



Progressive Engineering Inc.

GEORGIA PACIFIC

Evaluation of the
1/2" DensGlass® Gold Sheathing
to ASTM C1177/C1177 M-06

1/29/2010

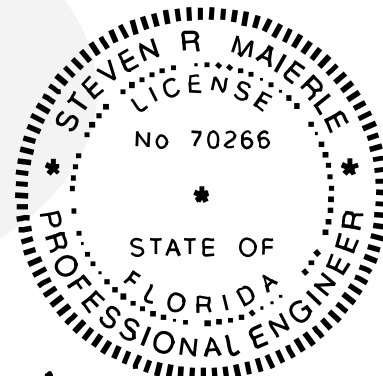
Steven Ray Maierle
Florida P.E. 70266

Practicing through...

PEI Engineering Services, Inc.
58640 State Road 15
Goshen, IN 46528
Phone: 574-533-0337
Fax: 574-533-9736
C.O.A. Number 27447

ENGINEER'S STATEMENT:

I witnessed the physical
testing reported herein and
have reviewed this report for
compliance with the stated
test standard for which the
test was primarily performed.



Steven R Maierle

Date Signed: Feb 08, 2010

This test report contains twenty-one (21) pages, including the cover sheet. Any additions to, alterations of, or unauthorized use of excerpts from this report are expressly forbidden.

2009-1167

(B)

1. TITLE

Evaluation of the 1/2" DensGlass® Gold Sheathing to ASTM C1177/C1177 M-06

2. OBJECTIVE

Evaluation of the Flexural Strength; Core End and Edge Hardness; Nail Pull Resistance; Humidified Deflection; End Squareness, Thickness, Width and Length; and Water Resistance of the gypsum panel products as described in ASTM C 473-06a.

This test report pertains only to the specimens tested. It remains the sole responsibility of the manufacturer to provide a product consistent to that which was tested.

3. TESTED FOR

Georgia Pacific
2861 Miller Road
Decatur, GA 30035

4. TESTING ORGANIZATION

Progressive Engineering Inc.

58640 State Road 15
Goshen, IN 46528
www.p-e-i.com

See IAS Evaluation Report TL-178 for ISO 17025 Accreditation.

5. TESTING PERSONNEL

Laboratory Manager - Jason R. Holdeman
Technician - Chris Stutzman



Some of the tests were witnessed by Eric Kasiske of Georgia Pacific.

6. REFERENCE STANDARDS

ASTM C 1177/C 1177M - 06 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

ASTM C 473 - 06a - Standard Test Methods for Physical Testing of Gypsum Panel Products

7. TEST EQUIPMENT

Tinius Olsen Hydraulic Tension/Compression Machine - (**PEI** #144)
ASTM C473 Flexural Test Fixture - (**PEI** #546)
ASTM C473 Nail Pull and Hardness Tester - (**PEI** #548)
Digital Scale, 8100g - (**PEI** #603)
Temperature and Humidity Meter - (**PEI** #681)
Nail Pull Support Fixture - (**PEI** #547)
1" Dial Indicators - .001" increments
1" Disk Micrometer - (**PEI** #626)

8. TEST SPECIMEN

1/2" DensGlass® Gold Sheathing - manufactured on 11/4/09. The sheathing consisted of a gypsum core with a yellow glass mat on the face and back of the board. The glass mat was wrapped over the long edges of the board. The edges were square with no taper. The average measured thickness was .500".

See Appendix page A2 for the Affidavit letter certifying the random selection of this material.

9. TEST SPECIMEN CONSTRUCTION

Flexural Strength

- A. Three (3) different 1/2" x 4' x 8', sheets of DensGlass® Gold Sheathing were randomly selected and each sheet labeled uniquely.
- B. Each sheet was cut according to ASTM C 473-06a (Method B), Section 11.5.1 guidelines.

Core, End and Edge Hardness

- A. Three (3) different 1/2" x 4' x 8', sheets of DensGlass® Gold Sheathing were randomly selected and each sheet labeled uniquely.
- B. Each sheet was cut according to ASTM C 473-06a (Method B), Section 12.5.1, 12.5.2 and 12.5.3 guidelines.

Nail Pull Resistance

- A. Three (3) different 1/2" x 4' x 8', sheets of DensGlass® Gold Sheathing were randomly selected and each sheet labeled uniquely.
- B. Each sheet was cut and drilled according to ASTM C 473-06a, Section 13.5.1 and 13.5.2 guidelines.

9. TEST SPECIMEN CONSTRUCTION (con't)

Humidified Deflection

- A. Three (3) different 1/2" x 4' x 8', sheets of DensGlass® Gold Sheathing were randomly selected and each sheet labeled uniquely.
- B. Each sheet was cut according to ASTM C 473-06a, Section 14.5.1 guidelines.

End Squareness, Thickness, Width and Length

Three (3) different 1/2" x 4' x 8', sheets of DensGlass® Gold Sheathing were randomly selected and each sheet labeled uniquely.

Water Resistance

- A. Three (3) different 1/2" x 4' x 8', sheets of DensGlass® Gold Sheathing were randomly selected and each sheet labeled uniquely.
- B. Each sheet was scored and broke according to ASTM C473-06a, Section 20.5.1 guidelines.

10. SPECIMEN CONDITIONING

The test specimens were conditioned in accordance to ASTM C 473-06a.

11. TEST SETUP

Flexural Strength

The test specimens were placed in a fixture constructed in accordance to ASTM C 473-06a, Section 11.3.1. This fixture and specimen were placed in a Tinius Olsen test machine. See attached Fixture Drawing no. F969.

Core, End and Edge Hardness

The test specimens were secured in a vertical clamp fixture. The fixture and specimen combination was placed in a Tinius Olsen test machine. See attached Fixture Drawing no. F1216.

Nail Pull Resistance

The test specimens were placed on the Nail Pull Support Fixture so that the 7/64" pre-drilled center hole of the test specimen was centered within the 3" diameter support fixture hole. The test specimen and Nail Pull Support fixture were placed in the Tinius Olsen test machine so that the punch tool entered the 7/64" center hole, and was perpendicular to the face of the test specimen. See attached Fixture Drawing no. F971.

11. TEST SETUP (con't)

Humidified Deflection

The test specimens were placed in a humidity chamber in accordance to ASTM C 473-06a, Section 14.3. A dial indicator was positioned under the center of each board to measure deflection. See attached Fixture Drawing no. F2010.

Water Resistance

The test specimens were placed flat on 1/4" supports in a water bath with a 1" head of water above the top of the specimen.

12. TEST PROCEDURE

Flexural Strength

- A. A vertical load was applied to the face and the backside of an edge parallel specimen, parallel to the 12" edge, and across the centerline of the 16" edge.
- B. The vertical load was increased at a rate of 1"/minute until the test sample reached failure. Failure was considered a significant loss of load followed by no appreciable gain.
- C. A vertical load was applied to the face and to the backside of an edge perpendicular specimen, parallel to the 12" edge, and across the centerline of the 16" edge.
- D. The vertical load was increased at a rate of 1"/minute until the test specimen reached failure. Failure was considered a significant loss of load followed by no appreciable gain.
- E. All maximum loads attained were recorded.
- F. The test process was repeated for all test specimens.

Core, End and Edge Hardness

- A. The "CORE" test sample was lined up so that a 12" saw cut edge was facing upward, and therefore subject to the test pressure application.
- B. The "END" test sample was lined up so that the 12" mill-cut end was facing upward, and therefore subject to the test pressure application.
- C. The "EDGE" test sample was lined up so that the 12" edge was facing upward, and therefore subject to the test pressure application.
- D. A vertical load was applied to the edge of a test sample at three (3) locations using the punch tool which was inserted 1/2" into the test sample, as defined in ASTM C 473-06a Section 12.6. The punch tool was inserted at a rate of 1"/ minute.
- E. The maximum load attained was recorded.
- F. This test process was repeated for all test samples.

12. TEST PROCEDURE (con't)

Nail Pull Resistance

- A. A vertical load was applied to the center of a test sample using the punch tool at a rate of 1"/minute until the test sample reached failure. Failure was considered a significant loss of load followed by no appreciable gain.
- B. The maximum load attained was recorded.
- C. This procedure was repeated for each test sample according to ASTM C 473-06a Section 13.6.

Humidified Deflection

- A. Each specimen was suspended face down on parallel and level bearing edges in an atmosphere of 90 +/- 3° F and 90 +/- 3% relative humidity for 48 hours.
- B. The humidified deflection of each specimen was measured from the dial indicator after the 48 hour time period.

End Squareness, Thickness, Width and Length

End Squareness

End squareness was determined by using a T-square and measuring device at both ends of each specimen as described in ASTM C473-06a, Section 15.6.

Thickness

Thickness was measured with a micrometer at six (6) locations at both ends of each specimen as described in ASTM C473-06a, Sections 16.5 and 16.6.

Width

Width was measured with a tape measure at two (2) locations at both ends of each specimen as described in ASTM C473-06a, Section 18.6.

Length

Length was measured with a tape measure at two (2) locations at both edges of each specimen as described in ASTM C473-06a, Section 19.6.

Water Resistance

- A. Each specimen was weighed then submerged in the water bath for two (2) hours.
- B. The specimen was removed and the excess water was wiped from the surfaces and edges.
- C. The specimen was weighed immediately again.
- D. This procedure was repeated for each test sample according to ASTM C 473-06a, Section 20.6.

13. TEST RESULTS

See attached data pages for test results.

14. CONCLUSION

The 1/2" DensGlass® Gold Sheathing met the requirements as specified in ASTM C1177/C1177M-06.

Progressive Engineering Inc.

ASTM C 473-06a Flexural Strength (Method B)

Date: 1/21/2010
Client: Georgia Pacific

Project No.: 2009-1167
Test Condition: 71.0 °F and 48% R.H.
Load Rate: 1" per minute

Specimen: 1/2" DensGlass® Gold Sheathing

Edge Perpendicular = Long edge of the full panel is perpendicular to the load bearing edges.

Edge Parallel = Long edge of the full panel is parallel to the load bearing edges.

Test No.	Test Sample	Sample Alignment	Maximum Load Reached	Failure Description
1	2-1	Edge Perpendicular Facing Side Up	157 lbf	Core Failure
2	2-2	Edge Perpendicular Facing Side Down	195 lbf	Core Failure
3	2-3	Edge Parallel Facing Side Up	110 lbf	Core Failure
4	2-4	Edge Parallel Facing Side Down	109 lbf	Core Failure
5	4-1	Edge Perpendicular Facing Side Up	144 lbf	Core Failure
6	4-2	Edge Perpendicular Facing Side Down	187 lbf	Core Failure
7	4-3	Edge Parallel Facing Side Up	98 lbf	Core Failure
8	4-4	Edge Parallel Facing Side Down	140 lbf	Core Failure
9	7-1	Edge Perpendicular Facing Side Up	160 lbf	Core Failure
10	7-2	Edge Perpendicular Facing Side Down	194 lbf	Core Failure
11	7-3	Edge Parallel Facing Side Up	108 lbf	Core Failure
12	7-4	Edge Parallel Facing Side Down	142 lbf	Core Failure

		Minimum Breaking Load per ASTM C1177-06
Average Max Load Reached - Edge Perpendicular		100 lbf
Average Max Load Reached - Edge Parallel		80 lbf

Average Max Load Reached	Edge Perpendicular Facing Side Up	154 lbf
	Edge Perpendicular Facing Side Down	192 lbf
	Edge Parallel Facing Side Up	105 lbf
	Edge Parallel Facing Side Down	130 lbf

Progressive Engineering Inc.

ASTM C 473-06a Core, End and Edge Hardness (Method B)

Date: 1/21/2010
Client: Georgia Pacific

Project No.: 2009-1167
Test Condition: 71.0 °F and 48% R.H.
Load Rate: 1" per minute

Specimen: 1/2" DensGlass® Gold Sheathing

Core Test

Test No.	Test Sample	Test A	Test B	Test C	15% off Replacement	
1	2	51 lbf	48 lbf	48 lbf		Average = 48 lbf Minimum Hardness = 15 lbf per ASTM C1177-06
2	4	50 lbf	42 lbf	47 lbf		
3	7	49 lbf	49 lbf	45 lbf		

End Test

Test No.	Test Sample	Test A	Test B	Test C	15% off Replacement	
4	2	44 lbf	44 lbf	40 lbf		Average = 44 lbf Minimum Hardness = 15 lbf per ASTM C1177-06
5	4	45 lbf	35 lbf	42 lbf	48 lbf	
6	7	46 lbf	44 lbf	43 lbf		

Edge Test

Test No.	Test Sample	Test A	Test B	Test C	15% off Replacement	
7	2-1	47 lbf	50 lbf	47 lbf		Average = 49 lbf Minimum Hardness = 15 lbf per ASTM C1177-06
8	2-2	45 lbf	50 lbf	48 lbf		
9	4-1	49 lbf	46 lbf	38 lbf	57 lbf	
10	4-2	42 lbf	59 lbf	60 lbf	56 lbf, 64 lbf	
11	7-1	53 lbf	47 lbf	45 lbf		
12	7-2	50 lbf	45 lbf	47 lbf		

Progressive Engineering Inc.

ASTM C 473-06a Nail Pull Resistance (Method B)

Date: 1/21/2010
Client: Georgia Pacific

Project No.: 2009-1167
Test Condition: 71.0 °F and 48% R.H.
Load Rate: 1" per minute

Specimen: 1/2" DensGlass® Gold Sheathing

Test No.	Test Sample	Maximum Load	15% off Discard
1	2-1	112 lbf	
2	2-2	101 lbf	
3	2-3	96 lbf	
4	2-4	94 lbf	
5	2-5	108 lbf	
6	4-1	112 lbf	
7	4-2	97 lbf	
8	4-3	105 lbf	
9	4-4	103 lbf	
10	4-5	97 lbf	
11	7-1	115 lbf	
12	7-2	91 lbf	
13	7-3	98 lbf	
14	7-4	112 lbf	
15	7-5	92 lbf	

Average = 102 lbf

Minimum Resistance = 80 lbf
per ASTM C1177-06

Progressive Engineering Inc.

ASTM C 473-06a Humidified Deflection

Date: 1/29/2010
Client: Georgia Pacific

Project No.: 2009-1167

Test Condition: 90 +/- 3 °F and 90 +/- 3 % R.H.

Specimen: 1/2" DensGlass® Gold Sheathing

Specimen	Sample No.	Deflection (in)
1/2" 2	1	.036
	2	.043
1/2" 4	1	.022
	2	.028
1/2" 7	1	.063
	2	.073

***Average = 0**

Max Allowable Deflection = 1/4
per ASTM C1177-06

* The Average value is derived from ASTM C473-06a Section 14, which states "Report the humidified deflection as the average of the specimens to the nearest 1/8" in. (3 mm)."

ASTM C 473-06a End Squareness, Thickness, Width, Length

Date: 1/25/2010

Client: Georgia Pacific

Project No.: 2009-1167

Specimen: 1/2" DensGlass® Gold Sheathing

End Squareness (in)												
Specimen	A	B	Average = 0									
3	1/16	1/16	Tolerance (+/-) = 1/8 per ASTM C1177-06									
5	0	0										
8	1/16	1/8										
Width (in)												
Specimen	A	B	Nominal = 48									
3	47 29/32	47 15/16	Average = 47 29/32									
5	47 29/32	47 29/32	Difference = - 3/32									
8	47 7/8	47 29/32	Tolerance = (+0" / -1/8") per ASTM C1177-06									
Length (in)												
Specimen	A	B	Nominal = 96									
3	95 15/16	95 7/8	Average = 95 7/8									
5	95 15/16	95 7/8	Difference = - 1/8									
8	95 15/16	95 7/8	Tolerance (+/-) = 1/4 per ASTM C1177-06									
Thickness (in)												
Specimen	A	B	C	D	E	F	G	H	I	J	K	L
3	.507	.504	.499	.499	.497	.501	.497	.497	.500	.499	.501	.502
5	.505	.503	.500	.498	.496	.499	.497	.499	.498	.497	.502	.504
8	.506	.502	.500	.499	.498	.499	.498	.499	.500	.499	.502	.506
												Nominal Tolerance = (+/-) 1/32" or .03125"
												Board Tolerance = (+/-) 1/16" or .0625" per ASTM C1177-06

Progressive Engineering Inc.

ASTM C 473-06a Water Resistance Test

Date: 1/21/2010

Project No.: 2009-1167

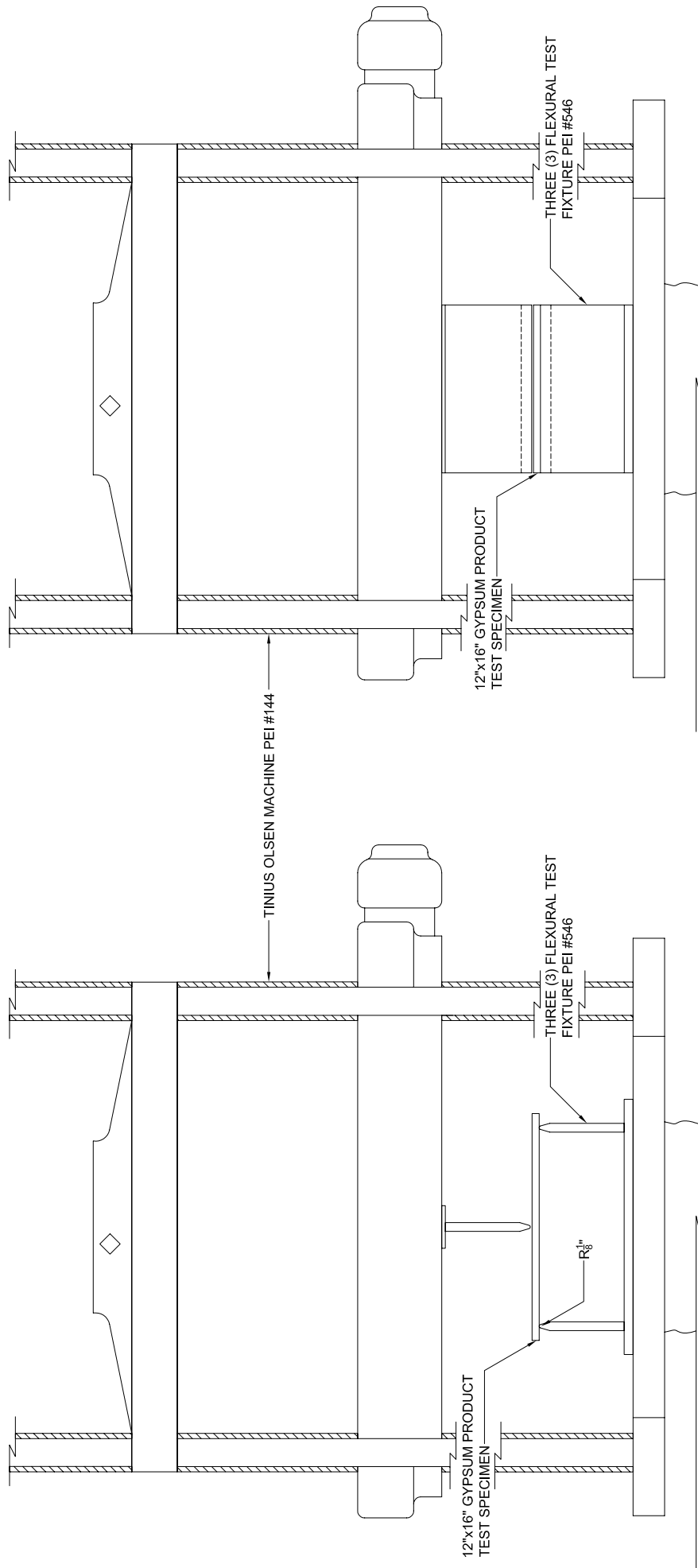
Client: Georgia Pacific

Specimen: 1/2" DensGlass® Gold Sheathing

Specimen	Weight Before Soak	Weight After Soak	Weight Gain	Weight Gain Percentage
2	928.4 g	997.8 g	69.4 g	7%
4	917.7 g	985.6 g	67.9 g	7%
7	923.6 g	999.9 g	76.3 g	8%

Average Water Absorption = 8%

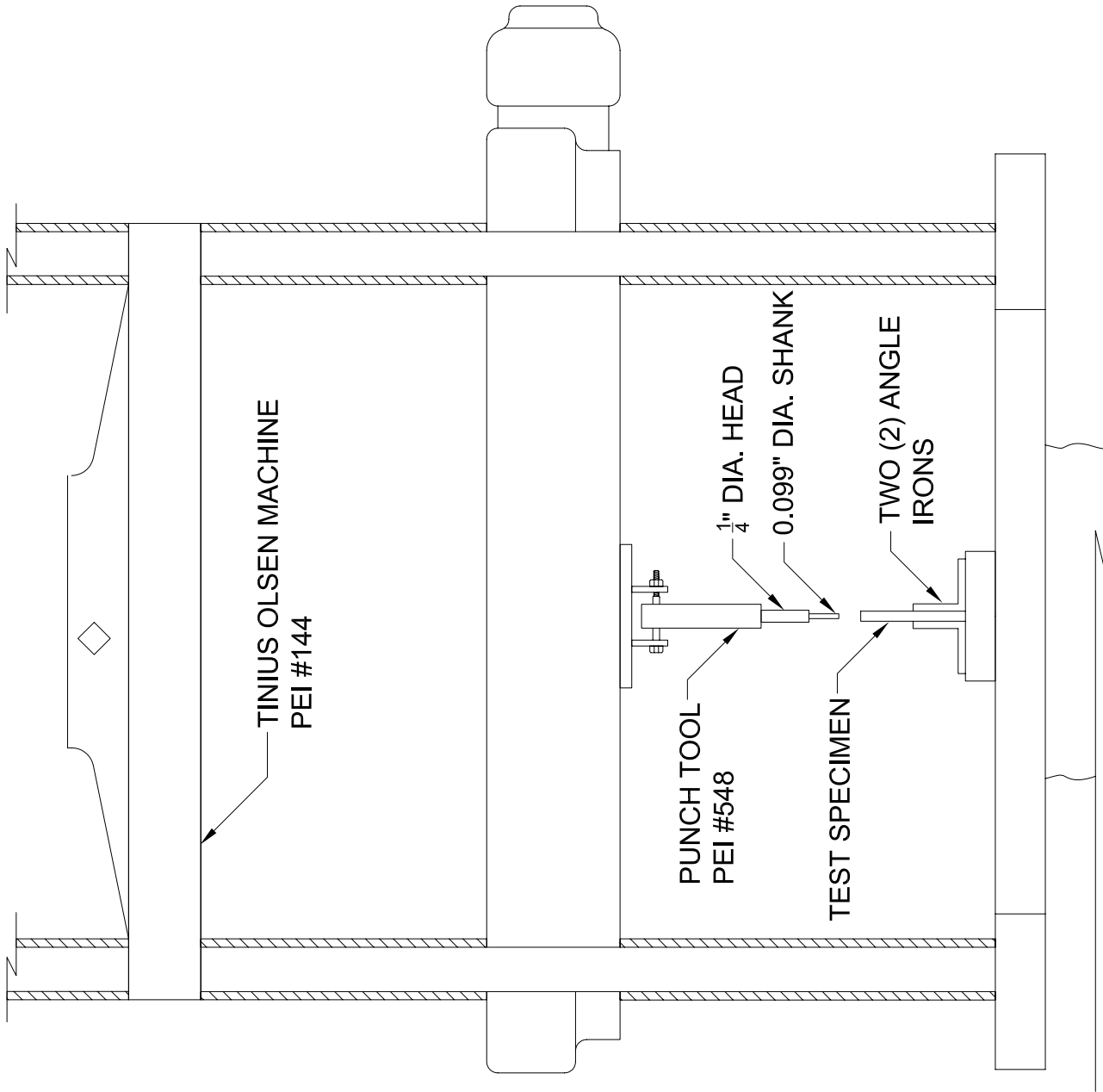
Maximum Absorption = 10%
per ASTM C1177-06



FRONT VIEW

SIDE VIEW

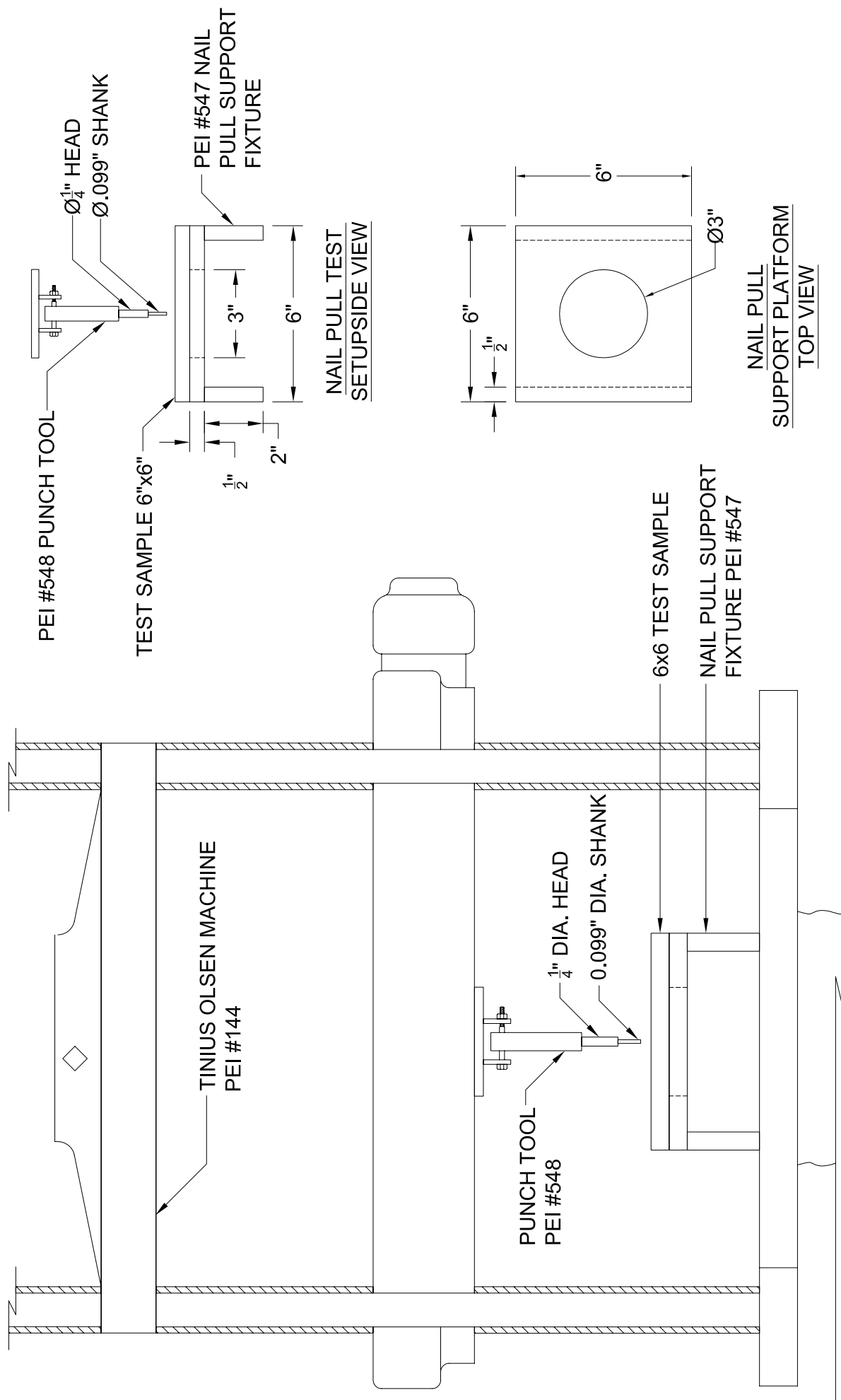
DWN BY: A. BENDER DATE: 6/15/05 SCALE: DRAWING NUMBER: F969		This drawing and all information contained herein is the property of PROGRESSIVE ENGINEERING, INC. and is not to be reproduced without the written permission of P.E.I. assumes no responsibility for unauthorized use of this drawing. TITLE: TEST SET-UP	
		Progressive Engineering Inc. 58640 State Road 15 Goshen, IN 46528 Phone (574) 533-0337 Fax (574) 533-9736 www.p-e-i.com	





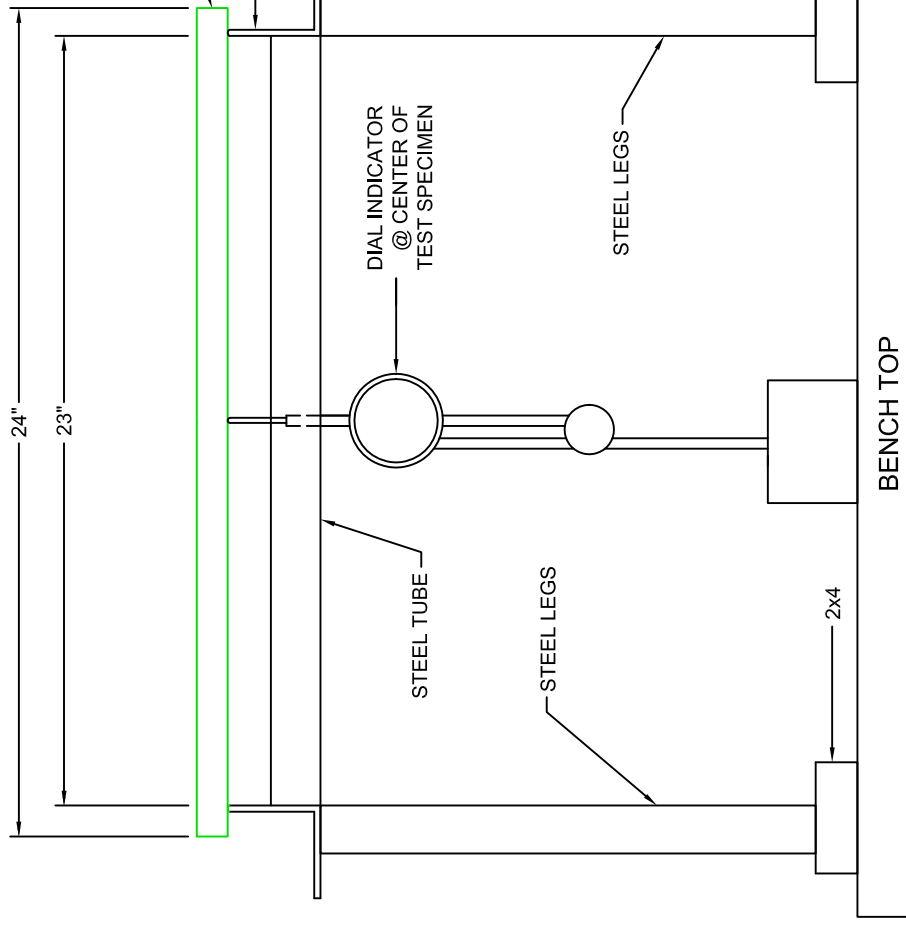
Progressive Engineering Inc.
 58640 State Road 15
 Goshen, IN 46528
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 Fax (574) 533-9736
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DWN BY: A. BENDER DATE: 6/15/05 SCALE: DRAWING NUMBER F1216		This drawing and all information contained herein is the property of PROGRESSIVE ENGINEERING, INC. and is not to be reproduced without the written permission of PEI. PEI assumes no responsibility for unauthorized use of this drawing.	
TITLE: TEST SET-UP			

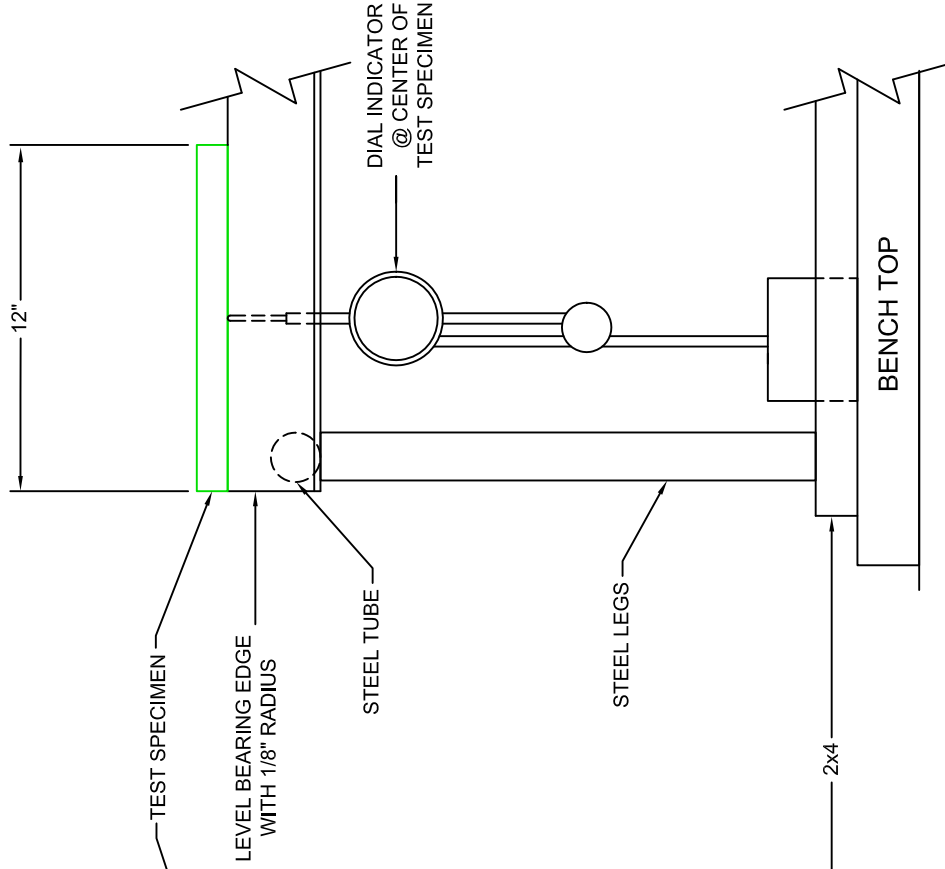


DRAWN BY: A. BENDER	This drawing and all information contained herein is the property of PROGRESSIVE ENGINEERING, INC. and is not to be reproduced without the written permission of P.E.I. Progressive Engineering Inc. assumes no responsibility for unauthorized use of this drawing.
DATE: 6/15/05	
SCALE:	
DRAWING NUMBER F971	
TITLE: TEST SET-UP	

EDGE VIEW



END VIEW

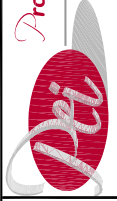


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DWN. BY: L.WIG
DATE: 04/28/08
SCALE:
DWG. NO.

F2010

TITLE: TEST SET-UP



Progressive Engineering Inc.

58640 State Road 15
Goshen, IN 46528
Phone (574) 533-0337
Fax (574) 533-9736

www.p-e-i.com

Progressive Engineering Inc.

1/2" DensGlass® Gold Sheathing



Typical Flexural Test Set-up



Typical Core End & Edge Hardness Test Set-up



Typical Nail Pull Resistance Test Set-up



Typical Humidified Deflection Test Set-up

APPENDIX

Georgia Pacific
2009-1167
(B)



Georgia-Pacific
Gypsum

801 Minacker Road
Antioch, CA 94509

Tele: (925) 757-2870
Fax: (925) 757-8540

December 08, 2009

Progressive Engineering Inc.
58640 SR 15
Goshen, IN 46528

Attn: Mr. Jason Holdeman,
Laboratory Manager
jholdeman@p-e-i.com

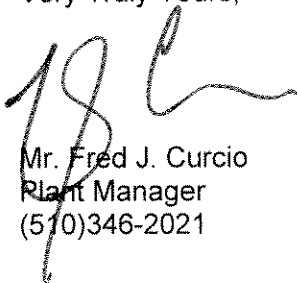
Dear Mr. Holdeman,

This is to confirm that the ½" DensGlass Sheathing product shipped to you from our facility for the purpose of evaluation were manufactured according to Georgia-Pacific Gypsum LLC manufacturing specifications and are representative of standard production.

The manufacturing code for the product is: 11/04/09 CA1 10:46
11/04/09 CA1 10:47

½" DensGlass® Sheathing:

Very Truly Yours,



Mr. Fred J. Curcio
Plant Manager
(510)346-2021



Mr. Robert J. King
Quality Resource Manager
(925) 757-2870 X293

Cc: Anne H. Ksionzyk
Decatur Technical Center

Progressive Engineering Inc.

Board Weight and Thickness

Date: 1/14/2010

Project No.: 2009-1167

Client: Georgia Pacific

Temp.: 69 °F

Specimen: 1/2" DensGlass® Gold Sheathing

Humidity: 41% R.H.

Sample No.	Weight (lbs)	*Thickness (in)	Board Code
09-1167-12RE-1	66	.503	11/04/09 CA1 10:46
09-1167-12RE-2	66.4	.502	11/04/09 CA1 10:46
09-1167-12RE-3	65.7	.502	11/04/09 CA1 10:47
09-1167-12RE-4	65	.502	11/04/09 CA1 10:47
09-1167-12RE-5	66.3	.502	11/04/09 CA1 10:47
09-1167-12RE-6	65.7	.502	11/04/09 CA1 10:45
09-1167-12RE-7	65.8	.503	11/04/09 CA1 10:46
09-1167-12RE-8	65.6	.503	11/04/09 CA1 10:46
09-1167-12RE-9	66.4	.504	11/04/09 CA1 10:47
09-1167-12RE-10	66	.503	11/04/09 CA1 10:47

Note: "NER-574" was printed on the face of all the sheets.

Min:	65.0	.502
Max:	66.4	.504
Average:	65.9	.503

* These thickness measurements were taken for informational purposes only. For official board thickness results, see the ASTM C 473 End Squareness, Thickness, Width, Length data page, located in Georgia Pacific Report 2009-1167 (B).