



Farabaugh Engineering and Testing Inc.

Project No. T271-22

Report Date: August 12, 2022

No. Pages: 9 (inclusive)

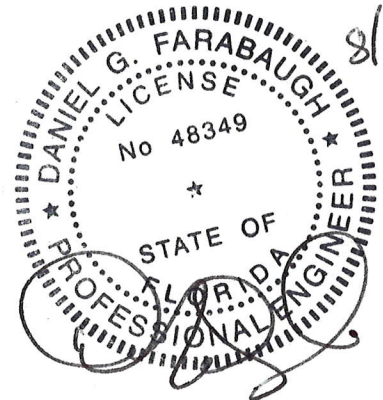
UL 580 / UL1897 UPLIFT RESISTANCE TESTING

ON

METRO LOCK ROOF PANEL 16" COVERAGE X 13/16" HIGH JOINT X 26 GA. STEEL (OVER 5/8" PLYWOOD)

FOR

METRO METALS.
5424 METRO PARK DRIVE
TUSCALOOSA, AL. 35405



Prepared by:

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Approved by:

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Purpose

This test method covers the evaluation of uplift resistance of roof assemblies per UL 580-06 and UL 1897-12 and as provided herein.

Test Completion Date: 9/5/22

Test Specimen

Manufacturer: Metro Metals
5424 Metro Park Drive
Tuscaloosa, AL. 35405

Test Specimen: Metro Lock Metal Panel - 16" wide coverage X 13/16" high joint x 26 ga.
(nail-strip panel)

Substrate: 5/8" plywood (nominal)

Testing Apparatus

Test Chamber: The test chamber consists 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 5/8" plywood was attached to the wood joist (2x10) supports (spaced at 2'-0" o.c.) using 8d ring shank nails at 4" o.c. around the perimeter and at interior supports. See specific test conditions for location of plywood fasteners.
- The metal roof panels were attached to the wood deck substrate using #10-14 X 1" long, type A point, wafer head, wood screw along length of the panel as shown on attached drawings. The screws were attached with a specified spacing pattern along the length of the panel with a fastening spacing of 5-3/16" o.c. (Test #1) and 15-9/16" o.c. (Test #2). The panel sidejoint was a snap seam lap joint. See panel lap detail for location of fasteners. The outer perimeter of the assembly was secured with perimeter fastening as required to maintain a periphery seal.
- 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 as shown in the attached table.
- Each pressure increment was held for at least 1 minute.
- 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.

TEST #1
UL 580 UPLIFT TEST

Test Specimen: Metro Lock Metal Panel - 16" wide coverage x 13/16" High Joint x 26 ga

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

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

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	7-9/16	4-5/16	4-13/16	4-1/8
2	5	48.5	41.5	7-7/16	4	4-13/16	3-7/8
3	60	24.2 – 48.5*	41.5	7-7/16	4	4-13/16	3-7/8
4	5	56.5	0	7-1/2	4-3/4	4-3/4	4-1/16
5	5	56.5	48.5	7-5/16	3-13/16	4-9/16	3-7/8

* Oscillation frequency as specified in UL 580.

Results:

Maximum Total Uplift Pressure (Held for 1 min.) = 105.0 psf

Max.Total Uplift Test Pressure at Failure= 105 psf (Panel seam disengaged during the middle of 5th phase of Class 90)

TEST #2
UL 580 UPLIFT TEST

Test Specimen: Metro Lock Metal Panel - 16" wide coverage x 13/16" High Joint x 26 ga

Panel Fastener Spacing: 15-9/16" 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	7-1/2	5-5/8	4-7/8	5-11/16
1	5	16.2	0	7-7/16	4-5/8	4-13/16	4-11/16
2	5	16.2	13.8	7-3/16	4-3/16	4-5/8	4-5/16
3	60	8.1 – 27.7*	13.8	7-1/16	4	4-1/2	4-3/16
4	5	24.2	0	7-1/8	4-1/8	4-5/8	4-1/4
5	5	24.2	20.8	7-1/167	4	4-5/8	4-1/8

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	7	4	4-9/16	4-3/16
2	5	32.3	27.7	6-3/16	3-9/16	4	3-7/8
3	60	16.2 – 55.4*	27.7				

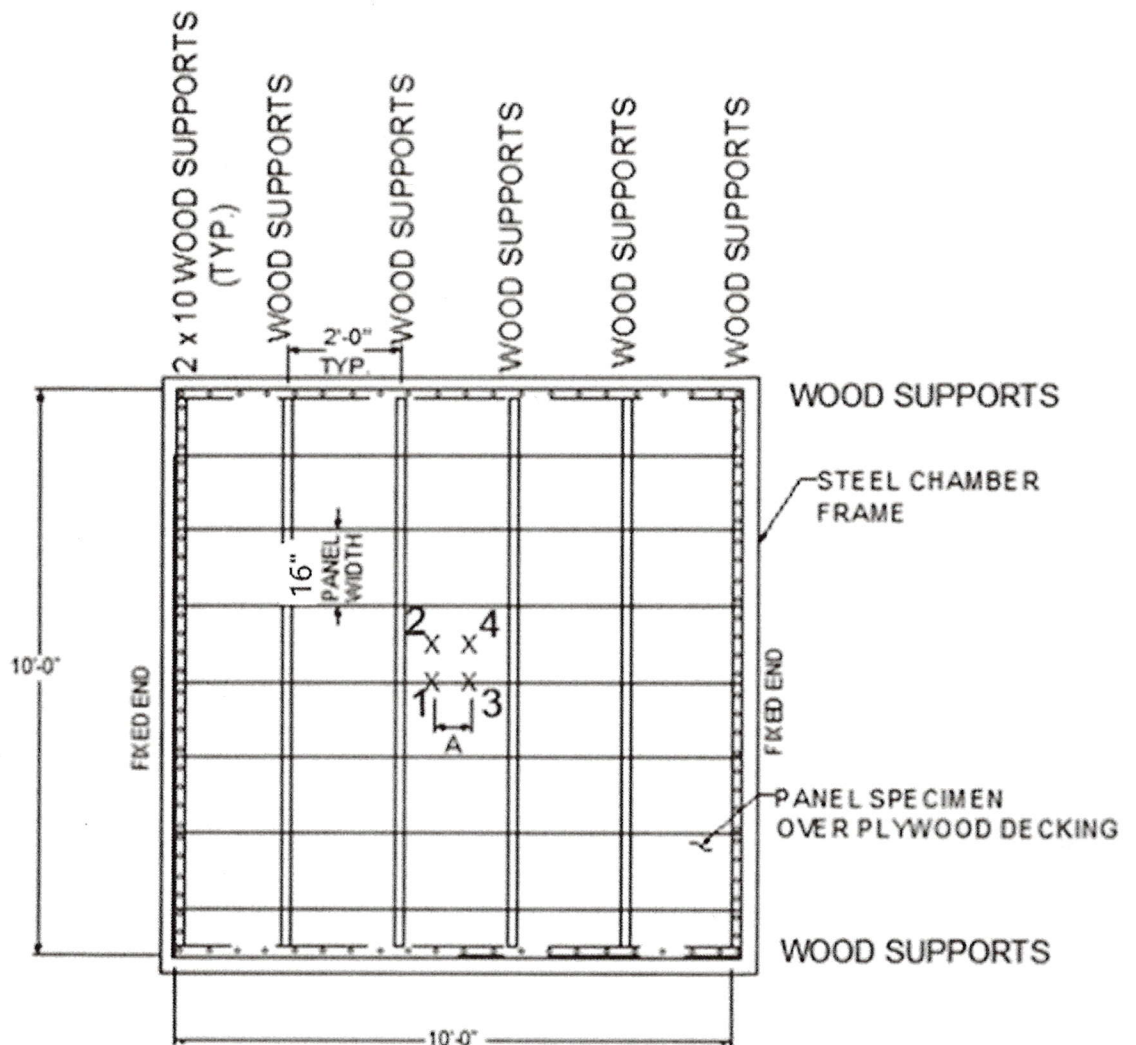
* Oscillation frequency as specified in UL 580.

Results:

Maximum Total Uplift Pressure (Held for 1 min.) = 60.0 psf

Max.Total Uplift Test Pressure at Failure= 64.0 psf (Panel fastener pulled out of plywood and pulled over panel slot while heading to the 3rd phase of Class 60)

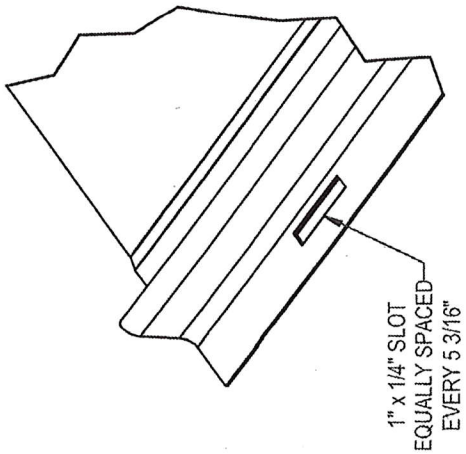
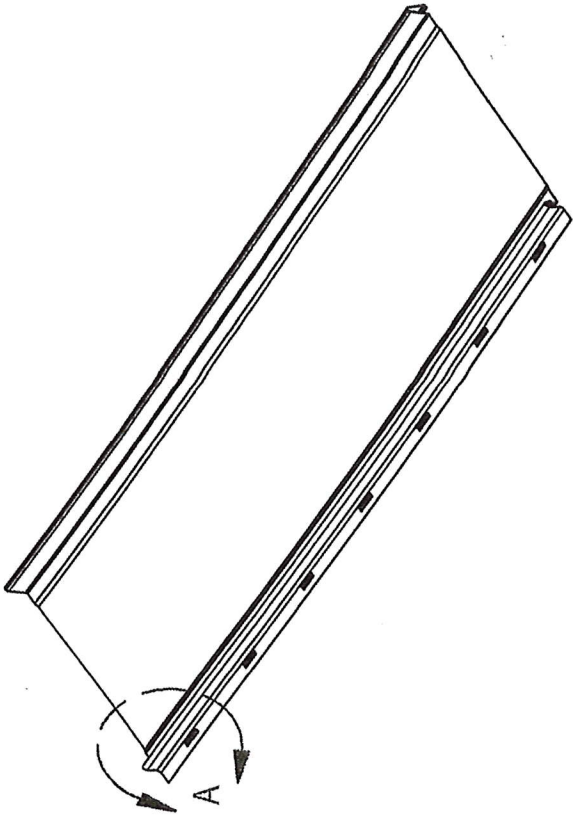
TEST SET UP



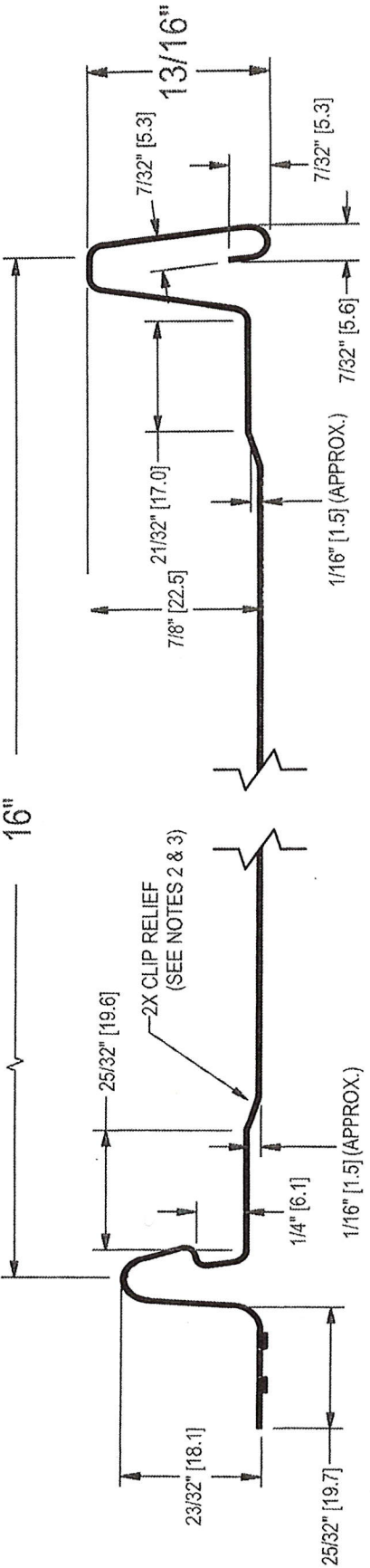
NOTE:- DEFECTION POINT #1 AT FASTENER LOCATION
A = FASTENER LOCATION / 2

X# - DEFLECTION LOCATION

PLAN VIEW OF PANELS

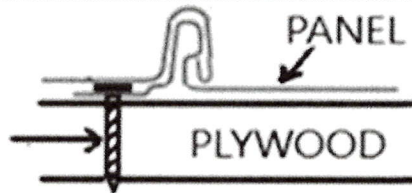


DETAIL A



TEST #1 & TEST #2

#10-14x1" WAFER HEAD SCREWS
@ 5-3/16" OR 15-9/16" O.C.



PANEL LAP

Spectrochemical Laboratories-Material Evaluation, Inc.

155 Prominence Drive, New Kensington, PA. 15068

Phone: (724) 334-4140 Fax: (724) 334-4143

Date: 11-Aug-22

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Report of Tensile Testing

Client: Farabaugh Engineering & Testing (Ref PO #: Verbal - P. Farabaugh)

PIN #	Dimensions (in.) Width x Thickness	Area (sq. - in.)	Yield Point (lb.)	Tensile Strength (lb.)	Yield Strength (psi.)	Tensile Strength (psi.)	Elongation (% in 2 in.)	Fracture Location
↗ Metro Metals, Metro Lock Panel, 16" w x 26ga	0.5091 x 0.0170	0.0087	555	636	64100	73500	25.3	M/2 Break ↗
Metro Metals, Metro Rib Panel, 36" Cover. x 26ga	0.5090 x 0.0165	0.0084	889	911	105900	108500	0.4	U/4 (outside of gl)

Test Method: Q2300.04 rev.14 (ASTM A370-21, E8-21, or E646-16 : Yld. by 0.2% offset, Elong. after fracture)

Equipment Used: Instron 5900R60HVL (s/n: 1602) w/ Extensometer (s/n: E93054)

Performed By: T. Ault

Respectfully submitted,



Todd A. Ault

Laboratory Manager

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For more information call: 724-334-4140