2
5/8” USG Gypsum
2:45P

Test #3 at Failure

Alpha Systems
3/1/02
Ceiling Dead Load Test #3
5/8” USG Gypsum
2:45P