



Farabaugh Engineering and Testing Inc.

Project No. T379-20

Report Date: December 31, 2020

No. Pages: 10 (inclusive)

UL 580 / UL1897 UPLIFT RESISTANCE TESTING

CMP MULIT-RIB METAL ROOF PANEL 36" WIDE (COVERAGE) X 26 STEEL

FOR

CONSTRUCTION METAL PRODUCTS INC..
2204 WEST FRONT STREET
STATESVILLE, NC. 28677



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Project No. T379-20

Purpose

This test method covers the evaluation of uplift resistance of roof assemblies per UL 580-06, rev. 2009 and UL 1897-12 and as provided herein.

Test Specimen

Manufacturer: Construction Metal Products Inc.
2204 West Front Street.
Statesville, NC. 28677

Specimen: Multi-Rib Metal Roof Panel, 36" wide (Coverage), 26 ga steel

Substrate: 15/32" plywood

Test Completion Date

December 30, 2020

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 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 15/32" APA Plywood sheathing was attached to 2 x 10 wood structural framing supports using 8d x 2-1/2" long ring shank nails. Wood supports were located at 2'-0" o.c. The nail pattern was 6" o.c. in the field and 6" o.c. around the perimeter.
- The metal roof panels were attached to the wood deck substrate using #10-12 x 1-1/2" long hex head screws with washer spaced at 24" for Test #1 along the length of the panel or at 6" o.c. for Test #2. See fastener pattern drawing 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 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. The positive 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
UL 580 UPLIFT TEST

Test Specimen: Multi-Rib Metal Roof Panel, 36" wide (Coverage), 26 ga steel

Condition: One fastener at each panel rib with additional fastener at lap.

Fastener Spacing: 24" o.c. along length of panel

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	4-3/4	4-13/16	5-5/8
1	5	16.2	0	7-15/16	4-11/16	4-3/4	5-1/2
2	5	16.2	13.8	7-15/16	4-5/8	4-11/16	5-3/8
3	60	8.1 – 27.7*	13.8	7-7/8	4-9/16	4-5/8	5-5/16
4	5	24.2	0	7-15/16	4-5/8	4-11/16	5-3/8
5	5	24.2	20.8	7-7/8	4-1/2	4-5/8	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	7-7/8	4-1/2	4-5/8	5-5/16
2	5	32.3	27.7	7-13/16	4-7/16	4-9/16	5-1/4
3	60	16.2 – 55.4*	27.7	7-11/16	4-5/16	4-1/2	5-1/8
4	5	40.4	0	7-13/16	4-7/16	4-9/16	5-1/4
5	5	40.4	34.6	7-11/16	4-1/4	4-7/16	5-1/8

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	7-3/4	4-3/8	4-1/2	5-3/16
2	5	48.5	41.5	7-5/8	4-1/4	4-3/8	5
3	60	24.2 – 48.5*	41.5	7-3/8	4-1/4	4-3/16	5
4	5	56.5	0	7-3/4	4-3/8	4-1/2	5-3/16
5	5	56.5	48.5	7-9/16	4-1/8	4-1/4	4-15/16

* Oscillation frequency as specified in UL 580.

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

Project No. T379-20

TEST #1 (cont.)

UL 1897 UPLIFT TEST

Test Specimen: Multi-Rib Metal Roof Panel, 36" wide (Coverage), 26 ga steel

Condition: One fastener at each panel rib with additional fastener at lap.

Fastener Spacing: 24" o.c. along length of panel

Deflection Measurements

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

Results:

Maximum Total Uplift Pressure (sustained for 1 min.) = 172 psf

Maximum Total Uplift Test Pressure = 182 psf (Panel fastener pulled out of plywood.)

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TEST #2
UL 580 UPLIFT TEST

Test Specimen: Multi-Rib Metal Roof Panel, 36" wide (Coverage), 26 ga steel

Condition: One fastener at each panel rib with additional fastener at lap.

Fastener Spacing: 6" o.c. along length of panel

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	3-7/8	4-1/16	8	5-7/8
1	5	16.2	0	3-13/16	4	7-15/16	5-13/16
2	5	16.2	13.8	3-3/4	3-15/16	7-7/8	5-11/16
3	60	8.1 – 27.7*	13.8	3-3/4	3-13/16	7-13/16	5-5/8
4	5	24.2	0	3-3/4	3-15/16	7-7/8	5-13/16
5	5	24.2	20.8	3-3/4	3-7/8	7-3/4	5-5/8

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	3-3/4	3-7/8	7-13/16	5-5/8
2	5	32.3	27.7	3-11/16	3-13/16	7-3/4	5-1/2
3	60	16.2 – 55.4*	27.7	3-5/8	3-11/16	7-5/8	5-3/8
4	5	40.4	0	3-5/8	3-3/4	7-3/4	5-9/16
5	5	40.4	34.6	3-9/16	3-11/16	7-5/8	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	3-5/8	3-3/4	7-11/16	5-9/16
2	5	48.5	41.5	3-1/2	3-5/8	7-9/16	5-5/16
3	60	24.2 – 48.5*	41.5	3-1/2	3-5/8	7-9/16	5-5/16
4	5	56.5	0	3-11/16	3-13/16	7-3/4	5-9/16
5	5	56.5	48.5	3-1/2	3-5/8	7-9/16	5-5/16

* Oscillation frequency as specified in UL 580.

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

Project No. T379-20

TEST #2 (cont.)

UL 1897 UPLIFT TEST

Test Specimen: Multi-Rib Metal Roof Panel, 36" wide (Coverage), 26 ga steel

Condition: One fastener at each panel rib with additional fastener at lap.

Fastener Spacing: 6" o.c. along length of panel

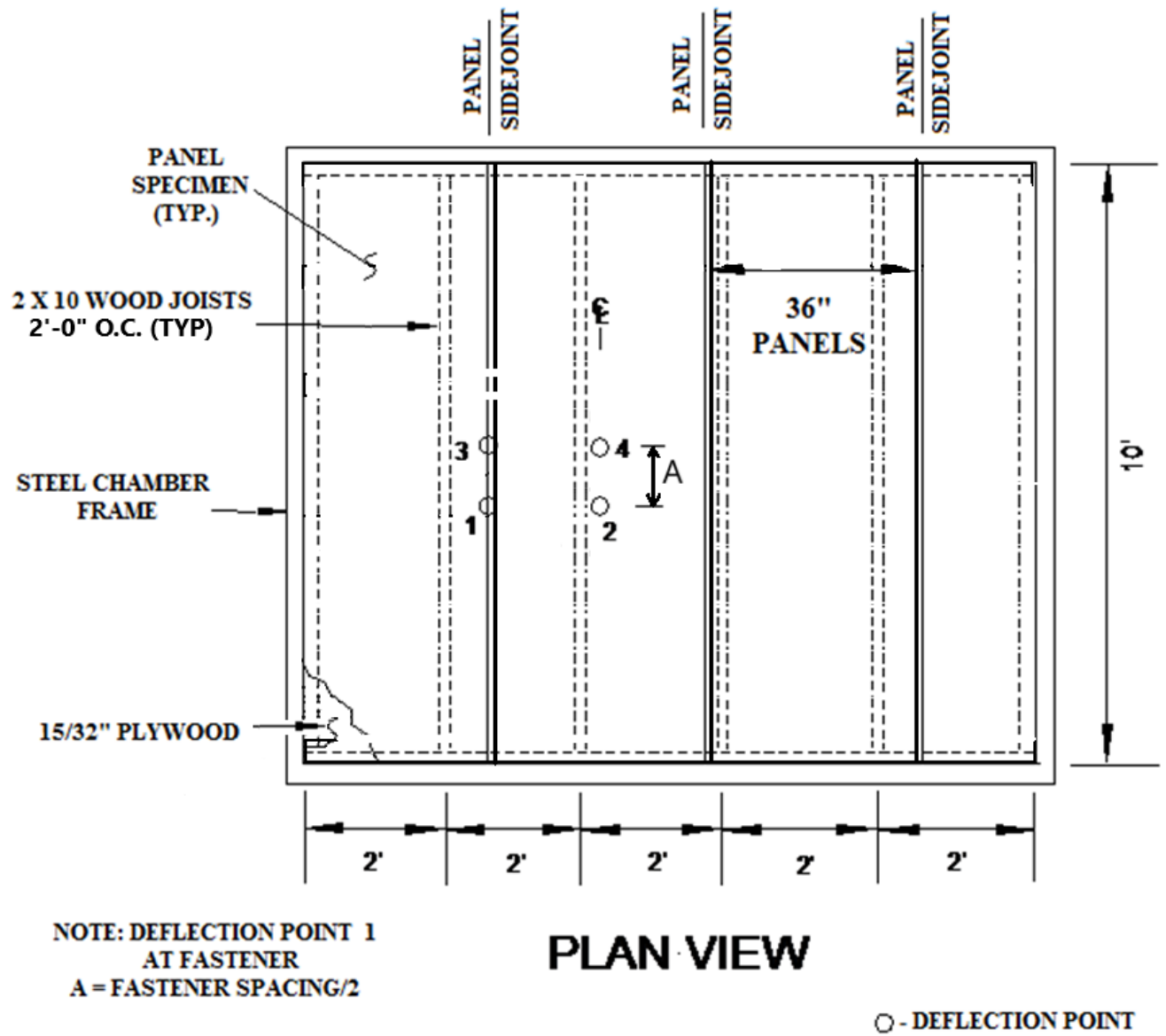
Deflection Measurements

Total Uplift Pressure (psf)	Time Duration (min.)	#1 (in)	#2 (in)	#3 (in)	#4 (in)
112	1	3-1/2	3-5/8	7-1/2	5-1/4
127	1	3-7/16	3-1/2	7-1/2	5-3/16
142	1	3-3/8	3-1/2	7-7/16	5-1/8
157	1	3-5/16	3-7/16	7-3/8	5-1/16
172	1	3-1/4	3-3/8	7-5/16	5
187	1	3-3/16	3-5/16	7-1/4	5
202	1	3-3/16	3-5/16	7-3/16	4-15/16
217	1	3-1/8	3-1/4	7-1/8	4-7/8
232	1	3-1/16	3-3/16	7-1/16	4-13/16
247	1	3	3-1/8	7-1/16	4-3/4
262	1	2-15/16	3-1/16	7	4-11/16
277	1	2-7/8	3	6-15/16	4-5/8
292	1	2-13/16	2-15/16	6-7/8	4-9/16
307	1	2-3/4	2-7/8	6-13/16	4-1/2
322	1	2-11/16	2-13/16	6-3/4	4-7/16

Results:

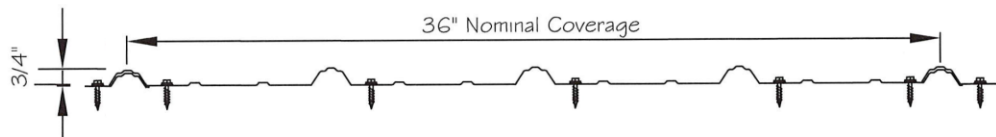
Maximum Total Uplift Pressure (sustained for 1 min.) = 322.9 psf

Maximum Total Uplift Test Pressure = 323.4 psf (Plywood decking pulled up from supports below.)



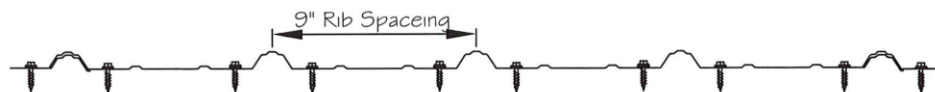
Construction Metal Products, Inc.

System: CMP Multi-Rib



FASTENING PATTERN @ 24" O.C. ALONG LENGTH OF PANEL (TEST #1)

FASTENING PATTERN @ 6" O.C. ALONG LENGTH OF PANEL (TEST #2)



FASTENING PATTERN ON PANEL ENDS FOR ALL TESTS



#10-12 X 1-1/2" LONG HEX
HEAD FASTENER (TYP.)

Multi-rib edge lap

DETAIL:

SYSTEM:
DATE:



SCALE:

DRAWING NO:

Project No. T379-20

TENSILE TEST REPORT

Client: Construction Metal Products Inc.
2204 West Front Street.
Statesville, NC. 28677

Test Date: December 31, 2020

Test Method: ASTM A370-10

Material Description:

Multi-Rib Metal Roof Panel, 36" wide (Coverage), 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)
20175	0.018	0.508	459.9	538.8	50,300	58,930	24.9

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