



Farabaugh Engineering and Testing Inc.

Project No. T245-17

Report Date: September 1, 2017

No. Pages: 9 (inclusive)

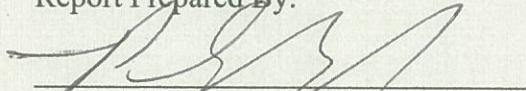
UL 580 / UL1897 UPLIFT RESISTANCE TESTING

HORIZON LOC METAL ROOF PANEL 16" WIDE X 26 GA. STEEL

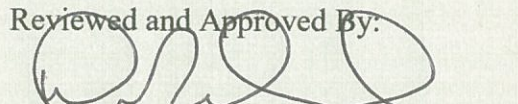
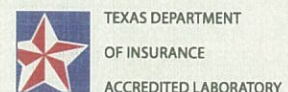
FOR

CENTRAL STATES MANUFACTURING, INC.
302 JANE PLACE
LOWELL, AR. 72745

Report Prepared By:


Paul G. Farabaugh

Reviewed and Approved By:


Daniel G. Farabaugh

Project No. T245-17

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 Dates:

8/23/17 - Test #1 Panel fasteners @ 4.69" o.c.

Test Specimen

Manufacturer: Central States Manufacturing, Inc.
302 Jane Place
Lowell, AR 72745

Specimen: Horizon Loc Metal Roof Panel, 16" wide x 26 ga. Steel.

Substrate: 7/16" OSB wood decking

Sealant: WeatherMaster Metal Roof Sealant

Underlayment: 30# felt paper

Testing Apparatus

Test Chamber: The test chamber consisted 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 degrees 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 degrees 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 7/16" OSB wood decking 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 30 lb felt paper was on top of the 7/16" OSB wood sheathing substrate.
- A 3/8" bead of WeatherMaster Metal Roof Sealant was applied at seam location (see Detail 1)
- The Horizon Loc Panels were attached thru the felt paper and into the wood substrate using #10 -12 x 1" long pancake head wood screws. The fastening pattern for the panel screw was at every other slotted hole (spacing 4.69" o.c.).
- The panel ends were attached to the perimeter with #10 -14 x 1-1/2" long hex head wood screws with 1/2" dia. metal washers (4 per panel at panel ends and 6" o.c. at longitudinal sides). Continuity fastener was on each end of the panel at each panel seam.
- A plastic barrier was located between the panels and the underlying substrate.

NOTE: Specimen cured for 14 days prior to testing to let sealant in seam to cure.

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.

Project No. T245-17

TEST MOCK-UP #1

Test Date: 8/23/17

Specimen: Horizon Loc Metal Roof Panel, 16" wide x 26 ga. Steel

Fastener Spacing: 4.69" 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	6-11/16	7-1/2	6-13/16	7-5/8
1	5	16.2	0	6-5/8	7-1/8	6-3/4	7-3/16
2	5	16.2	13.8	6-9/16	6-15/16	6-11/16	7
3	60	8.1 – 27.7*	13.8	6-1/2	6-13/16	6-5/8	6-13/16
4	5	24.2	0	6-9/16	7	6-3/4	7
5	5	24.2	20.8	6-1/2	6-3/4	6-11/16	6-3/4

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	6-1/2	6-13/16	6-11/16	6-7/8
2	5	32.3	27.7	6-7/16	6-5/8	6-9/16	6-5/8
3	60	16.2 – 55.4*	27.7	6-3/8	6-3/8	6-1/2	6-3/8
4	5	40.4	0	6-7/16	6-9/16	6-9/16	6-5/8
5	5	40.4	34.6	6-5/16	6-3/8	6-7/16	6-3/8

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	6-3/8	6-1/2	6-1/2	6-1/2
2	5	48.5	41.5	6-1/4	6-1/4	6-3/8	6-1/4
3	60	24.2 – 48.5*	41.5	6-1/4	6-1/4	6-3/8	6-1/4
4	5	56.5	0	6-3/8	6-3/8	6-1/2	6-3/8
5	5	56.5	48.5	6-3/16	6-1/8	6-5/16	6

* Oscillation frequency as specified in UL 580.

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

Project No. T245-17

TEST MOCK-UP #1

UL 1897 UPLIFT TEST

Test Date: 8/23/17

Specimen: Horizon Loc Metal Roof Panel, 16" wide x 26 ga. Steel

Fastener Spacing : 4.69" o.c.

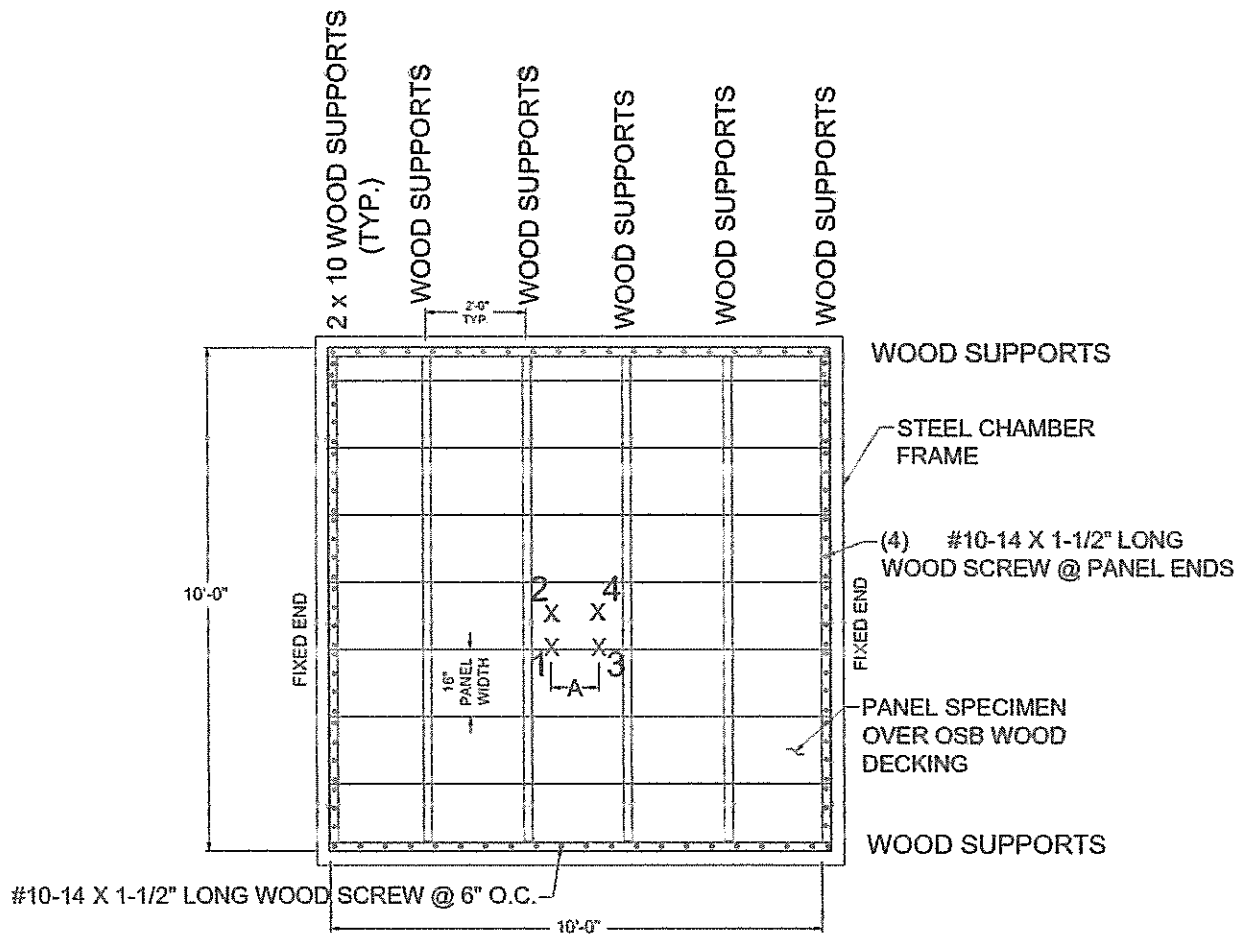
Deflection Measurements

Total Uplift Pressure (psf)	Time Duration (min.)	#1 (in)	#2 (in)	#3 (in)	#4 (in)
112	1	6-3/16	6	6-1/4	6
127	1	6-1/8	5-7/8	6-3/16	5-13/16
142	1	6	5-3/4	6-1/16	5-5/8
157	1	5-15/16	5-5/8	6	5-1/2

Results:

Maximum Total Uplift Pressure (at failure) = 157.7 psf (Seam disengaged and screw head pulled over panel)

TEST SETUP

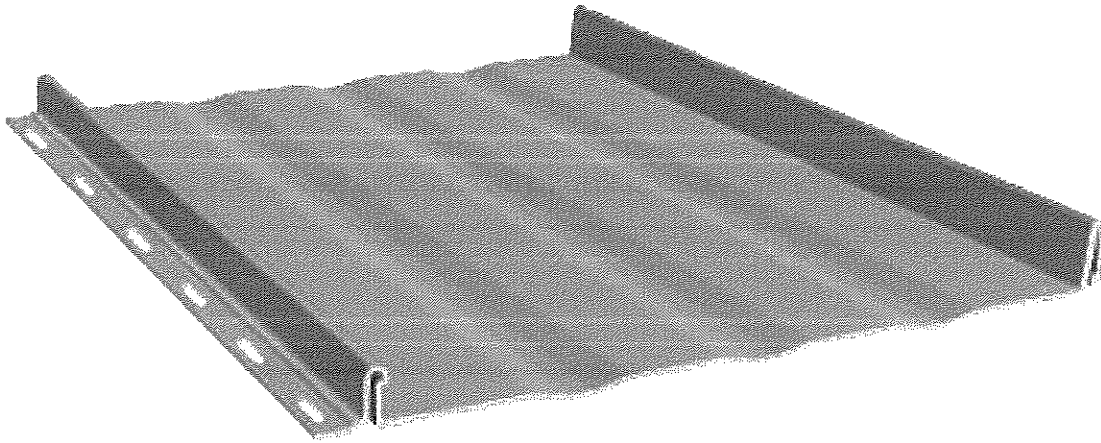


NOTE:- DEFLECTION POINT #1 AT FASTENER LOCATION
 A = FASTENER LOCATION / 2

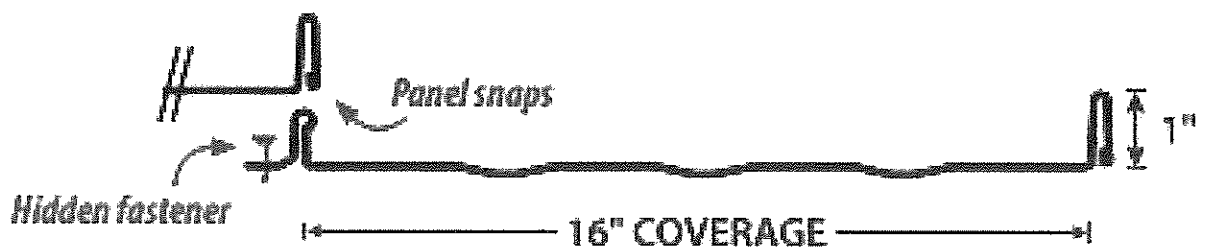
X - DEFLECTION LOCATION

PLAN VIEW OF PANELS

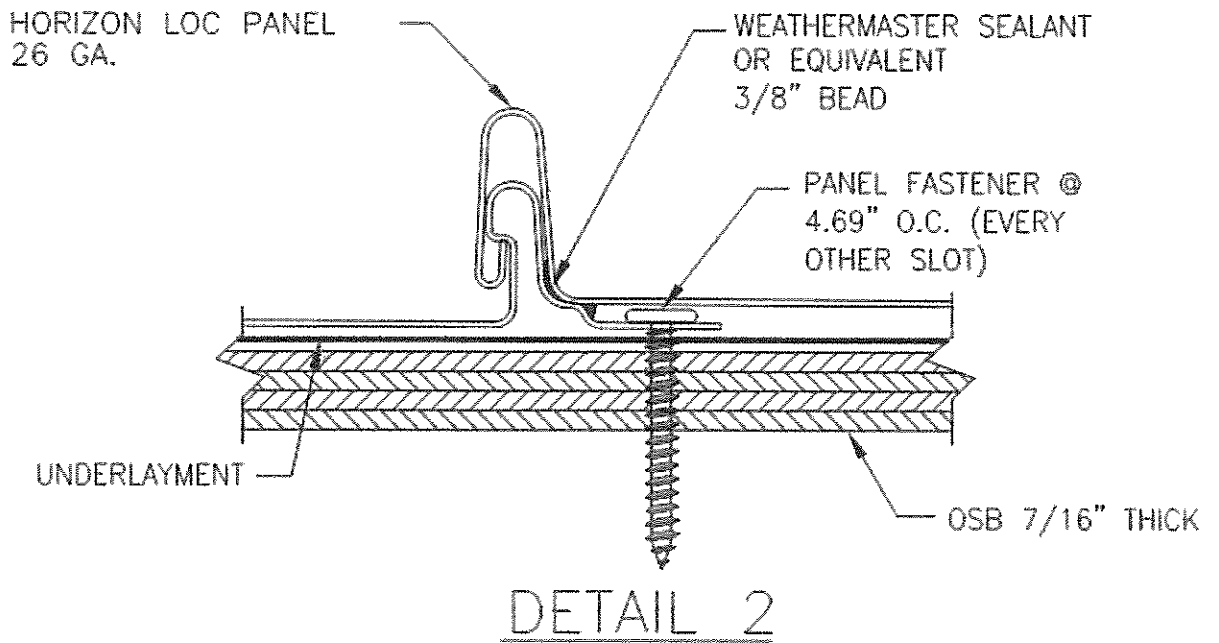
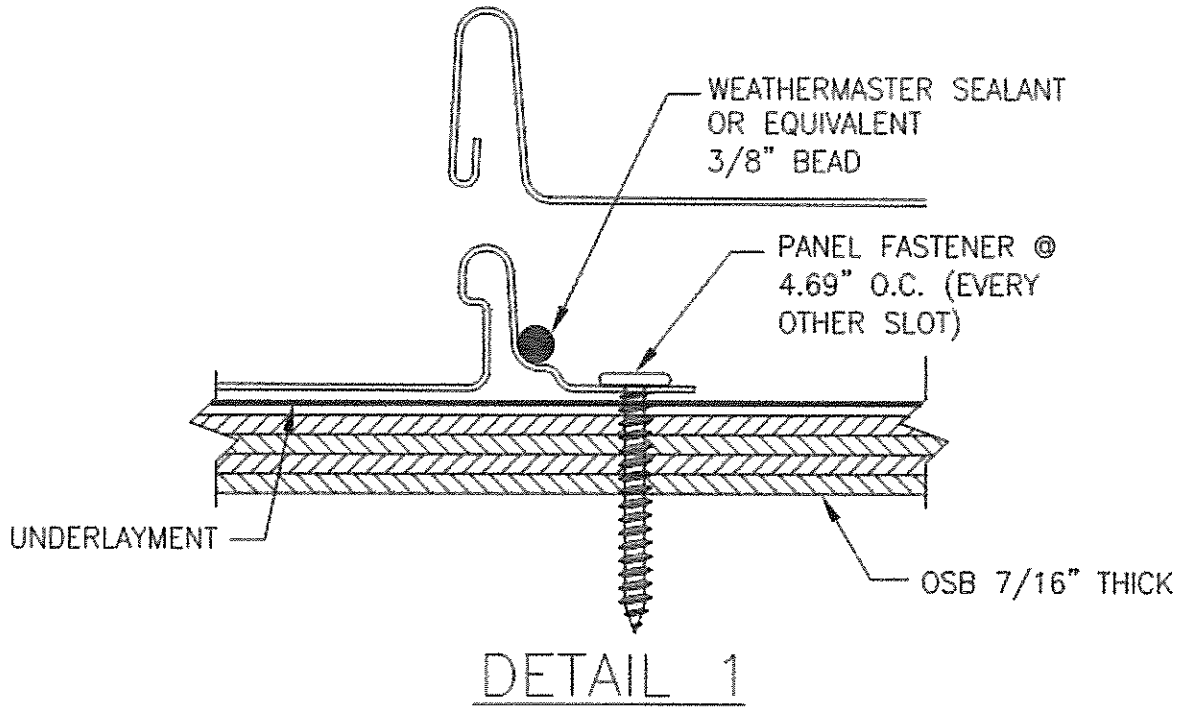
Project No. T245-17



HORIZON LOC PANEL



HORIZON LOC PANEL PROFILE



Project No. T245-17

TENSILE TEST REPORT

Client: Central States Manufacturing, Inc.
302 Jane Place
Lowell, AR 72745

Test Date: September 1, 2017

Test Method: ASTM A370-10

Material Description: Horizon Loc Metal Roof Panel, 16" wide x 26 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)
0148-17	0.503	0.016	577.0	627.1	71,695	77,921	20.04

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