

**UL 580 & UL 1897
TEST REPORT**

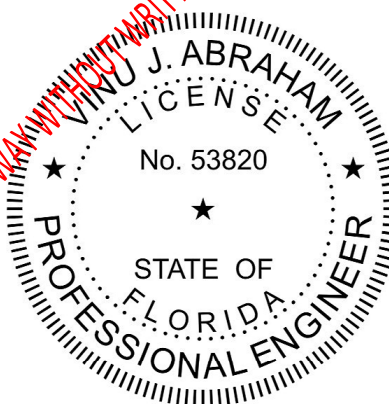
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SHEFFIELD METALS INTERNATIONAL

**MODEL DESIGNATION: SMI 1-1/2" Mechanical Seam over Plywood
PRODUCT TYPE: Standing Seam Roof System (24 Ga. Steel)**

This report contains in its entirety:

Cover Page: 1 page
Report Body: 6 pages



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Report No.: B5170.02-450-18
Test Date: 12/9/11
Report Date: 2/3/12
Test Report Retention End Date: 2/3/16

Sheffield Metals International

SMI 1-1/2" Mechanical Seam over Plywood (UL 580 & UL 1897)
Test Report #: B5170.02-450-18

1.0 MANUFACTURER'S IDENTIFICATION

- 1.1 Name of Applicant: Sheffield Metals International
5467 Evergreen Parkway
Sheffield Village, OH 44054
Voice: 904.413.7425
- 1.2 Contact Person: Jim Mitchell

2.0 LABORATORY IDENTIFICATION

- 2.1 Test Notification #: N/A
- 2.2 Lab Certifications: Miami-Dade County (05-1014-01); Florida Building Code (TST1527); IAS (TL-244); AAMA; WDMA; Keystone Certifications; Texas Department of Insurance

3.0 SCOPE OF WORK

- 3.1 Introduction: Sheffield Metals International retained Architectural Testing, Inc. (ATI) to conduct roof uplift testing on their SMI 1-1/2" Mechanical Seam over Plywood System per the requirements of Underwriters Laboratories Inc.
- 3.2 Report Information: Table 1 provides the test date for this specimen.

Table 1: Specimen Test Date

Mock-Up	Specimen #	Test Date
SMI 1-1/2" Mechanical Seam over Plywood	1	12/9/2011

4.0 PRODUCT IDENTIFICATION

- 4.1 Product Type: Standing Seam Roof System
- 4.2 Model Designation: SMI 1-1/2" Mechanical Seam over Plywood
- 4.3 Overall Size: 120" (wide) x 120" (long) – Panel assembly
- 4.4 General Description: This specimen consisted of a 120" x 120" structural roof frame fabricated from 2x (nominal) wood with intermediate rafters spaced 24" on center. This assembly was sheathed with a single layer of 1/2" (nominal) structural CDX Plywood. This was followed by a single layer each of felt paper and moisture/fire barrier. The roofing panels were fastened over the moisture/fire barrier.
- 4.5 Sample Source: Sheffield Metals International provided the test specimen.

5.0 COMPONENT DESCRIPTION

5.1 Structural Support Frame:

Table 2 provides the structural support frame components used for the test specimen.

Table 2: Structural Support Frame Components

Item	Description
Intermediate rafters	There were four (4) intermediate rafters used in this specimen - spaced 24" on center – that were each fabricated from 2x southern Yellow Pine timber planks.
Plywood substrate	A single layer of 1/2" (minimum 15/32" thick) CDX Plywood was utilized across the entire surface of this specimen.

5.2 Accessories:

Table 3 provides a description of the accessories used in the test specimen.

Table 3: Accessories

Item	Description
Felt paper	30# Asphalt saturated organic paper (ASTM D226) meeting type II requirements
Moisture/fire barrier	VesShield®

5.3 Metal Roof System:

Table 4 provides the metal roof system components used in the test specimen.

Table 4: Metal Roof System Components

Item	Overall Cross-Section	Material	Coil Width	Description
Mechanical Seam Panel	Please see part drawing labeled "SMI 1-1/2" Mechanical Seam Profile" for dimensions	24 ga. steel	20"	Each panel had an effective covering width of 16". Each finished roof panel was 120" (long) and featured two (2), 1-1/2" vertical legs (one w/return flap).
Clip Assembly (Butterfly Base 1-1/2" – Part # 1126602)	1.000" x 1.250" x 4.500" (long)	22 ga. G-90 galvanized steel	N/A	Each expansion-type butterfly panel clip consisted of a "base" and a "tab" that were each fabricated from two different thicknesses of steel. Each clip "base" had two holes capable of accommodating #10 pancake head screws.
Clip Assembly (Butterfly Tab 1-1/2" – Part # 1103098)	5.000" (long) x 0.910" (tall) with two return flaps that were 0.400" (wide)	24 ga. G-90 galvanized steel	N/A	

6.0 SPECIMEN CONSTRUCTION

Table 5 provides the specimen construction.

Table 5: Specimen Construction

Location	Description	
Plywood sheathing to structural support frame	2-1/2" x .131" EG ring shank nails spaced 4" on center at the perimeter	
	2-1/2" x .131" EG ring shank nails spaced 6" on center at the field	
Felt paper	A single layer of felt paper with 4" laps attached to the plywood substrate with 0.120" x 1-1/4" galvanized smooth shank roofing nails with 32 ga. tin caps	Spaced 7" on center at the perimeter
		Spaced 8" on center (staggered) at the field
Moisture/fire barrier	A single layer of VersaShield® with 4" laps was tacked in place across the top of the felt paper and was secured when the metal roofing was installed.	
Roof panel	Each finished roof panel featured an inside leg and an outside leg. These legs were overlapped around a butterfly clip base/tab assembly. These clip assemblies were spaced 4" and 24" from each panel end and at 24" on center thereafter. Each clip was mechanically attached to the plywood substrate using two (2), #10 x 1" Weather Gard® pancake head screws (Type A). The legs were then mechanically seamed 180 degrees.	
Partial panel cut edges	The partial panel cut edges at the perimeter of the roof panel assembly were attached to the plywood substrate using a single row of #10 x 1" Weather Gard® pancake head screws (Type A) spaced at 4" on center.	
Panel ends	The panel ends at the perimeter of the roof panel assembly were attached to the plywood substrate using a single row of #10 x 1" Weather Gard® pancake head screws (Type A) spaced at 4" on center.	

7.0 TEST RESULT SUMMARY

Table 6 provides a summary of the test results for all tests conducted per UL 580 and UL 1897.

Table 6: Summary of Test Results

Specimen #	Test Method	Conclusion
1	UL 580	PASS (Class 30,60, and 90)
	UL 1897 Maximum Combined Sustained Pressure	213.5
	UL 1897 Combined Failure Pressure	228.5



8.0 TEST SEQUENCE

Table 7 provides the test sequence for the specimen.

Table 7: Test Sequence

Specimen # 1	
1.	UL 580 Class 30 Test
2.	UL 580 Class 60 Test
3.	UL 580 Class 90 Test
4.	UL 1897 Test

9.0 UL 580 TEST RESULTS

9.1 Class 30, 60 and 90 Test Load Data

The test results for the specimen are presented in the following tables. Tables 8, 9 and 10 provide the Class 30, 60 and 90 test load data, respectively.

Table 8: Class 30 Load Data

Test Phase	Test Duration (min)	Positive Pressure (psf)	Negative Pressure (psf)	Status
1	5	0.0	16.2	PASS
2	5	13.8	16.2	PASS
3 ¹	60	13.8	8.1-27.7	PASS
4	5	0.0	24.2	PASS
5	5	20.8	24.2	PASS

1. Cyclic stage with 8-12 seconds per cycle.

Table 9: Class 60 Load Data

Test Phase	Test Duration (min)	Positive Pressure (psf)	Negative Pressure (psf)	Status
1	5	0.0	32.3	PASS
2	5	27.7	32.3	PASS
3 ¹	60	27.7	16.2-55.4	PASS
4	5	0.0	40.4	PASS
5	5	34.6	40.4	PASS

1. Cyclic stage with 8-12 seconds per cycle.

Table 10: Class 90 Load Data

Test Phase	Test Duration (min)	Positive Pressure (psf)	Negative Pressure (psf)	Status
1	5	0.0	48.5	PASS
2	5	41.5	48.5	PASS
3 ¹	60	41.5	24.2-48.5	PASS
4	5	0.0	56.5	PASS
5	5	48.5	56.5	PASS

1. Cyclic stage with 8-12 seconds per cycle.

9.2 Remarks

A single layer of 2 ml flat polyethylene film was applied across the entire surface of the prepared roof deck in order to seal against air leakage. This plastic film contacted all surfaces of the panels and/or clips and did not interfere with air passage to the specimen or the movement of adjacent parts. No signs of failure were noticed during class 30, 60, and 90 of the UL 580 test. No failures were observed in any components of the roof system or in any of the fasteners used to attach the roof system to the prepared structural roof frame.

10.0 UL 1897 TEST RESULTS

10.1 Failure Test Load Data

Table 11 provides the failure test load data.

Table 11: Detailed Test Results of the Optional Failure Test

Test Phase	Pressure Duration (min)	Negative Pressure (psf)	Positive Pressure (psf)	Combined Pressure (psf)	Status
1	1	30	48.5	78.5	PASS
2	1	45	48.5	93.5	PASS
3	1	60	48.5	108.5	PASS
4	1	75	48.5	123.5	PASS
5	1	90	48.5	138.5	PASS
6	1	105	48.5	153.5	PASS
7	1	120	48.5	168.5	PASS
8	1	135	48.5	183.5	PASS
9	1	150	48.5	198.5	PASS
10	1	165	48.5	213.5	PASS
11	1	180	48.5	228.5	FAIL

10.2 Remarks

The highest combined pressure the test specimen successfully resisted for 1 minute was 213.5 psf. The specimen failed due to four seams buckling towards the middle before losing pressure. The failure occurred while the specimen was being ramped up to a sustained combined pressure of 228.5 psf.

11.0 CERTIFICATION AND DISCLAIMER STATEMENT

All tests performed on this test specimen were conducted in accordance with the specifications of the applicable codes, standards and test methods listed below by ATI. ATI does not have, nor does it intend to acquire or will it acquire, a financial interest in any company manufacturing or distributing products tested at ATI. ATI is not owned, operated or controlled by any company manufacturing or distributing products it tests. This report is only intended for the use of the entity named in Section 1.0 of this report. Detailed assembly drawings showing panel/clip thicknesses, panel/clip profiles, accessories, fasteners and all other applicable layouts are on file and have been compared to the test specimen submitted. ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by ATI for the entire test record retention period.



If test specimen contains glazing, no conclusions of any kind regarding the adequacy or inadequacy of the glass in any glazed test specimen can be made. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen tested. This report may not be reproduced, except in full, without the written approval of ATI.

12.0 APPLICABLE CODES, STANDARDS, AND TEST METHODS

UL 580 – Tests for Uplift Resistance of Roof Assemblies
UL 1897 – Uplift Tests for Roof Covering Systems

13.0 WITNESSES (ALL OR PARTIAL)

Vinu J. Abraham, P.E.	Vice President – Southeast Region	ATI
Jeff McGovern	Director – Regional Operations	ATI
Kristin Norville, E.I.	Operations Engineer	ATI
Veron Wickham	Technician	ATI

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ENGINEER OF RECORD

Digitally Signed by: Vinu Abraham

Vinu J. Abraham, P.E.

2/3/2012

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Digitally Signed by: Angela Abramczyk

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2/3/2012