



**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

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Average = 31.8 PSF

Allowable load under the Manufactured Home Construction and Safety Standards

$31.8 / 2.5 \text{ safety factor} = 12.7 \text{ PSF}$

## 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.

A circular professional engineer seal for Evor F. Johns, Registered Professional Engineer, State of Indiana, No. 01656. The seal is stamped over a handwritten signature and the date 3/7/02.

**PROGRESSIVE ENGINEERING, Inc.**

**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" Gypsum Clear Span: 96"  
 Truss Spacing: 2' o.c. Temperature: 71 degree F.  
 Date: 3/1/2002 Humidity: 20%

**Test No. 1**

| Time | Load Increments | TRUSS                  |       | GYPSUM                 |       | TRUSS                  |       | GYPSUM                 |       | TRUSS                  |       | INDICATOR No. 2 RESULTANT DEFL. |                                | INDICATOR No. 4 RESULTANT DEFL. |  |
|------|-----------------|------------------------|-------|------------------------|-------|------------------------|-------|------------------------|-------|------------------------|-------|---------------------------------|--------------------------------|---------------------------------|--|
|      |                 | Indicator No.1 Reading | Defl. | Indicator No.2 Reading | Defl. | Indicator No.3 Reading | Defl. | Indicator No.4 Reading | Defl. | Indicator No.5 Reading | Defl. | Indicator No.2 RESULTANT DEFL.  | Indicator No.4 RESULTANT DEFL. |                                 |  |
| 2:45 | No Load         | 1.820                  | ----  | 1.846                  | ----  | 1.904                  | ----  | 1.922                  | ----  | 1.881                  | ----  | ----                            | ----                           |                                 |  |
| 2:50 | 2 PSF           | 1.812                  | .008  | 1.833                  | .013  | 1.892                  | .012  | 1.909                  | .013  | 1.873                  | .008  | .003                            | .003                           |                                 |  |
| 2:55 | No Load         | 1.819                  | .001  | 1.845                  | .001  | 1.903                  | .001  | 1.921                  | .001  | 1.880                  | .001  | .000                            | .000                           |                                 |  |
| 3:00 | 4 PSF           | 1.801                  | .019  | 1.816                  | .030  | 1.873                  | .031  | 1.888                  | .034  | 1.859                  | .022  | .005                            | .008                           |                                 |  |
| 3:05 | No Load         | 1.817                  | .003  | 1.843                  | .003  | 1.902                  | .002  | 1.919                  | .003  | 1.879                  | .002  | .001                            | .001                           |                                 |  |
| 3:10 | 6 PSF           | 1.795                  | .025  | 1.803                  | .043  | 1.861                  | .043  | 1.873                  | .049  | 1.850                  | .031  | .009                            | .012                           |                                 |  |
| 3:15 | No Load         | 1.816                  | .004  | 1.842                  | .004  | 1.900                  | .004  | 1.918                  | .004  | 1.877                  | .004  | .000                            | .000                           |                                 |  |
| 3:20 | 8 PSF           | 1.788                  | .032  | 1.790                  | .056  | 1.847                  | .057  | 1.858                  | .064  | 1.841                  | .040  | .012                            | .015                           |                                 |  |
| 3:25 | No Load         | 1.814                  | .006  | 1.840                  | .006  | 1.899                  | .005  | 1.917                  | .005  | 1.877                  | .004  | .001                            | .000                           |                                 |  |
| 3:30 | 10 PSF          | 1.779                  | .041  | 1.769                  | .077  | 1.837                  | .067  | 1.834                  | .088  | 1.828                  | .053  | .023                            | .028                           |                                 |  |
| 3:35 | No Load         | 1.812                  | .008  | 1.837                  | .009  | 1.894                  | .010  | 1.911                  | .011  | 1.872                  | .009  | .000                            | .001                           |                                 |  |
| 3:40 | 12 PSF          | 1.770                  | .050  | 1.747                  | .099  | 1.803                  | .101  | 1.809                  | .113  | 1.818                  | .063  | .024                            | .031                           |                                 |  |
| 3:45 | No Load         | 1.809                  | .011  | 1.831                  | .015  | 1.887                  | .017  | 1.903                  | .019  | 1.871                  | .010  | .001                            | .005                           |                                 |  |
| 3:50 | 14 PSF          | 1.763                  | .057  | 1.731                  | .115  | 1.786                  | .118  | 1.791                  | .131  | 1.812                  | .069  | .028                            | .038                           |                                 |  |
| 3:55 | No Load         | 1.809                  | .011  | 1.829                  | .017  | 1.884                  | .020  | 1.901                  | .021  | 1.871                  | .010  | .002                            | .006                           |                                 |  |

Ultimate Load: 30.1 PSF

Failure: Gypsum core failure truss #3

**PROGRESSIVE ENGINEERING, Inc.**

**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.  
 Date: 3/1/2002  
 Gypsum Clear Span: 96"  
 Temperature: 71 degree F.  
 Humidity: 20%

**Test No. 2**

| Time | Load Increments | TRUSS                  |                      |  | GYPSUM                 |                      |  | TRUSS                  |                      |  | GYPSUM                 |                      |  | TRUSS                  |                      |      | INDICATOR No. 2 RESULTANT DEFL. | INDICATOR No. 4 RESULTANT DEFL. |
|------|-----------------|------------------------|----------------------|--|------------------------|----------------------|--|------------------------|----------------------|--|------------------------|----------------------|--|------------------------|----------------------|------|---------------------------------|---------------------------------|
|      |                 | Indicator No.1 Reading | Indicator No.1 Defl. |  | Indicator No.2 Reading | Indicator No.2 Defl. |  | Indicator No.3 Reading | Indicator No.3 Defl. |  | Indicator No.4 Reading | Indicator No.4 Defl. |  | Indicator No.5 Reading | Indicator No.5 Defl. |      |                                 |                                 |
| 2:45 | No Load         | 1.913                  | ---                  |  | 1.833                  | ---                  |  | 1.900                  | ---                  |  | 1.866                  | ---                  |  | 1.897                  | ---                  | ---  | ---                             |                                 |
| 2:50 | 2 PSF           | 1.904                  | .009                 |  | 1.820                  | .013                 |  | 1.890                  | .010                 |  | 1.857                  | .009                 |  | 1.893                  | .004                 | .003 | .002                            |                                 |
| 2:55 | No Load         | 1.913                  | .000                 |  | 1.833                  | .000                 |  | 1.900                  | .000                 |  | 1.866                  | .000                 |  | 1.897                  | .000                 | .000 | .000                            |                                 |
| 3:00 | 4 PSF           | 1.891                  | .022                 |  | 1.802                  | .031                 |  | 1.874                  | .026                 |  | 1.839                  | .027                 |  | 1.881                  | .016                 | .007 | .006                            |                                 |
| 3:05 | No Load         | 1.911                  | .002                 |  | 1.830                  | .003                 |  | 1.898                  | .002                 |  | 1.864                  | .002                 |  | 1.896                  | .001                 | .001 | .000                            |                                 |
| 3:10 | 6 PSF           | 1.883                  | .030                 |  | 1.789                  | .044                 |  | 1.863                  | .037                 |  | 1.826                  | .040                 |  | 1.873                  | .024                 | .011 | .010                            |                                 |
| 3:15 | No Load         | 1.909                  | .004                 |  | 1.828                  | .005                 |  | 1.896                  | .004                 |  | 1.862                  | .004                 |  | 1.894                  | .003                 | .001 | .000                            |                                 |
| 3:20 | 8 PSF           | 1.874                  | .039                 |  | 1.775                  | .058                 |  | 1.850                  | .050                 |  | 1.812                  | .054                 |  | 1.863                  | .034                 | .014 | .012                            |                                 |
| 3:25 | No Load         | 1.907                  | .006                 |  | 1.826                  | .007                 |  | 1.894                  | .006                 |  | 1.861                  | .005                 |  | 1.893                  | .004                 | .001 | .000                            |                                 |
| 3:30 | 10 PSF          | 1.860                  | .053                 |  | 1.754                  | .079                 |  | 1.833                  | .067                 |  | 1.792                  | .074                 |  | 1.851                  | .046                 | .019 | .018                            |                                 |
| 3:35 | No Load         | 1.903                  | .010                 |  | 1.822                  | .011                 |  | 1.891                  | .009                 |  | 1.856                  | .010                 |  | 1.888                  | .009                 | .001 | .001                            |                                 |
| 3:40 | 12 PSF          | 1.848                  | .065                 |  | 1.737                  | .096                 |  | 1.818                  | .082                 |  | 1.777                  | .089                 |  | 1.842                  | .055                 | .023 | .021                            |                                 |
| 3:45 | No Load         | 1.900                  | .013                 |  | 1.818                  | .015                 |  | 1.887                  | .013                 |  | 1.852                  | .014                 |  | 1.886                  | .011                 | .002 | .002                            |                                 |
| 3:50 | 14 PSF          | 1.839                  | .074                 |  | 1.722                  | .111                 |  | 1.805                  | .095                 |  | 1.763                  | .103                 |  | 1.834                  | .063                 | .027 | .024                            |                                 |
| 3:55 | No Load         | 1.899                  | .014                 |  | 1.816                  | .017                 |  | 1.886                  | .014                 |  | 1.851                  | .015                 |  | 1.884                  | .013                 | .003 | .002                            |                                 |
|      | Ultimate Load:  |                        |                      |  |                        |                      |  |                        |                      |  |                        |                      |  |                        |                      | .000 | .000                            |                                 |
|      |                 |                        |                      |  |                        |                      |  |                        |                      |  |                        |                      |  |                        |                      | .000 | .000                            |                                 |

Ultimate Load: 30.1 PSF

Failure: Paper shear along center truss.

**PROGRESSIVE ENGINEERING, Inc.**

**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.  
 Date: 3/1/2002  
 Gypsum Clear Span: 96"  
 Temperature: 71 degree F.  
 Humidity: 20%

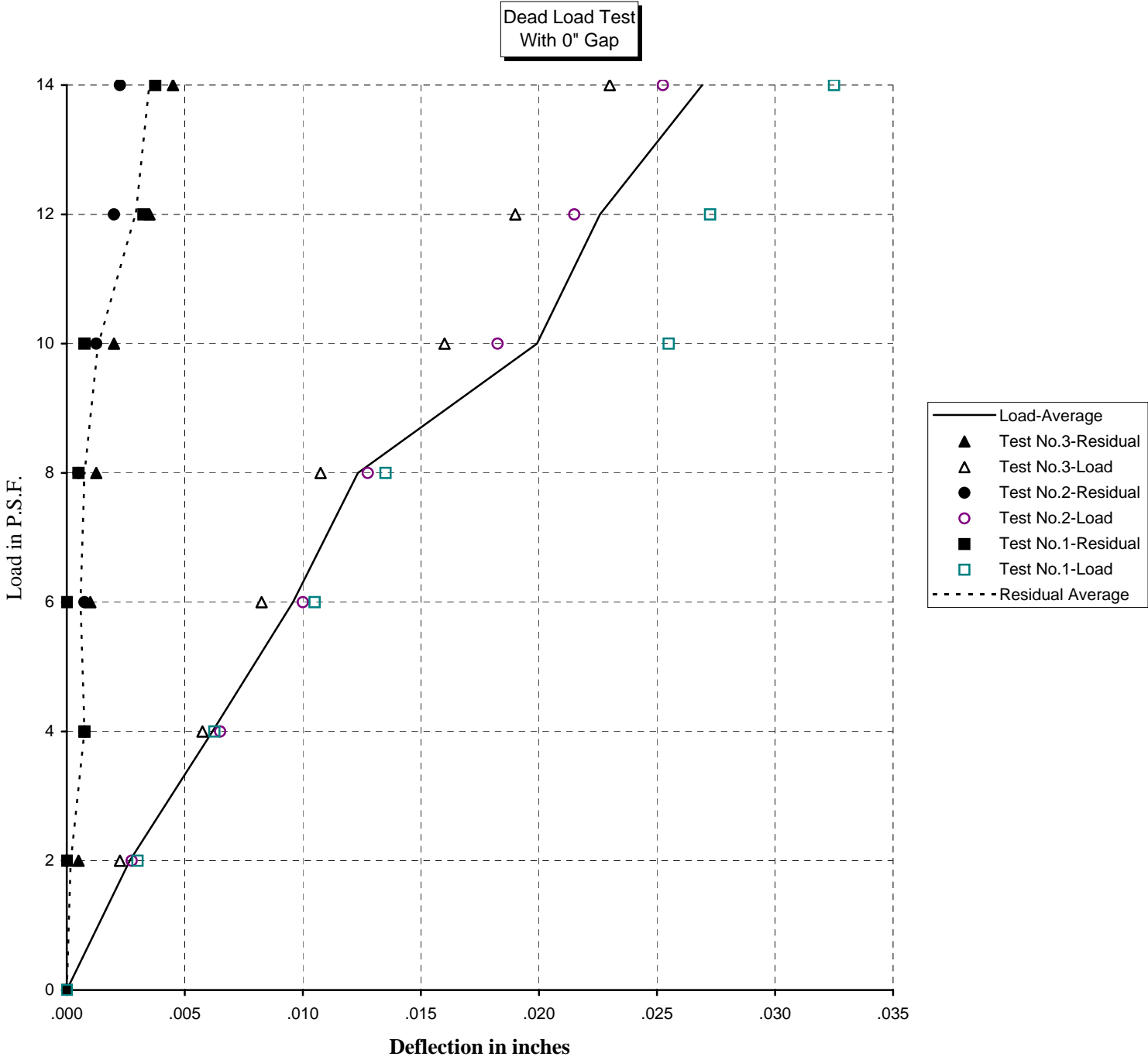
**Test No. 3**

| Time | Load Increments | TRUSS                  |       | GYPSUM                 |       | TRUSS                  |       | GYPSUM                 |       | TRUSS                  |       | INDICATOR No. 2 RESULTANT DEFL. | INDICATOR No. 4 RESULTANT DEFL. |
|------|-----------------|------------------------|-------|------------------------|-------|------------------------|-------|------------------------|-------|------------------------|-------|---------------------------------|---------------------------------|
|      |                 | Indicator No.1 Reading | Defl. | Indicator No.2 Reading | Defl. | Indicator No.3 Reading | Defl. | Indicator No.4 Reading | Defl. | Indicator No.5 Reading | Defl. |                                 |                                 |
| 3:00 | No Load         | 1.870                  | ----  | 1.864                  | ----  | 1.937                  | ----  | 1.686                  | ----  | 1.875                  | ----  | ----                            | ----                            |
| 3:05 | 2 PSF           | 1.866                  | .004  | 1.854                  | .010  | 1.929                  | .008  | 1.678                  | .008  | 1.868                  | .007  | .004                            | .001                            |
| 3:10 | No Load         | 1.873                  | -.003 | 1.864                  | .000  | 1.937                  | .000  | 1.686                  | .000  | 1.874                  | .001  | .001                            | .000                            |
| 3:15 | 4 PSF           | 1.854                  | .016  | 1.837                  | .027  | 1.914                  | .023  | 1.661                  | .025  | 1.856                  | .019  | .008                            | .004                            |
| 3:20 | No Load         | 1.871                  | -.001 | 1.862                  | .002  | 1.935                  | .002  | 1.684                  | .002  | 1.873                  | .002  | .001                            | .000                            |
| 3:25 | 6 PSF           | 1.845                  | .025  | 1.824                  | .040  | 1.902                  | .035  | 1.648                  | .038  | 1.847                  | .028  | .010                            | .006                            |
| 3:30 | No Load         | 1.870                  | .000  | 1.860                  | .004  | 1.933                  | .004  | 1.682                  | .004  | 1.871                  | .004  | .002                            | .000                            |
| 3:35 | 8 PSF           | 1.836                  | .034  | 1.811                  | .053  | 1.889                  | .048  | 1.634                  | .052  | 1.838                  | .037  | .012                            | .010                            |
| 3:40 | No Load         | 1.868                  | .002  | 1.858                  | .006  | 1.931                  | .006  | 1.679                  | .007  | 1.868                  | .007  | .002                            | .000                            |
| 3:45 | 10 PSF          | 1.820                  | .050  | 1.786                  | .078  | 1.867                  | .070  | 1.611                  | .075  | 1.823                  | .052  | .018                            | .014                            |
| 3:50 | No Load         | 1.863                  | .007  | 1.851                  | .013  | 1.924                  | .013  | 1.674                  | .012  | 1.866                  | .009  | .003                            | .001                            |
| 3:55 | 12 PSF          | 1.809                  | .061  | 1.769                  | .095  | 1.848                  | .089  | 1.593                  | .093  | 1.814                  | .061  | .020                            | .018                            |
| 4:00 | No Load         | 1.861                  | .009  | 1.847                  | .017  | 1.920                  | .017  | 1.669                  | .017  | 1.864                  | .011  | .004                            | .003                            |
| 4:05 | 14 PSF          | 1.800                  | .070  | 1.754                  | .110  | 1.836                  | .101  | 1.580                  | .106  | 1.807                  | .068  | .025                            | .021                            |
| 4:10 | No Load         | 1.858                  | .012  | 1.844                  | .020  | 1.918                  | .019  | 1.666                  | .020  | 1.863                  | .012  | .004                            | .004                            |

Ultimate Load: 35.3 PSF

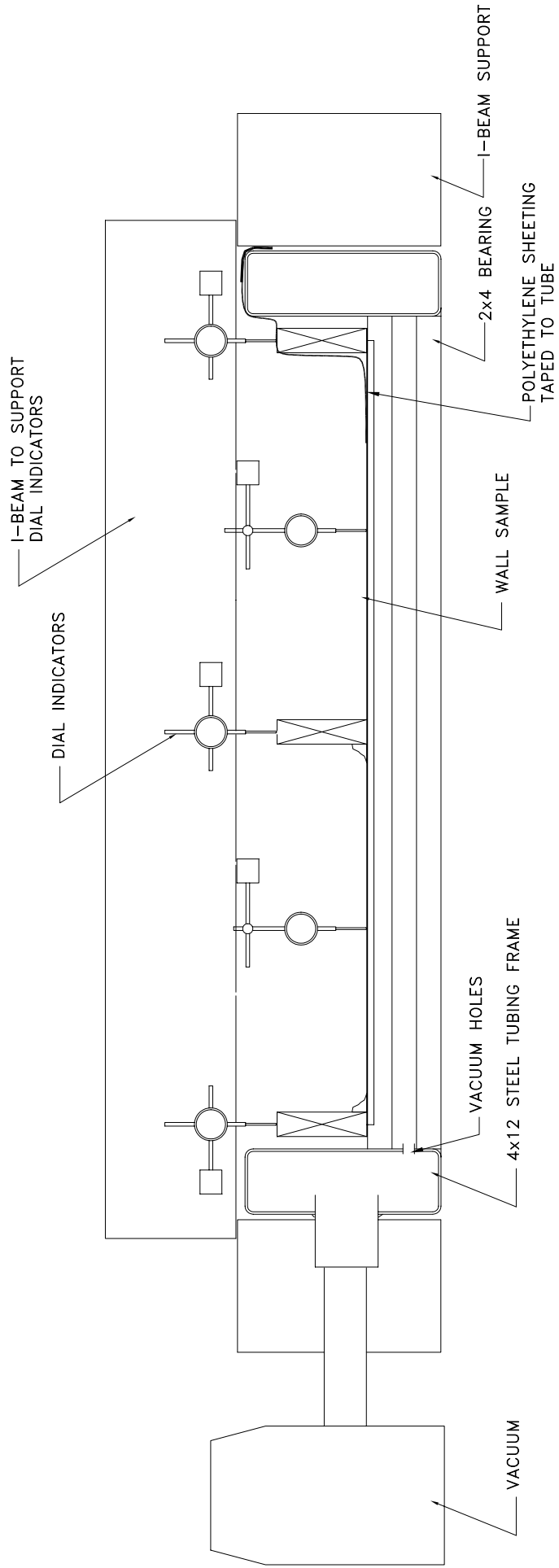
Failure: Gypsum core along truss #3 at each adhesive location

# PROGRESSIVE ENGINEERING, Inc.





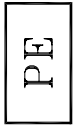




### SECTION A-A

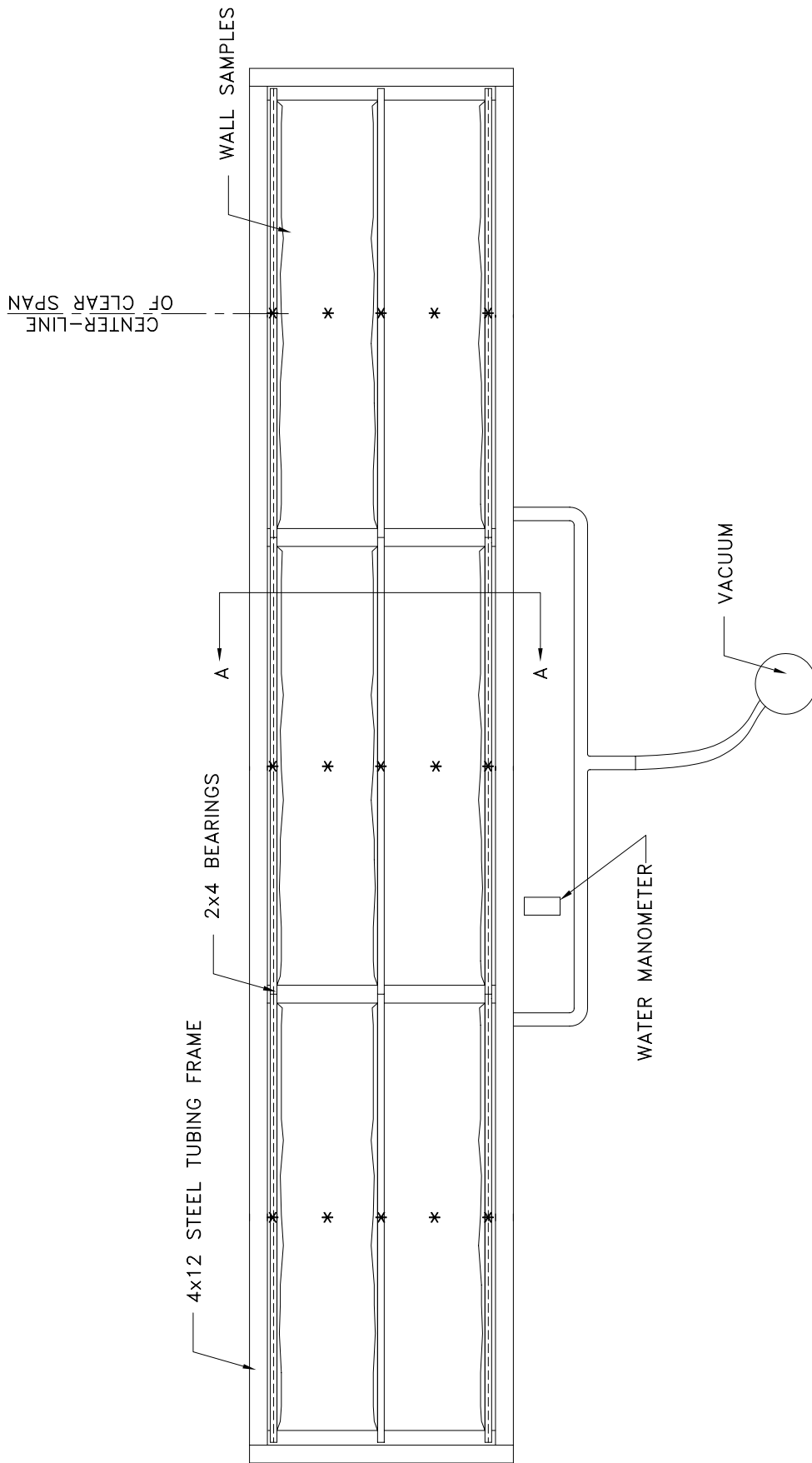
|                     |                              |
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| DWN. BY: EVERINGHAM | TITLE:<br><b>TEST SET-UP</b> |
| DATE: 8/8/94        |                              |
| SCALE: NONE         |                              |
| DRAWING NUMBER      | <b>F362</b>                  |

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**PROGRESSIVE ENGINEERING, INC.**  
Testing Laboratory

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Telephone (219) 533-0337



**NOTES:**

\* - DEFLECTION GAUGE LOCATIONS

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DWN. BY: MORRIS  
 DATE: 8/15/94  
 SCALE: 1/2" = 12"  
 DRAWING NUMBER

**F361**

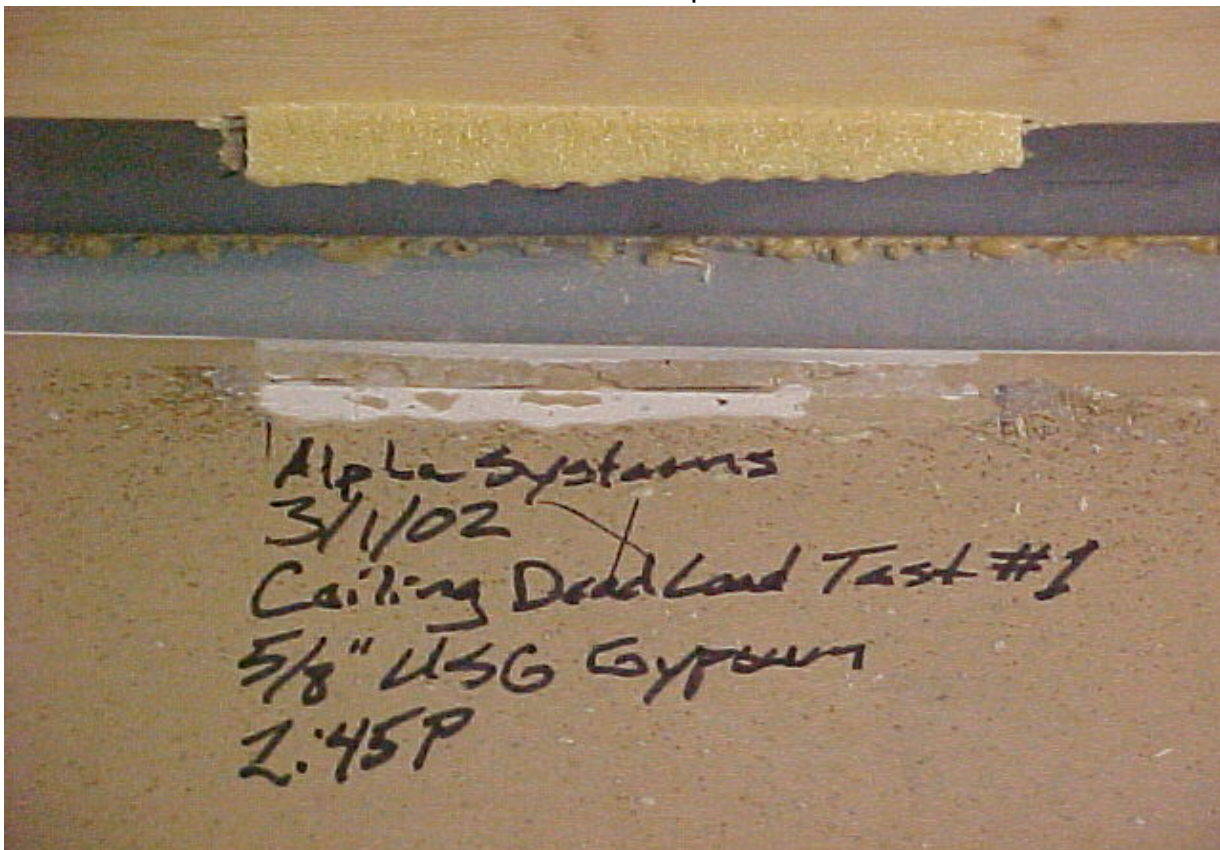
**TEST SET-UP**

**PE** PROGRESSIVE ENGINEERING, INC.  
 Testing Laboratory

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

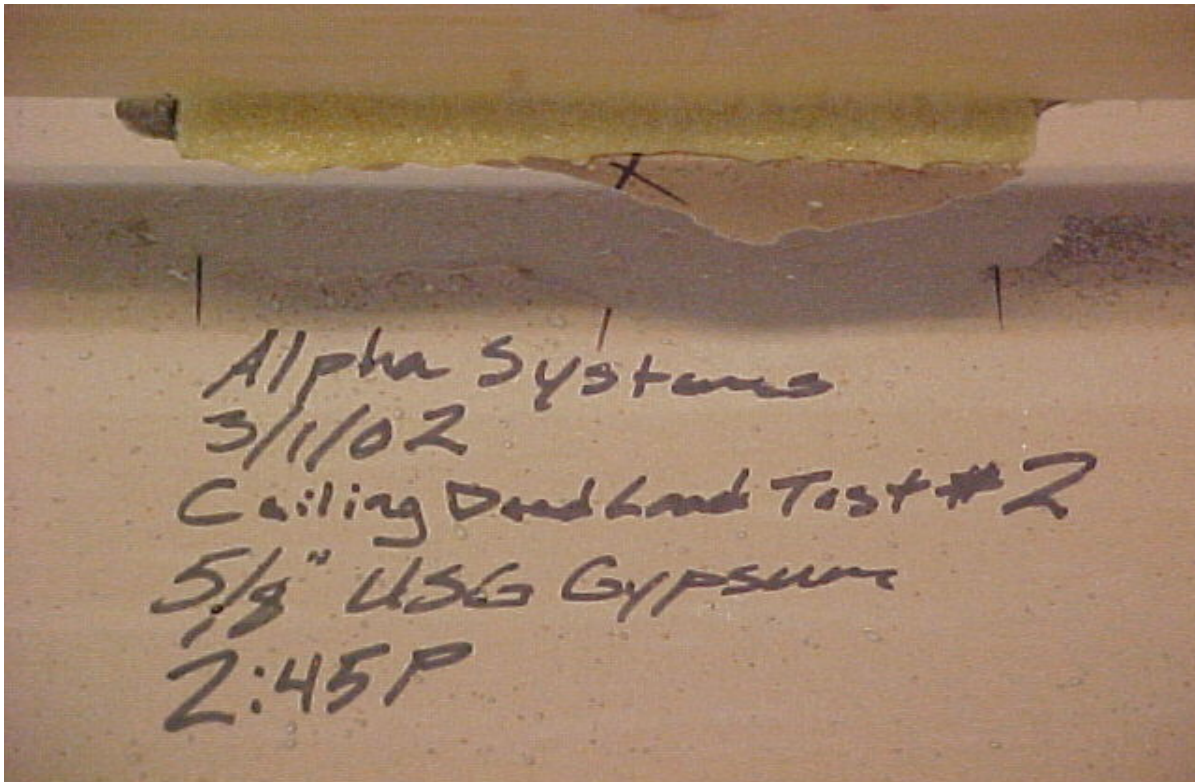


Test Set-Up

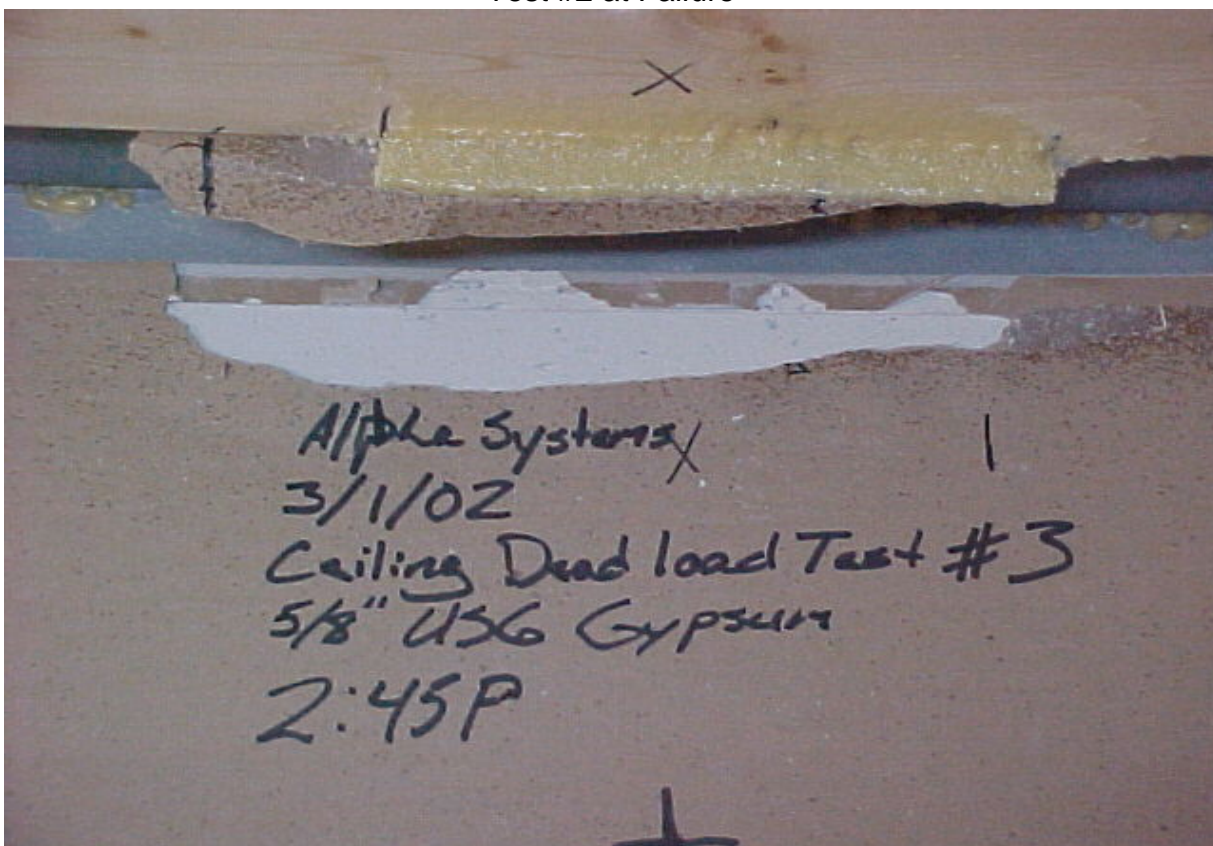


Test # 1 at Failure





Test #2 at Failure



Test #3 at Failure