

**ENGINEERS  
PLANNERS  
CONSULTANTS**

305 NORTH OAKLAND AVENUE · P.O. BOX 490 · NAPPANEE, INDIANA 46550

PHONE: 219-773-7975  
FAX: 219-773-2732

**Evaluation of Wall Assemblies Under Racking Load Sheathed with  
G-P Gypsum Corporation's 5/16" Gypsum Wall Board Pre-Dec  
Attached with Capitol Adhesives Inc. POLYBOND ADHESIVE  
(Double-Sided)**

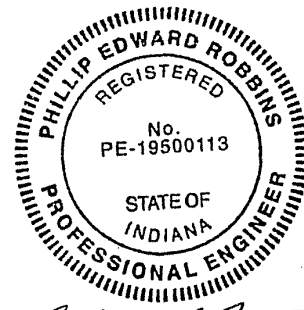
Prepared for

**G-P Gypsum Corp.  
2861 Miller Road  
Decatur, GA 30035**

Test Report: NTA970010-2

Issued: March 3, 1997

Prepared By:



*Phillip E. Robbins*  
**MAR 05 1997**

Phillip E. Robbins, P.E.  
NTA, Inc..

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## 1.0 INTRODUCTION

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

The Purpose of this evaluation was to determine what the allowable shear design load is for wall assemblies put together as described using G-P Gypsum Corporation's 5/16" gypsum wall board Pre-Dec and Capitol Adhesives Inc. POLYBOND adhesive for use as shear walls in manufactured housing.

## 2.0 TEST SPECIMEN DESCRIPTION

### A. Materials

1. Studs: 2 X 3 STUD grade SPF at 16" o.c.
2. Top Plate: Single 2 X 3 STUD grade SPF
3. Bottom Plate: Single 2 X 3 STUD grade SPF
4. Sheathing: 4' X 8' G-P Gypsum Corp. 5/16" gypsum wall board Pre-Dec
5. Adhesive: POLYBOND as manufactured by Capitol Adhesives Inc.

### B. Fasteners

1. Top plate attached to studs with two (2) 7/16" X 2 1/2" X 15 ga. staples per stud end.
2. Bottom plate attached to studs with two (2) 7/16" X 2 1/2" X 15 ga. staples per stud end.
3. Gypsum attached to 2 X 3 studs with 3/8" (average) bead of POLYBOND adhesive. Center stud at panel joint had 3/8" serpentine bead.
4. Gypsum attached to 2 X 3 top plate with 3/8" (average) bead of POLYBOND adhesive.
5. Gypsum attached to 2 X 3 bottom plate with 3/8" (average) bead of POLYBOND adhesive.
6. Gypsum attached to framing with 1/4" X 1" X 19 ga. staples at 6" o.c. around gypsum perimeter and no field fasteners along interior studs.

### C. Construction Steps

1. The POLYBOND adhesive was applied to the previously assembled wall framing with a adhesive application gun.
2. The gypsum wall board was placed on one side of the wall framing immediately after the POLYBOND adhesive was applied and then promptly stapled along all panel edge framing members. The sample was then flipped over and gypsum was applied to the other side in the same manner.

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D. Cure Time

The wall assemblies were tested a minimum of (7) days after construction.

3.0 TEST SETUP AND PROCEDURE

The top and bottom plates were attached to 4 X 4s with one (1) 3/8" X 2 1/2" lag screw in each bay adjacent to a panel edge for load application. The 4 X 4 attached to the bottom plate was fastened to the I-beam to secure the sample to the test rack.

Load was applied horizontally to the 4 X 4 attached to the top plate of the wall. Dial indicators were placed on the top plate (indicator #1) and bottom plate (indicator #2) opposite the loaded end of the wall. Additional dial indicators were placed at the load end of the wall at the base of the rack on the first stud (indicator #3). See figure #2 for details.

Load was applied in 400 pound increments, up to 2400 pounds, at a rate of approximately 400 lbs/minute. When each load increment was reached, deflection readings were taken while holding at that load and then the load was reduced back to zero at a rate of approximately 400 lbs/minute. Zero load readings were taken after each load increment up to 2400 pounds. Load was then applied at the same rate of 400 lbs/minute until failure was reached.

To determine the horizontal deflection of the panel, deflection readings from indicator #2 and #3 were subtracted from indicator #1. Indicator #3 which is attached to the stud measures any rotation of the panel. Indicator #2 measures any slippage of the panel in the test rack. Indicator #1 measures the total of indicators #2 and #3 plus the deformation of the panel.

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4.0 TEST RESULTS

A total of three (3) specimens with gypsum wall board attached to both sides with POLYBOND were tested. The ultimate loads achieved and the types of failures are described below.

<u>TEST SAMPLE</u>	<u>MAX. LOAD</u>	<u>FAILURE MODE</u>
#1	10420 Lbs.	Paper failure center panel joint.
#2	10599 Lbs.	Gypsum shear top left of right panel.
#3	10464 Lbs.	Gypsum shear top left of right panel.

Average Ultimate Load (lbs) = 10494 Lbs.

Allowable design Load (PLF) = (Ave. Ult. load)/[(wall length)(safety factor)]

( 10494 Lbs.)/[(8 ft.)(2.5)] = 525 PLF

5.0 CONCLUSION

Based on the results of the tests conducted the maximum allowable design shear wall load built with 2 X 3 STUD grade SPF studs spaced 16" o.c. and 2 X 3 STUD grade SPF bottom plate and 2 X 3 STUD grade SPF top plate with gypsum wall board attached to both sides built as described in this report is:

**G-P Gypsum Corp. 5/16" gypsum wall board Pre-Dec  
ATTACHED TO BOTH SIDES WITH  
POLYBOND = 525 PLF**

This design value is only applicable for Manufactured Housing built under the Manufactured Home Construction and Safety Standards and is not intended for use with other model building codes.

5.1 FOLLOW-UP TESTING

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

TEST WITNESSED BY: John Kirkwood  
John Kirkwood

TEST REPORT REVIEWED BY: Phillip E. Robbins  
Phillip E. Robbins, P.E.



**NTA Inc. WALL RACK**

GYPSUM ATTACHED TO BOTH SIDES

TEST: ASTM E 72-80

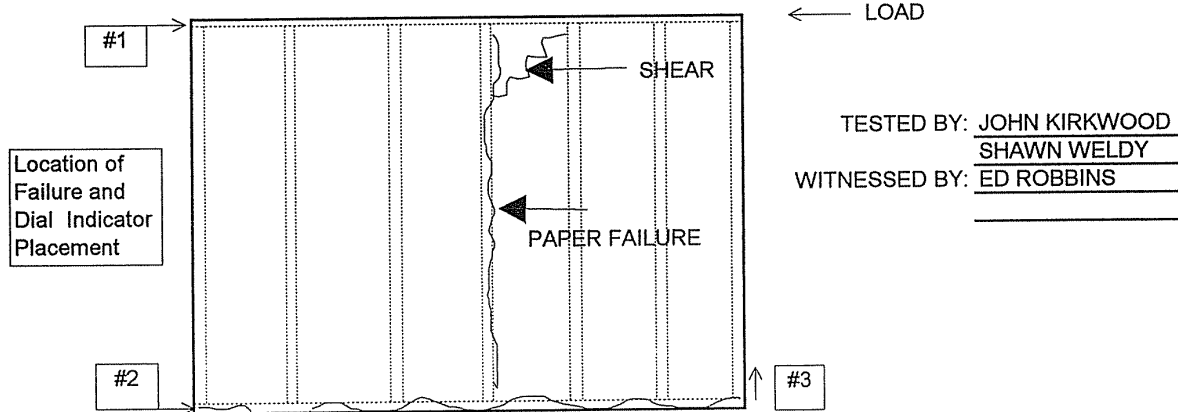
TEST No.: 970010-2 SAMPLE# 1  
 DATE TESTED: 2/27/97  
 TEMPERATURE: 68F  
 HUMIDITY: <15%  
 AVE. MOISTURE CONTENT @ CONST.  
 PLATES: 8-10%  
 STUDS: 10-12% Spaced at 16" O.C.

GYPSUM TYPE: G-P Gyp. Corp. 5/16" Pre-Dec  
 STAPLES: 1/4" X 1" X 19 GA. SENCO K13  
 FIELD SPACING: none 2X3 STUD SPF  
 TOP PLATE SPACING: 6" O.C. 2X3 STUD SPF  
 BOTTOM PLATE SPACING: 6" O.C. 1X3 UTILITY SPF  
 VERTICAL EDGE SPACING: 6" O.C. 2X3 STUD SPF  
 BEAD SIZE/ADHESIVE: 3/8" BEAD POLYBOND  
 Adhesive Manufacturer: CAPITOL ADHESIVES INC.

LOAD (lbs)	INDICATOR #1 (in)		INDICATOR #2 (in)		INDICATOR #3 (in)		RESULTANT DEFLECTION #1-#2-#3
	READING	DEF.	READING	DEF.	READING	DEF.	
0	0.056		0.225		0.862		0.009
400	0.077	0.021	0.233	0.008	0.858	0.004	-0.006
0	0.057	0.001	0.232	0.007	0.862	0.000	0.040
800	0.121	0.065	0.238	0.013	0.850	0.012	0.009
0	0.076	0.020	0.235	0.010	0.861	0.001	0.046
1200	0.132	0.076	0.240	0.015	0.847	0.015	0.009
0	0.077	0.021	0.235	0.010	0.860	0.002	0.045
1600	0.155	0.099	0.249	0.024	0.832	0.030	0.011
0	0.080	0.024	0.236	0.011	0.860	0.002	0.067
2000	0.187	0.131	0.249	0.024	0.822	0.040	0.011
0	0.081	0.025	0.236	0.011	0.859	0.003	0.132
2400	0.265	0.209	0.255	0.030	0.815	0.047	0.024
0	0.095	0.039	0.236	0.011	0.858	0.004	

LOAD AT FAILURE: 10420 LBS DATE FABRICATED: 2/20/97  
 MODE OF FAILURE: GYPSUM SHEAR TOP LEFT OF RIGHT PANEL  
 PAPER FAILURE CENTER STUD

8' X 8' SAMPLE GYPSUM LOT # 96-08-17-08-52-22-2



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# NTA Inc. WALL RACK



TEST: ASTM E 72-80

GYPSUM ATTACHED TO BOTH SIDES

TEST No.: 970010-2 SAMPLE# 2  
 DATE TESTED: 2/27/97  
 TEMPERATURE: 68F  
 HUMIDITY: <15%  
 AVE. MOISTURE CONTENT @ CONST.  
 PLATES: 8-10%  
 STUDS: 10-12% Spaced at 16" O.C.

GYPSUM TYPE: G-P Gyp. Corp. 5/16" Pre-Dec  
 STAPLES: 1/4" X 1" X 19 GA. SENCO K13  
 FIELD SPACING: none 2X3 STUD SPF  
 TOP PLATE SPACING: 6" O.C. 2X3 STUD SPF  
 BOTTOM PLATE SPACING: 6" O.C. 1X3 UTILITY SPF  
 VERTICAL EDGE SPACING: 6" O.C. 2X3 STUD SPF  
 BEAD SIZE/ADHESIVE: 3/8" BEAD POLYBOND  
 Adhesive Manufacturer: CAPITOL ADHESIVES INC.

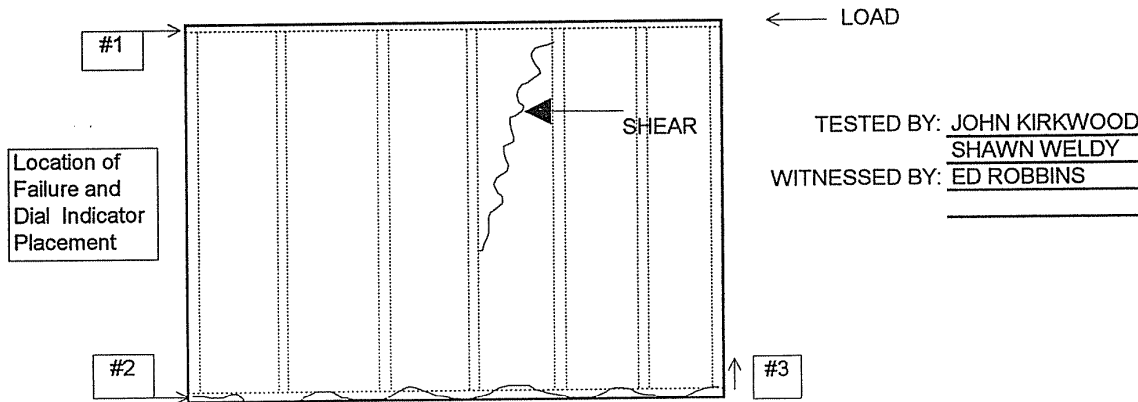
LOAD (lbs)	INDICATOR #1 (in)		INDICATOR #2 (in)		INDICATOR #3 (in)		RESULTANT DEFLECTION #1-#2-#3
	READING	DEF.	READING	DEF.	READING	DEF.	
0	0.089		0.266		0.750		
400	0.122	0.033	0.268	0.002	0.748	0.002	0.029
0	0.094	0.005	0.266	0.000	0.750	0.000	0.005
800	0.155	0.066	0.274	0.008	0.743	0.007	0.051
0	0.100	0.011	0.267	0.001	0.749	0.001	0.009
1200	0.199	0.110	0.280	0.014	0.740	0.010	0.086
0	0.115	0.026	0.268	0.002	0.748	0.002	0.022
1600	0.244	0.155	0.286	0.020	0.731	0.019	0.116
0	0.122	0.033	0.269	0.003	0.747	0.003	0.027
2000	0.299	0.210	0.290	0.024	0.722	0.028	0.158
0	0.133	0.044	0.270	0.004	0.745	0.005	0.035
2400	0.350	0.261	0.294	0.028	0.711	0.039	0.194
0	0.139	0.050	0.272	0.006	0.744	0.006	0.038

LOAD AT FAILURE: 10599 LBS DATE FABRICATED: 2/20/97  
 MODE OF FAILURE: GYPSUM SHEAR TOP LEFT OF RIGHT PANEL

8' X 8' SAMPLE

GYPSUM LOT #

96-08-17-08-52-22-2



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# NTA Inc. WALL RACK



TEST: ASTM E 72-80

GYPSUM ATTACHED TO BOTH SIDES

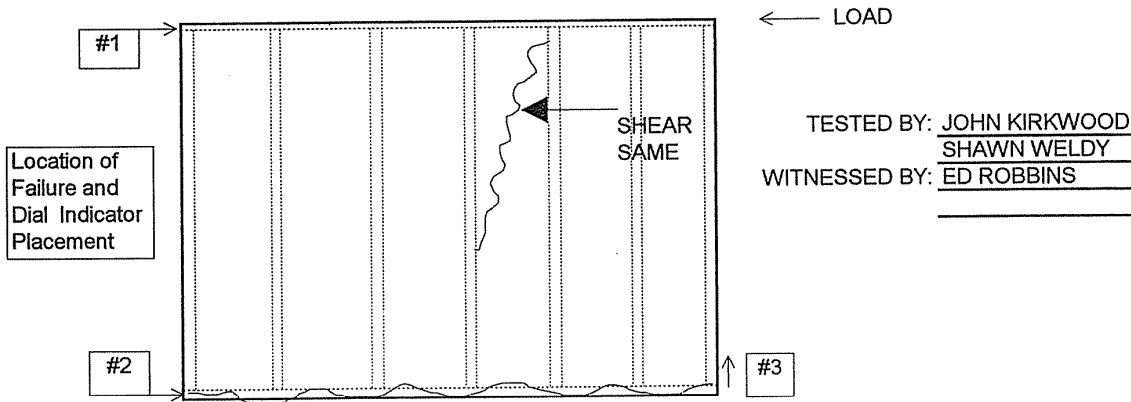
TEST No.: 970010-2 SAMPLE# 3  
 DATE TESTED: 2/27/97  
 TEMPERATURE: 68F  
 HUMIDITY: <15%  
 AVE. MOISTURE CONTENT @ CONST.  
 PLATES: 8-10%  
 STUDS: 10-12% Spaced at 16" O.C.

GYPSUM TYPE: G-P Gyp. Corp. 5/16" Pre-Dec  
 STAPLES: 1/4" X 1" X 19 GA. SENCO K13  
 FIELD SPACING: none 2X3 STUD SPF  
 TOP PLATE SPACING: 6" O.C. 2X3 STUD SPF  
 BOTTOM PLATE SPACING: 6" O.C. 1X3 UTILITY SPF  
 VERTICAL EDGE SPACING: 6" O.C. 2X3 STUD SPF  
 BEAD SIZE/ADHESIVE: 3/8" BEAD POLYBOND  
 Adhesive Manufacturer: CAPITOL ADHESIVES INC.

LOAD (lbs)	INDICATOR #1 (in)		INDICATOR #2 (in)		INDICATOR #3 (in)		RESULTANT DEFLECTION #1-#2-#3
	READING	DEF.	READING	DEF.	READING	DEF.	
0	0.115		0.333		0.860		
400	0.126	0.011	0.335	0.002	0.858	0.002	0.007
0	0.115	0.000	0.333	0.000	0.860	0.000	0.000
800	0.165	0.050	0.336	0.003	0.853	0.007	0.040
0	0.116	0.001	0.334	0.001	0.859	0.001	-0.001
1200	0.198	0.083	0.339	0.006	0.842	0.018	0.059
0	0.118	0.003	0.334	0.001	0.856	0.004	-0.002
1600	0.236	0.121	0.345	0.012	0.835	0.025	0.084
0	0.119	0.004	0.335	0.002	0.852	0.008	-0.006
2000	0.305	0.190	0.350	0.017	0.833	0.027	0.146
0	0.125	0.010	0.335	0.002	0.850	0.010	-0.002
2400	0.368	0.253	0.359	0.026	0.824	0.036	0.191
0	0.125	0.010	0.336	0.003	0.849	0.011	-0.004

LOAD AT FAILURE: 10464 LBS DATE FABRICATED: 2/20/97  
 MODE OF FAILURE: GYPSUM SHEAR TOP LEFT OF RIGHT PANEL

8' X 8' SAMPLE GYPSUM LOT # 96-08-17-08-52-22-2

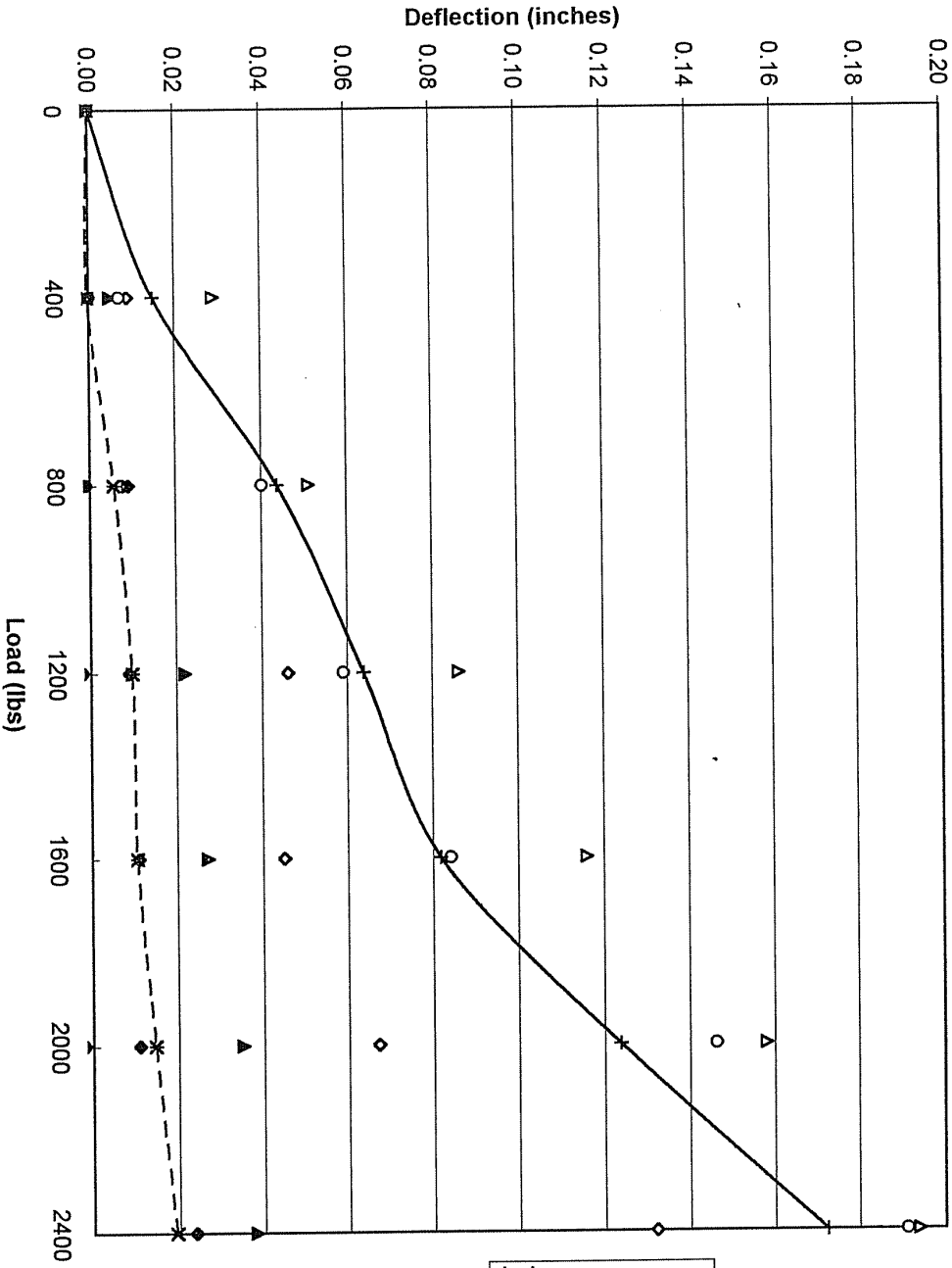


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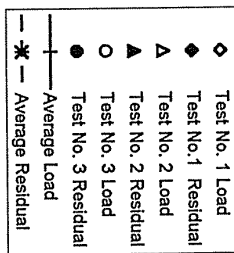
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Load Deflection Curves

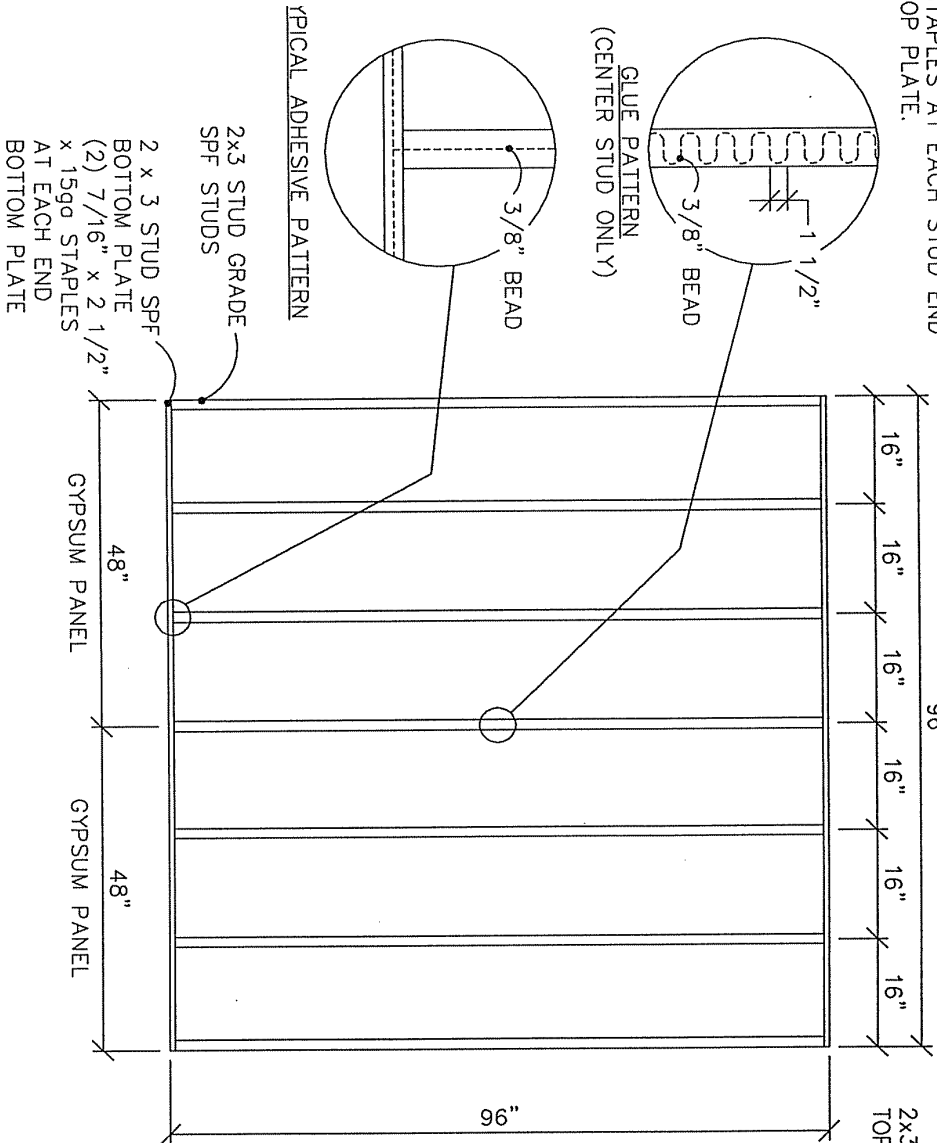


Capital Adhesives, Inc. POLYBOND  
G-P Gypsum Corp. 5/16" Gypsum Wall Board Pre-dec  
BOTH SIDES



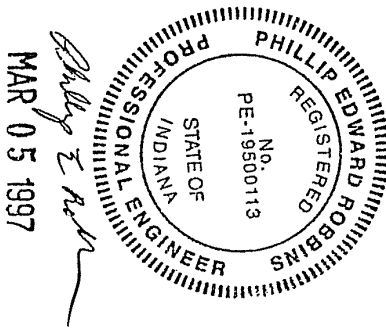


(2) 7/16" x 2 1/2" x 15 ga. STAPLES AT EACH STUD END TOP PLATE.



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

1/4" x 1" x 19 ga. SENCOC K13 STAPLES - 6" O.C. AROUND GYPSUM PERIMETER AND NO FIELD FASTENERS



ADHESIVE = POLYBOND, CAPITOL ADHESIVES INC. DESIGN SHEAR = 524 PLF

(2) 48"x96" G-P GYPSUM CORP. 5/16" GYPSUM WALL BOARD PRE-DEC ATTACHED TO BOTH SIDES WITH STAPLES AND 3/8" BEAD OF ADHESIVE ON ALL STUDS AND ON THE TOP AND BOTTOM PLATES.

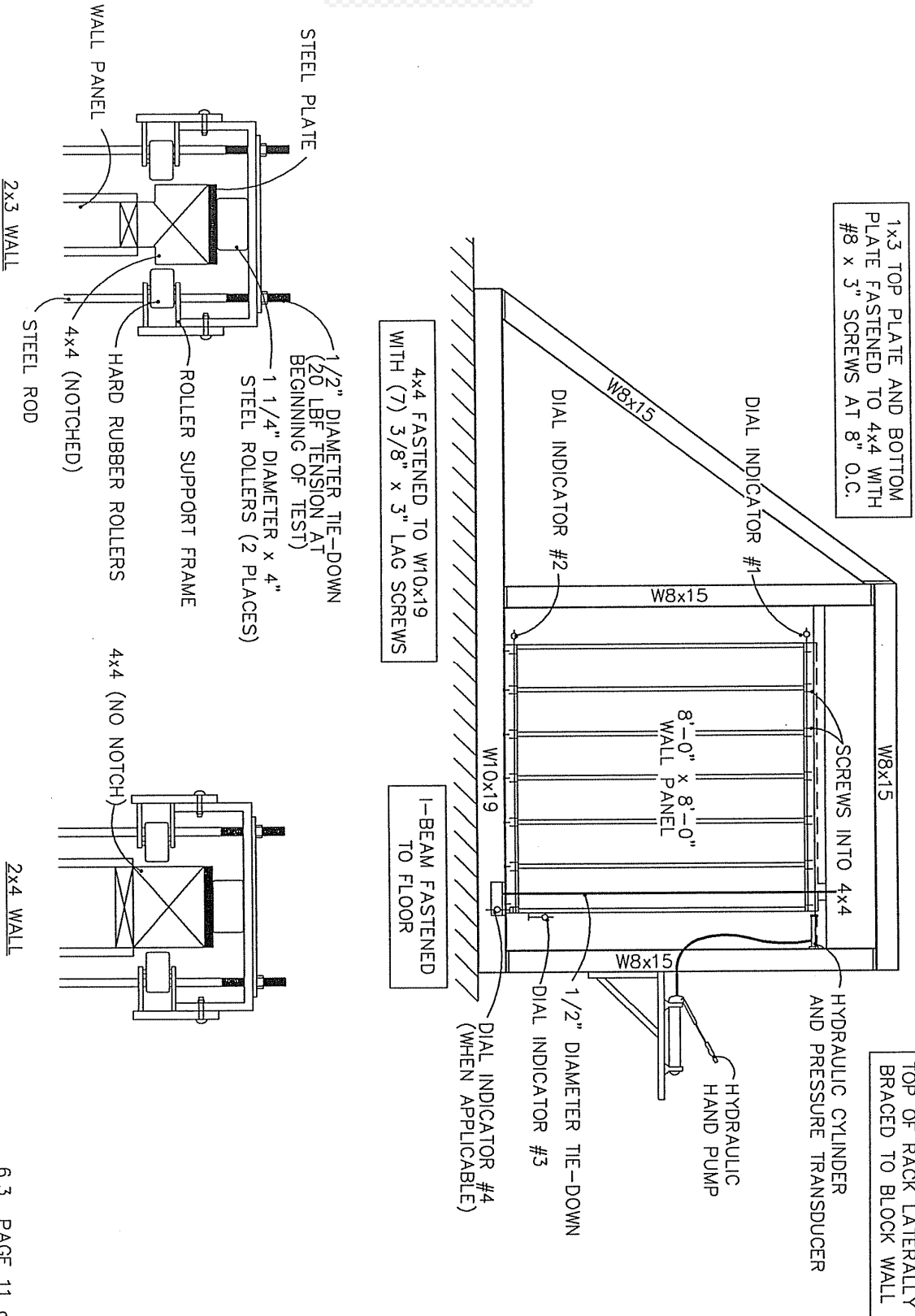
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REVISIONS:

GP614-2p	MODEL:	NTA, INC. 305 NORTH OAKLAND AVENUE, NAPPANEE, IN. 46550	TITLE:	WALL PANEL	SCALE:	N. T. S.	APPROVED BY:	
					DATE:	03/03/96	PROJECT NO.:	NTA970010-2
					DRAWN BY:	RN	DRAWING NO.:	FIGURE #1

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C1HBG-PT-20.18-20.30



REVISIONS:	NTA, INC.		
RT-7153Y	MODEL:	305 NORTH OAKLAND AVE., NAPPANEE, IN. 46550	
	TITLE:	RACKING TEST FIXTURE	
	SCALE:	N.T.S.	
	DATE:	03/03/96	APPROVED BY:
	DRAWN BY:	RN	PROJECT NO:
			NTA970010-2
			DRAWING NO:
			FIGURE #2
		6.3	PAGE 11 of 11

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AUG 30 2024

Federal Manufactured Home Construction And Safety Standards

CI 3A0R1d1V

**SUMMARY OF RESULTS**  
**G-P Gypsum Corp. 5/16" gypsum wall board Pre-Dec**  
**Capitol Adhesives Inc. POLYBOND Adhesive**  
**E-72 80 8' x 8' Shear Wall Tests**

TEST NO.	PANEL DESCRIPTION	LOT #	Single or Double	ADHESIVE DESCRIPTION	BEAD SIZE	STUD C/C	TOP/BTM. PLATE	MECHANICAL PERIMETER FASTENERS	SPACING (INCHES) C/C	FIELD FAST. (Y/N) C/C"	ULTIMATE LOAD (Lbs)	DESIGN LOAD(PLF)
970010-1 s1	G-P 5/16" Pre-Dec	96-08-17-08-52-22-2	single	POLYBOND	3/8"	16"	2x3/1x3	1/4"x1"x19GA.	6"	N	6015	301
970010-1 s2	G-P 5/16" Pre-Dec	96-08-17-08-52-22-2	single	POLYBOND	3/8"	16"	2x3/1x3	1/4"x1"x19GA.	6"	N	6060	303
970010-1 s3	G-P 5/16" Pre-Dec	96-08-17-08-52-22-2	single	POLYBOND	3/8"	16"	2x3/1x3	1/4"x1"x19GA.	6"	N	5814	291
970010-2 s1	G-P 5/16" Pre-Dec	96-08-17-08-52-22-2	double	POLYBOND	3/8"	16"	2x3/2x3	1/4"x1"x19GA.	6"	N	10420	521
970010-2 s2	G-P 5/16" Pre-Dec	96-08-17-08-52-22-2	double	POLYBOND	3/8"	16"	2x3/2x3	1/4"x1"x19GA.	6"	N	10599	530
970010-2 s3	G-P 5/16" Pre-Dec	96-08-17-08-52-22-2	double	POLYBOND	3/8"	16"	2x3/2x3	1/4"x1"x19GA.	6"	N	10464	523

Averages:  
 Ultimate= 5963 LBS  
 Design= 298 PLF

Averages:  
 Ultimate= 10494 LBS  
 Design= 525 PLF



SUMMARY.xls

C1HBG-PT-20.30