

Evaluation of Double-Sided Wall Assemblies Under Racking Load Sheathed with 5/32" Lauan Paneling

Attached with:
"P5100" Adhesive, Front Panels
"P3100" Adhesive, Back Panels

Manufactured By:
Alpha Systems

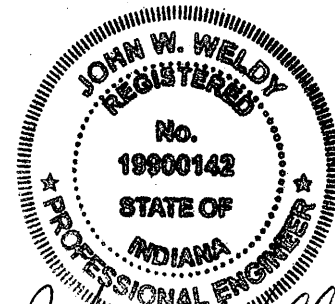
Prepared For:
**Alpha Systems
5120 Beck Drive
Elkhart, IN 46516**

Test Report: NTA990060

Issued: September 27, 1999

Prepared By:
John Kirkwood
Director of Testing.

Reviewed By:
John W. Weldy, P.E.
Test Engineer



John W. Weldy
10-13-99

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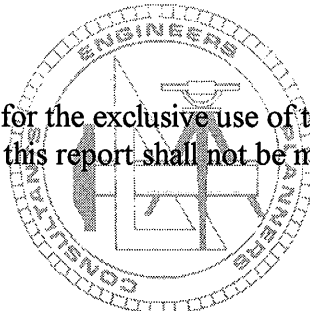


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1.0 INTRODUCTION

NTA, Inc. conducted racking load tests on wall assemblies at the NTA test facility in Nappanee, Indiana. The wall assemblies were tested in conformance to ASTM E 72-80; Standard Methods of Conducting Strength Tests of Panels for Building Construction, Section 14, Racking Load -- Evaluation of Luaun Materials on a Standard Wood Frame.

The Purpose of this evaluation is to determine what the allowable design shear load is for wall assemblies constructed as described in this report, using 5/32" luaun paneling attached with "P5100" and "P3100" adhesive as manufactured by Alpha Systems.

2.0 TEST SPECIMEN DESCRIPTION

A. Materials

1. Studs: 2 x 3, Stud Grade SPF at 16" o.c.
2. Top Plate: Single 1 x 3, Un-Graded SPF.
3. Bottom Plate: Single 1 x 3, Un-Graded SPF.
4. Luaun: 48" x 96", 5/32" Luaun Paneling.
5. Adhesive: "P5100 and P3100", Alpha Systems.

B. Fastening

- Top plate fastened to studs with (2) - 7/16" x 1-3/4" x 15 Ga. staples per stud.
- Bottom plate fastened to studs with (2) - 7/16" x 1-3/4" x 15 Ga. staples per stud.
- Luaun attached to 2 x 3 studs with (2) - 1/16" - 1/8" (average) beads of P5100 adhesive on the front. Back side with (1) 1/4" bead of P3100 per stud.
- Luaun attached to center 2 x 3 stud at seam with (2) - 1/16" - 1/8" (average) bead of "P5100" adhesive. (Front side) Back side with (2) 1/4" P3100 beads.
- Luaun attached to top and bottom plates of front side with (2) 1/16" - 1/8" beads of P5100 adhesive.
- Luaun attached to top and bottom plates of the back side with (1) 1/4" bead of P3100.
- Luaun fastened to framing with 3/16" x 3/4" x 19 Ga. staples at 6" o.c. around perimeter of Luaun, and none in the field for the interior studs. Front and back side fastening schedule identical.

C. Construction Steps

- "P 5100" applied to the assembled wall with a caulking gun (one side).
- "P 3100" applied to the assembled wall with a caulking gun (one side).
- The Luaun was placed on one side of the wall framing immediately after the adhesive was applied and then promptly fastened along all panel edges and framing members as described.

D. Cure Time

After construction, each of the wall assemblies were cured a minimum of seven (7) days before testing.

3.0 TEST SETUP AND PROCEDURE

The wall top plate was fastened to a steel load bar using four(4) - #10 wood screws into each stud bay adjacent to a panel edge for load application. The bottom plate was securely fastened to a structural tee with four (4) - #10 wood screws into each stud bay. The structural tee was then attached to the I-beam in order to secure the sample to the test rack.

Load was applied horizontally to the load bar attached to the top plate of the wall. Dial indicators were placed on the top plate (Indicator #1), and on the bottom plate (Indicator #2) opposite the loaded end of the wall. An additional dial indicator was placed on the load end of the wall at the base of the rack at the first stud location (Indicator #3). See Figure #2 for details.

Load was applied in 395 pound increments, up to 2360 pounds, at a rate of approximately 790 pounds per two minutes (not less than). When each load increment was reached, deflection readings were taken while maintaining the load. The load was then reduced back to zero at an approximate rate of 790 pounds per two minutes. Zero load readings were taken after each load increment up to 2360 pounds. Finally, load was applied at the same approximate rate until failure occurred.

To determine the horizontal deflection of the panel, subtract the deflection readings from Indicators #2 and #3 from Indicator #1. Indicator #3, which is attached to the stud, will measure any rotation of the panel. Indicator #2 measures any slippage of the panel in the test rack. Indicator #1 measures the total of displacement of Indicators #2 and #3, as well as the deformation of the panel.

4.0 TEST RESULTS

A total of three (3) test samples were tested. Each sample had 5/32" lauan attached to the front side using "P 5100" adhesive. Each sample had 5/32" lauan attached to the back side using "P3100" adhesive. The ultimate loads achieved and the types of failures that occurred are described below.

<u>SAMPLE</u>	<u>ULTIMATE LOAD</u>	<u>FAILURE MODE</u>
#1	10675 pounds	Lauan shear.
#2	10555 pounds	Lauan shear.
#3	11500 pounds	Lauan shear.

Average Ultimate Load = 10,910 pounds

Allowable Design Load = (Average Ultimate Load) / [(Wall Length)*(Safety Factor)]

(10,910 pounds) / [(8 feet)*(2.5)] = 545.5 PLF

5.0 CONCLUSION

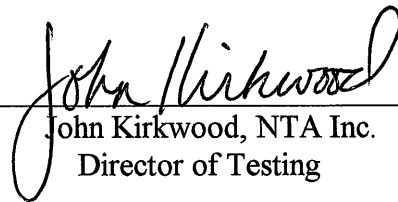
Based on the results of the tests conducted, the maximum allowable design load for a 96" tall shear wall built of 2 x 3 Stud Grade SPF studs at 16" o/c, 1 x 3, un-graded SPF top plates with 1 x 3 un-graded SPF bottom plates with Lauan attached to both sides as described in this report is:

**For 5/32" Lauan Paneling
Attached to Both Sides with
Alpha Systems
P5100 Adhesive - Front panels
P3100 Adhesive - Back Panels
= 545.5 PLF**

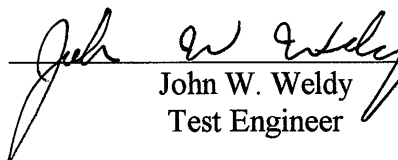
5.1 FOLLOW-UP TESTING

Follow-up testing will be in accordance with the NTA, Inc. follow-up testing procedures.

TEST REPORT BY:


John Kirkwood, NTA Inc.
Director of Testing

REPORT REVIEWED BY:


John W. Weldy
Test Engineer

NTA, Inc.

WALL RACKING TEST

Test Procedure: ASTM E 72-80

Type of Sheathing: 5/32" Lauan
 Gypsum Lot Number: _____

Adhesive Manufacturer: Alpha Systems
 Type of Adhesive: P 5100 Front/ P3100 Back

FASTENERS: 3/16" x 3/4" x 19 Ga. Senco Staple
 Field Spacing: None
 Top Plate Spacing: 6" o.c.
 Bottom Plate Spacing: 6" o.c.
 Vertical Edge Spacing: 6" o.c.
 Adhesive Bead Size: (2) 1/16" - 1/8" P 5100 Front
(1) 1/4" - P 3100 Back

SAMPLE 1

Test Number: 990060
 Test Date: 9/27/99
 Temperature: 70 F
 Relative Humidity: 36%

AVERAGE MOISTURE CONTENT

Plates: 11.50% 1 x 3 SPF Ungraded

Studs: 12.00% 2 x 3 SPF Stud Grade

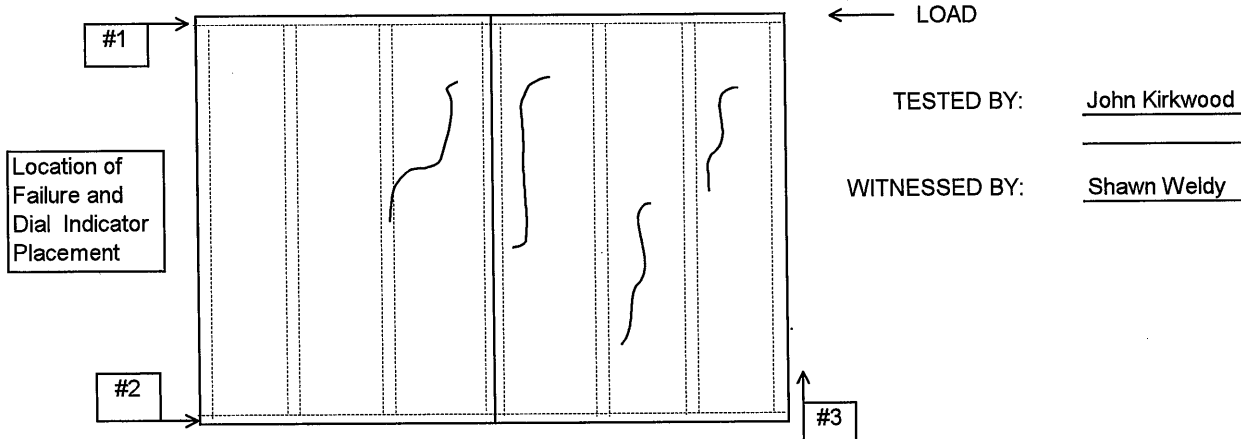
LOAD (pounds)	INDICATOR #1 (in.)		INDICATOR #2 (in.)		INDICATOR #3 (in.)		RESULTANT DEFLECTION (#1 - #2 - #3)
	READING	DEF.	READING	DEF.	READING	DEF.	
0	0.125		0.450		0.602		
395	0.132	0.007	0.451	0.001	0.601	0.001	0.005
0	0.126	0.001	0.450	0.000	0.602	0.000	0.001
790	0.157	0.032	0.451	0.001	0.601	0.001	0.030
0	0.130	0.005	0.450	0.000	0.602	0.000	0.005
1185	0.194	0.069	0.452	0.002	0.600	0.002	0.065
0	0.136	0.011	0.450	0.000	0.602	0.000	0.011
1570	0.226	0.101	0.453	0.003	0.599	0.003	0.095
0	0.140	0.015	0.451	0.001	0.601	0.001	0.013
1965	0.256	0.131	0.454	0.004	0.597	0.005	0.122
0	0.148	0.023	0.452	0.002	0.600	0.002	0.019
2360	0.267	0.142	0.454	0.004	0.597	0.005	0.133
0	0.153	0.028	0.452	0.002	0.599	0.003	0.023

LOAD AT FAILURE: 10675

DATE FABRICATED: 9/20/99

MODE OF FAILURE: Shear failure in between stud bays. Both sides.

8' x 8' SAMPLE: LAUAN ATTACHED TO BOTH SIDES.



NTA, Inc.

WALL RACKING TEST

Test Procedure: ASTM E 72-80

Type of Sheathing: 5/32" Lauan
 Gypsum Lot Number: _____

Adhesive Manufacturer: Alpha Systems
 Type of Adhesive: P 5100 Front/ P3100 Back

FASTENERS: 3/16" x 3/4" x 19 Ga. Senco Staple
 Field Spacing: None
 Top Plate Spacing: 6" o.c.
 Bottom Plate Spacing: 6" o.c.
 Vertical Edge Spacing: 6" o.c.
 Adhesive Bead Size: (2) 1/16" - 1/8" P 5100 Front
(1) 1/4" - P 3100 Back

SAMPLE 2

Test Number: 990060
 Test Date: 9/27/99
 Temperature: 70 F
 Relative Humidity: 36%

AVERAGE MOISTURE CONTENT

Plates: 11.50% 1 x 3 SPF Ungraded

Studs: 12.00% 2 x 3 SPF Stud Grade

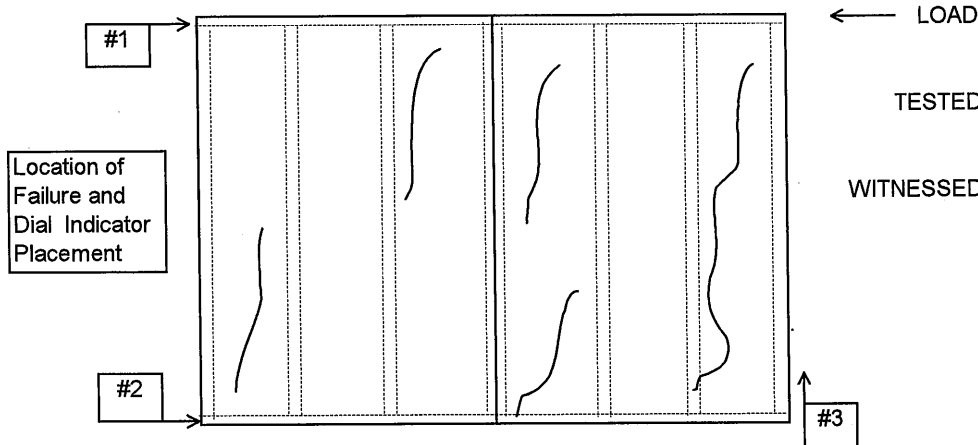
LOAD (pounds)	INDICATOR #1 (in.)		INDICATOR #2 (in.)		INDICATOR #3 (in.)		RESULTANT DEFLECTION (#1 - #2 - #3)
	READING	DEF.	READING	DEF.	READING	DEF.	
0	0.125		0.503		0.513		
395	0.135	0.010	0.504	0.001	0.512	0.001	0.008
0	0.129	0.004	0.503	0.000	0.513	0.000	0.004
790	0.169	0.044	0.504	0.001	0.512	0.001	0.042
0	0.138	0.013	0.503	0.000	0.513	0.000	0.013
1185	0.202	0.077	0.506	0.003	0.510	0.003	0.071
0	0.143	0.018	0.503	0.000	0.512	0.001	0.017
1570	0.238	0.113	0.507	0.004	0.509	0.004	0.105
0	0.151	0.026	0.504	0.001	0.511	0.002	0.023
1965	0.267	0.142	0.508	0.005	0.507	0.006	0.131
0	0.156	0.031	0.505	0.002	0.511	0.002	0.027
2360	0.303	0.178	0.510	0.007	0.506	0.007	0.164
0	0.158	0.033	0.505	0.002	0.510	0.003	0.028

LOAD AT FAILURE: 10555

DATE FABRICATED: 9/20/99

MODE OF FAILURE: Shear failure in between stud bays. Both sides.

8' x 8' SAMPLE: LAUAN ATTACHED TO BOTH SIDES.



TESTED BY: John Kirkwood

WITNESSED BY: Shawn Weldy

NTA, Inc.

WALL RACKING TEST

Test Procedure: ASTM E 72-80

Type of Sheathing: 5/32" Lauan
 Gypsum Lot Number: _____

Adhesive Manufacturer: Alpha Systems
 Type of Adhesive: P 5100 Front/ P3100 Back

FASTENERS: 3/16" x 3/4" x 19 Ga. Senco Staple
 Field Spacing: None
 Top Plate Spacing: 6" o.c.
 Bottom Plate Spacing: 6" o.c.
 Vertical Edge Spacing: 6" o.c.
 Adhesive Bead Size: (2) 1/16" - 1/8" P 5100 Front
(1) 1/4" - P 3100 Back

SAMPLE 3

Test Number: 990060
 Test Date: 9/27/99
 Temperature: 70 F
 Relative Humidity: 36%

AVERAGE MOISTURE CONTENT

Plates: 11.50% 1 x 3 SPF Ungraded

Studs: 12.00% 2 x 3 SPF Stud Grade

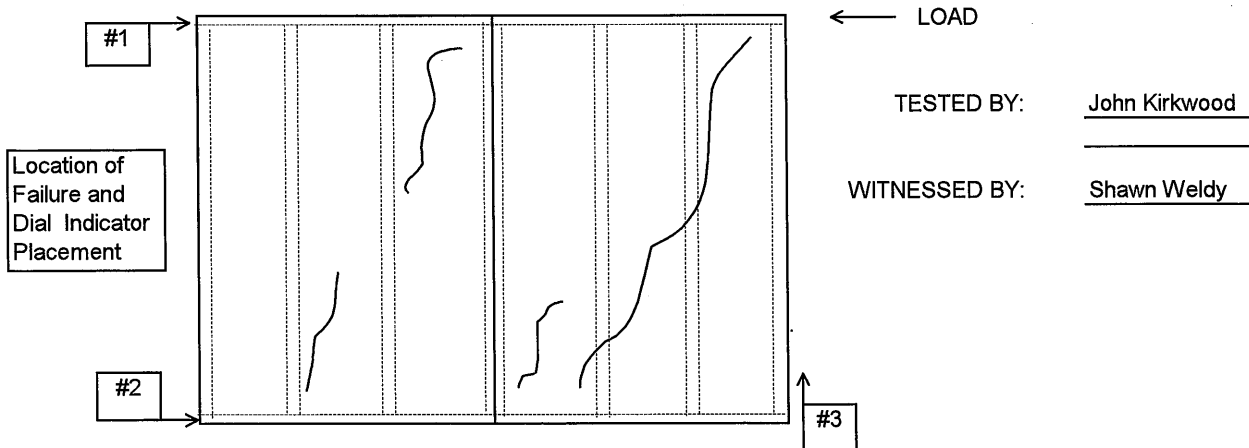
LOAD (pounds)	INDICATOR #1 (in.)		INDICATOR #2 (in.)		INDICATOR #3 (in.)		RESULTANT DEFLECTION (#1 - #2 - #3)
	READING	DEF.	READING	DEF.	READING	DEF.	
0	0.430		0.500		0.988		
395	0.438	0.008	0.501	0.001	0.987	0.001	0.006
0	0.420	0.010	0.500	0.000	0.988	0.000	0.010
790	0.468	0.038	0.502	0.002	0.987	0.001	0.035
0	0.425	0.005	0.501	0.001	0.988	0.000	0.004
1185	0.491	0.061	0.503	0.003	0.986	0.002	0.056
0	0.433	0.003	0.501	0.001	0.988	0.000	0.002
1570	0.534	0.104	0.504	0.004	0.985	0.003	0.097
0	0.444	0.014	0.502	0.002	0.988	0.000	0.012
1965	0.541	0.111	0.506	0.006	0.984	0.004	0.101
0	0.451	0.021	0.503	0.003	0.988	0.000	0.018
2360	0.631	0.201	0.508	0.008	0.980	0.008	0.185
0	0.460	0.030	0.503	0.003	0.987	0.001	0.026

LOAD AT FAILURE: 11500

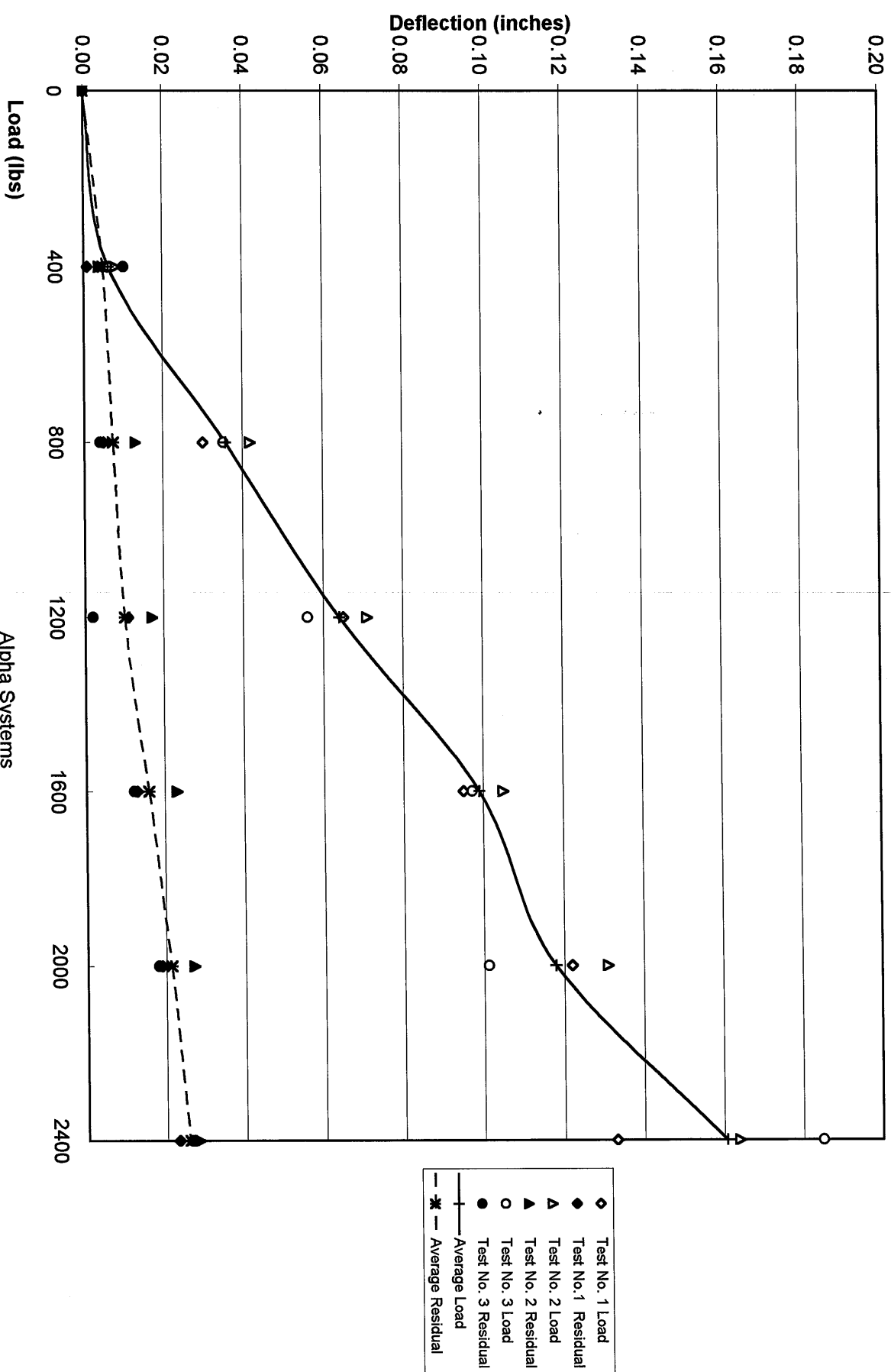
DATE FABRICATED: 9/20/99

MODE OF FAILURE: Shear failure in between stud bays. Both sides.

8' x 8' SAMPLE: LAUAN ATTACHED TO BOTH SIDES.



Load Deflection Curves



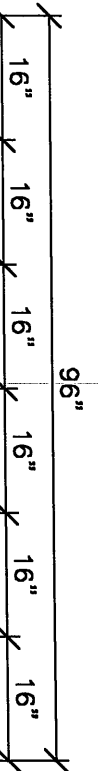
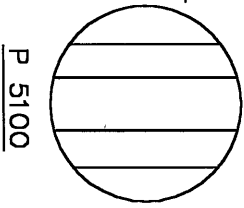
NTA980060

Alpha Systems
 "P 5100 P3100" Adhesives
 5/32" Lauan Paneling
 Both Sides

(2) 7/16" x 1-3/4" x 15 ga. STAPLES AT EACH STUD END TOP PLATE.

FRONT SIDE
AVERAGE BEAD SIZE

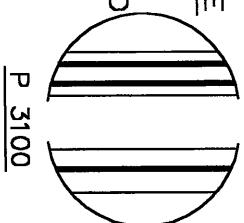
1/16" - 1/8"
2 PER STUD



1 X 3 UN-GRADED SPF TOP PLATE

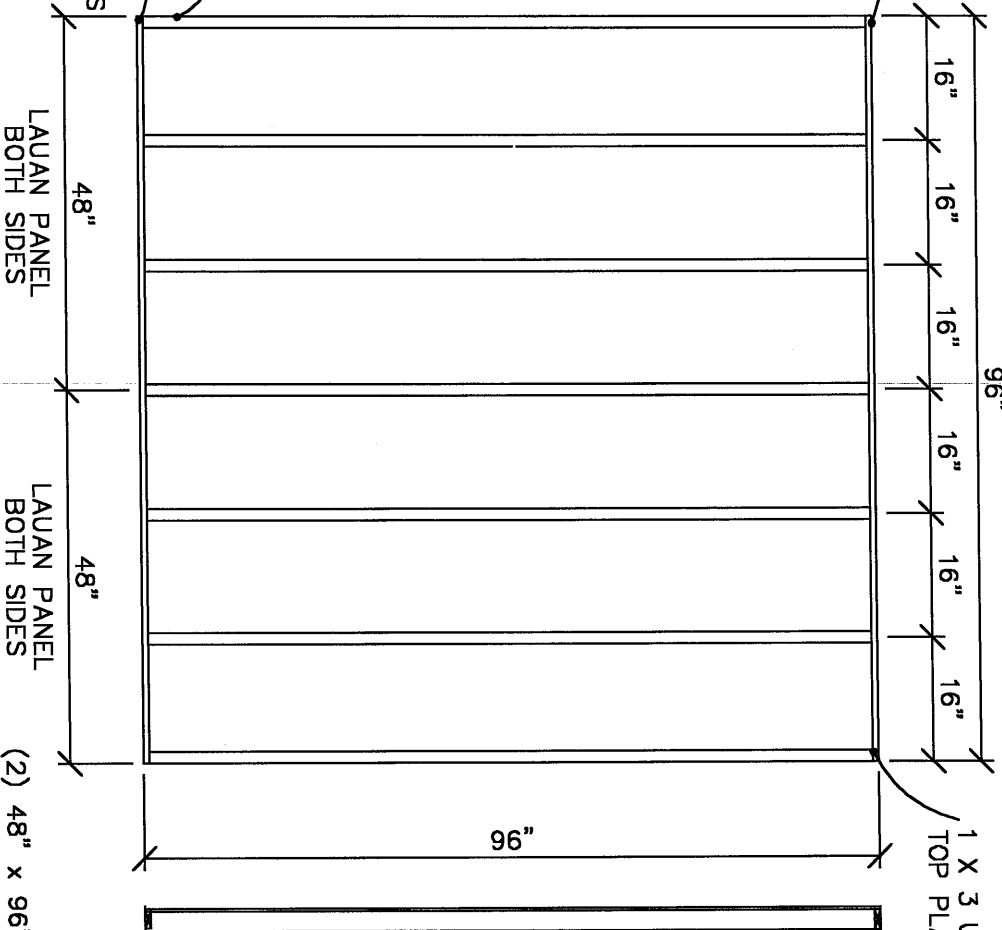
BACK SIDE
AVERAGE BEAD SIZE

1/4"
1 PER STUD
2 PER CENTER STUD



2X3 STUD GRADE
SPF STUDS

1X3 UTILITY SPF BOTTOM PLATE
(2) 7/16" x 1 3/4" x 15GA. STAPLES
AT EACH END BOTTOM PLATE



LAUAN PANEL
BOTH SIDES

LAUAN PANEL
BOTH SIDES

(2) 48" x 96" x 5/32" LAUAN PANELING

ATTACHED TO BOTH SIDES WITH
3/16" X 1" X 19 GAUGE STAPLES
6" O/C PERIMETER NO FIELD FASTENERS

NOTE:
SEE THE ATTACHED TEST REPORT
FOR EXACT CONSTRUCTION PROCEDURE.

DESIGN SHEAR = 545.5 PLF

PAGE 10 OF 11

REVISIONS:

NTA, INC.

305 N. OAKLAND AVENUE, NAPPANEE, IN. 46550

MODEL:

TITLE:

WALL PANEL

990060

SCALE: N.T.S.

APPROVED BY:

DATE: 09/27/99

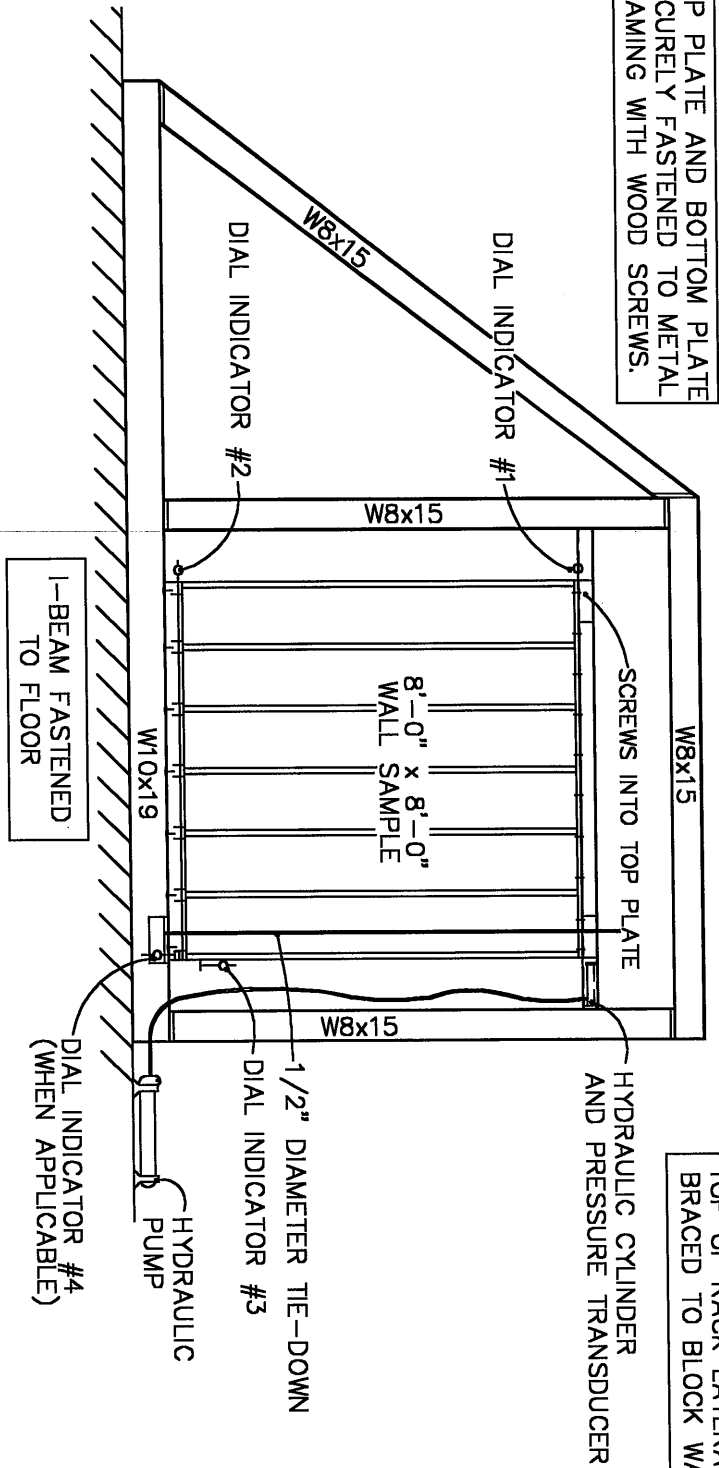
PROJECT NO:

NTA9900060

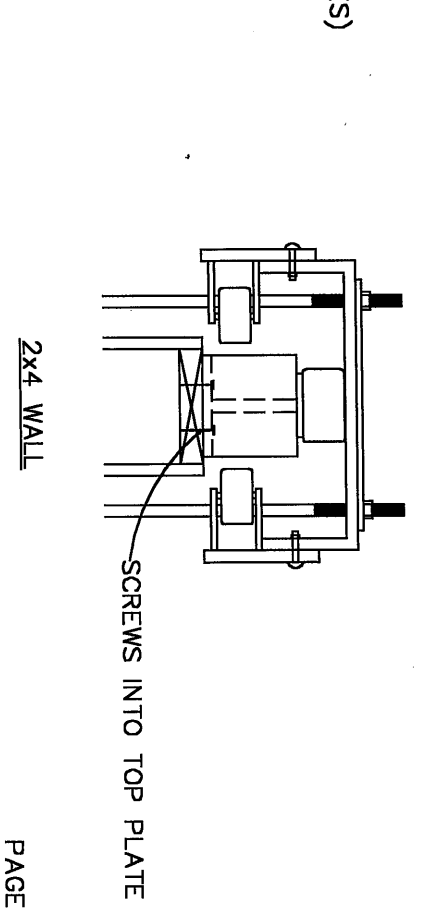
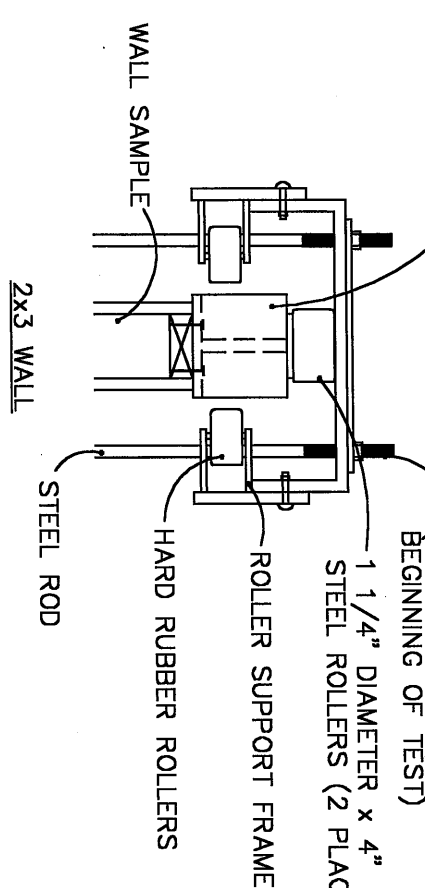
DRAWN BY: JCK

DRAWING NO:

TOP PLATE AND BOTTOM PLATE SECURELY FASTENED TO METAL FRAMING WITH WOOD SCREWS.



METAL FRAMING USED TO CONNECT TO TOP PLATE OF WALL FRAME



REVISIONS:	NTA, INC.		SCALE: N.T.S.	APPROVED BY:
990060	MODEL:	305 N.DAKLAND AVE., NAPPANEE, IN. 46550	DATE: 09/27/99	PROJECT NO: NTA990060
	TITLE:	RACKING TEST FIXTURE	DRAWN BY: JCK	DRAWING NO: