Farabaugh Engineering and Testing Inc.

Project No. T112-17

Report Date: January 31, 2017

No. Pages: 8 (inclusive)

UL 580 / UL1897 UPLIFT RESISTANCE TESTING

LARGE PRECISION TILE PANEL
14-1/2" WIDE X 24 GA. STEEL

FOR

PETERSEN ALUMINUM CORP.
10551 PAC ROAD
TYLER, TX. 75707

Report Prepared By:

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Reviewed and Approved By:

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Purpose

This test method covers the evaluation of uplift resistance of roof assemblies per UL 580-06, rev. 2009 and UL 1897-04, rev. 2008 and as provided herein.

Test Specimen

Customer: Petersen Aluminum
10551 PAC Rd.
Tyler, TX. 75707

Specimen: Large Precision Tile Panel, 14-1/2" wide, 24 ga. steel

Substrate: 5/8" plywood decking / W. R. Grace Ice & Water Shield roof underlayment membrane

Testing Apparatus

Test Chamber: The test chamber consist of three sections: a top section to create a uniform vacuum, a center section in which the roof assembly is constructed, and a bottom section to create a uniform positive pressure.

Pressure Chamber: The air pressure in the pressure chamber was measured at five points. Each of four points were located 42" from chamber corners at a 45 degree angle, with the fifth tube located 18" from the center of the air inlet opening. The end of each tube was 7" above the chamber floor. The tubes were connected to a manifold that, in turn was connected to a manometer.

Vacuum Chamber Measurement: The air pressure in the vacuum chamber was measured at five points. Each of four points was located 18" from chamber corners at a 45 degree angle and 8" above the chamber floor. The fifth tube located 12" from the center of the exhaust opening and 6" below the opening. The tubes were connected to a manifold that, in turn was connected to a manometer. The pressure in the vacuum chamber was controlled by an automatic damper. The damper door was moved by means of an air motor hooked to an air line and controlled by pressure switches located in the control console. An additional pressure line from the manifold to pressure switches controlled the automatic damper.

Installation

- The 5/8" plywood was attached to 2 x 10 wood structural framing supports using 8d x 2-1/2" long ring shank nails. The nail pattern is 6" o.c. in the field and 6" o.c. around the perimeter.

- A layer of Self Adhering Waterproof Membrane was on top of the plywood sheathing substrate.

- The Large Precision Tile Panels were attached thru the top layer of underlayment membrane and into the plywood substrate using (2) #10 -13 x 1" long GP Concealor screws. Fasteners were located at the pre-punched fasteners holes spaced at 12-7/8" o.c. on the top nail flange for each panel. See test setup for location of perimeter screws around the test specimen. All fasteners for the panel were the #10-13 x 1" long GP Concealer screws.

- A plastic barrier was located between the panels and the underlying substrate.

Test Procedure

- The test assembly was subjected to positive and negative pressures to form an uplift pressure at the values and time duration per UL 580 as shown in the attached table.

- Upon completion of each 60 minute oscillation phase and at the conclusion of each class level, the assembly was examined and observations recorded.

- Vertical movement of the assembly during the tests was recorded.

- Subsequent to the completion of Phase 5 of the Class 90 test sequence, the test specimen was subjected to higher static uplift pressures per UL 1897 as shown on the attached table. The positive uplift pressure supplied from below was maintained at 48.5 psf while the negative uplift pressure supplied from above was increased in increments until failure or the desired uplift pressure was obtained.

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TEST #1

Test Date: 1/26/17

Specimen: Large Precision Tile Panel, 14-1/2" wide, 24 ga. steel

Panel Fastener Spacing on Nail flange: 12.875" o.c.

Class 30 Deflection Measurements

Phase	Time Duration (min.)	Negative Pressure (psf)	Positive Pressure (psf)	#1 (in)	#2 (in)	#3 (in)	#4 (in)
Initial	0	0	0	4	4-5/16	7-3/16	5-1/16
1	5	16.2	0	4-1/8	4-3/8	7-1/8	5-1/8
2	5	16.2	13.8	4-1/4	4-7/16	7	5-1/4
3	60	8.1 – 27.7*	13.8	4-3/8	4-1/2	6-15/16	5-1/4
4	5	24.2	0	4-5/16	4-7/16	7	5-3/16
5	5	24.2	20.8	4-7/16	4-9/16	6-15/16	5-5/16

Class 60 Deflection Measurements

Phase	Time Duration (min.)	Negative Pressure (psf)	Positive Pressure (psf)	#1 (in)	#2 (in)	#3 (in)	#4 (in)
1	5	32.3	0	4-3/8	4-1/2	7	5-1/4
2	5	32.3	27.7	4-1/2	4-5/8	6-7/8	5-3/8
3	60	16.2 – 55.4*	27.7	4-9/16	4-11/16	6-3/4	5-7/16
4	5	40.4	0	4-3/8	4-1/2	7	5-1/4
5	5	40.4	34.6	4-9/16	4-11/16	6-3/4	5-7/16

Class 90 Deflection Measurements

Phase	Time Duration (min.)	Negative Pressure (psf)	Positive Pressure (psf)	#1 (in)	#2 (in)	#3 (in)	#4 (in)
1	5	48.5	0	4-1/2	4-5/8	6-7/8	5-3/8
2	5	48.5	41.5	4-5/8	4-7/8	6-3/4	5-7/16
3	60	24.2 – 48.5*	41.5	4-5/8	4-7/8	6-3/4	5-7/16
4	5	56.5	0	4-1/2	4-5/8	6-7/8	5-3/8
5	5	56.5	48.5	4-3/4	4-15/16	6-5/8	5-5/8

* Oscillation frequency as specified in UL 580.

Results: Upon completion of the above loading, there were no specimen failures.

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TEST MOCK-UP #1

UL 1897 UPLIFT TEST

Test Date: 1/26/17

Specimen: Large Precision Tile Panel, 14-1/2" wide, 24 ga. steel

Panel Fastener Spacing on Nail flange: 12.875" o.c.

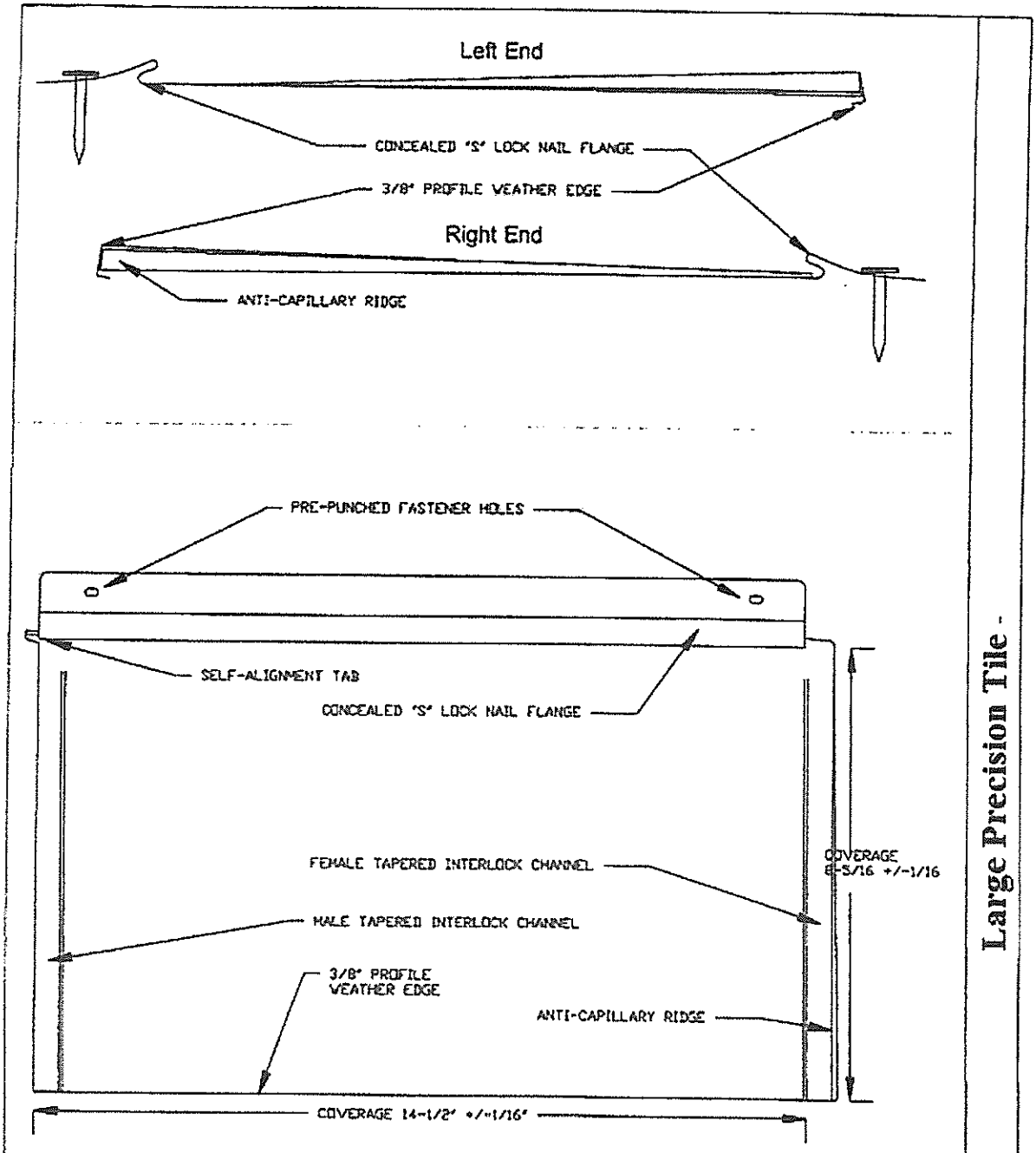
Deflection Measurements

Total Uplift Pressure (psf)	Time Duration (min.)	#1 (in)	#2 (in)	#3 (in)	#4 (in)
112	1	4-7/8	5	6-9/16	5-11/16
127	1	4-15/16	5-1/8	6-1/2	5-3/4
142	1	5	5-1/4	6-3/8	5-7/8
157	1	5-1/8	5-3/8	6-5/16	6
172	1	5-1/4	5-7/16	6-1/4	6-1/16
187	1	5-3/8	5-9/16	6-1/8	6-3/16
202	1	5-1/2	5-11/16	6	6-3/8
217	1	5-5/8	5-13/16	5-7/8	6-1/2
232	1	5-7/8	5-15/16	5-3/4	6-5/8
248	1	6	6-1/16	5-5/8	6-3/4

Results:

Maximum Total Uplift Pressure (sustained for 1 min.) = 248.0 psf

Maximum Total Uplift Test Pressure (failure) = 257.4 psf
(Plywood pulled off of joists)

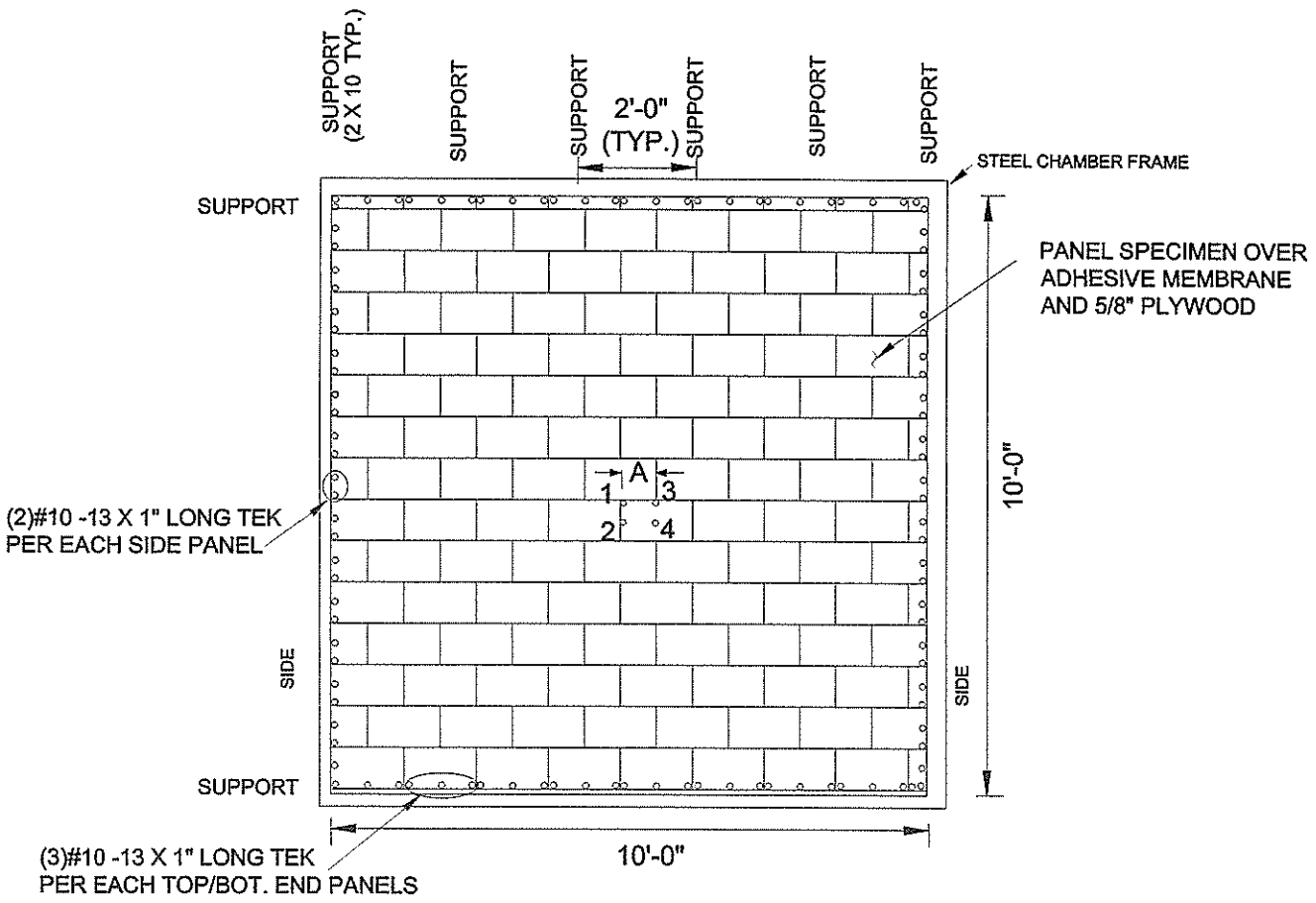


Large Precision Tile - Profile Details

Millennium tiles	*STAINLESS COLORS	GA. AVAILABLE	MATERIALS	FINISH
			SIZES AVAILABLE	

PG. 1

TEST SETUP



PLAN VIEW OF PANELS

Project No. T112-17

TENSILE TEST REPORT

Client: Petersen Aluminum
10551 PAC Rd.
Tyler, TX. 75707

Test Date: January 31, 2017

Test Method: ASTM A370-10

Material Description: Large Precision Tile Panel, 14-1/2" wide, 24 ga. steel

Sample No.	Width (in)	Thickness (in)	Yield Load (lb)	Max. Load (lb)	0.2% Offset Yield Strength (psi)	Tensile Strength (psi)	Elongation (% in 2 inches)
0012-17	0.498	0.023	540.7	677.4	47,204	59,140	28.9

Equipment Used: Tensile Machine #QT7-061196-020
Caliper #1074379
Extensometer #10311744D
Micrometer #110596927