Architectural Testing

UL 580 & UL 1897
TEST REPORT

Rendered to:

SHEFFIELD METALS INTERNATIONAL

MODEL DESIGNATION: SMI 1-1/2" Mechanical Seam over B-Deck w/ISO
PRODUCT TYPE: Standing Seam Roof System (24 Ga. Steel)

This report contains in its entirety:
Cover Page: 1 page
Report Body: 7 pages

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Report No.: B5170.06-450-18
Test Dates: 12/28-29/11
Report Date: 3/2/12
Test Report Retention End Date: 3/2/16

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Sheffield Metals International

SMI 1-1/2" Mechanical Seam over B-Deck w/ISO (UL 580 & UL 1897)
Test Report #: B5170.06-450-18

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 B-Deck w/ISO System per the requirements of Underwriters Laboratories Inc.
3.2	Report Information:	Table 1 provides the test dates for this specimen.

Table 1: Specimen Test Dates

Mock-Up	Specimen #	Test Dates
SMI 1-1/2" Mechanical Seam over B-Deck w/ISO	3	12/28/2011 – 12/29/2011

4.0 PRODUCT IDENTIFICATION

4.1	Product Type:	Standing Seam Roof System
4.2	Model Designation:	SMI 1-1/2" Mechanical Seam over B-Deck w/ISO
4.3	Overall Size:	120" (wide) x 120" (long) – Panel assembly
4.4	General Description:	This specimen consisted of a structural support frame with exterior perimeter dimensions of 129" x 129" and was fabricated from 12 ga. A36 steel. This assembly was sheathed with a single layer of 22 ga. B-deck. This was followed by a single layer each of insulation, 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:

The structural support frame members were comprised of 12 ga. A36 steel. The intermediate rafters were spaced 60" on center. Table 2 provides the details of the B-Deck.

Table 2: B-Deck Details

Item	Description
22 ga. B-Deck	Each B-Deck panel was fabricated from 22 ga. (thickness = 0.030") ASTM A653, SS GRD33 steel and had a G60 galvanized coating applied to it. Each finished B-Deck panel was 36" (wide) x 120" (long) and featured 6 ribs that were each 3-1/2" (w) and 1-1/2" (h).

5.2 Accessories:

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

Table 3: Accessories

Item	Description
Insulation	H-Shield 1" thick polyiso insulation NOTE: The insulation was obtained in 4' x 4' sheets and trimmed as necessary when assembling the test specimens.
Felt paper	30# Asphalt saturated organic paper (ASTM D226) meeting type II requirements
Moisture/fire barrier	VersaShield®

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 ½" 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 thickness of steel. Each clip "base" had two holes capable of accommodating #12 pancake head screws.
Clip Assembly (Butterfly Tab 1-1/2" – Part # 1103095)	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

6.1 Specimen Construction:

Table 5 provides the specimen construction.

Table 5: Specimen Construction

Location	Description
B-deck to structural support frame	The B-deck panels were mechanically attached to the steel structural support frame using #12 x 1-1/4" self-drilling SMS spaced at 6" on center along the intermediate members and around the perimeter. Adjacent panels were mechanically attached to one another at the overlap locations using #12 x 1-1/4" self-drilling SMS spaced at 6" on center.
Insulation	A single layer of H-Shield 1" thick polyiso insulation was mechanically attached to the B-deck using #12 x 1-5/8" self-drilling PH Dekfast™ Fasteners through 2-7/8" x 2-7/8" insulation plates. The fasteners used to secure each piece of insulation were spaced according to Figure 1 (below). Additionally, the insulation was mechanically secured to the steel deck via the fasteners that attach the panel clips (described below).
Felt paper	A single layer of felt paper with 4" laps was tacked in place across the top of the B-deck and was secured when the metal roofing was installed.
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 7" from each panel end and at 18" on center thereafter. Each clip was mechanically attached to the B-deck substrate using two (2), #12 x 1-5/8" self-drilling PH Dekfast™ Fasteners. 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 B-deck substrate using groups of two (2), #12 x 1-5/8" self-drilling PH Dekfast™ Fasteners spaced at 6" on center (two [2] fasteners in group were spaced 2" apart).
Panel ends	The panel ends at the perimeter of the roof panel assembly were attached to the B-deck substrate using a single row of #12 x 1-5/8" self-drilling PH Dekfast™ Fasteners spaced at 4" on center.

6.2 Insulation:

Figure 1 provides the insulation pattern and the spacing of the fasteners used to attach it.

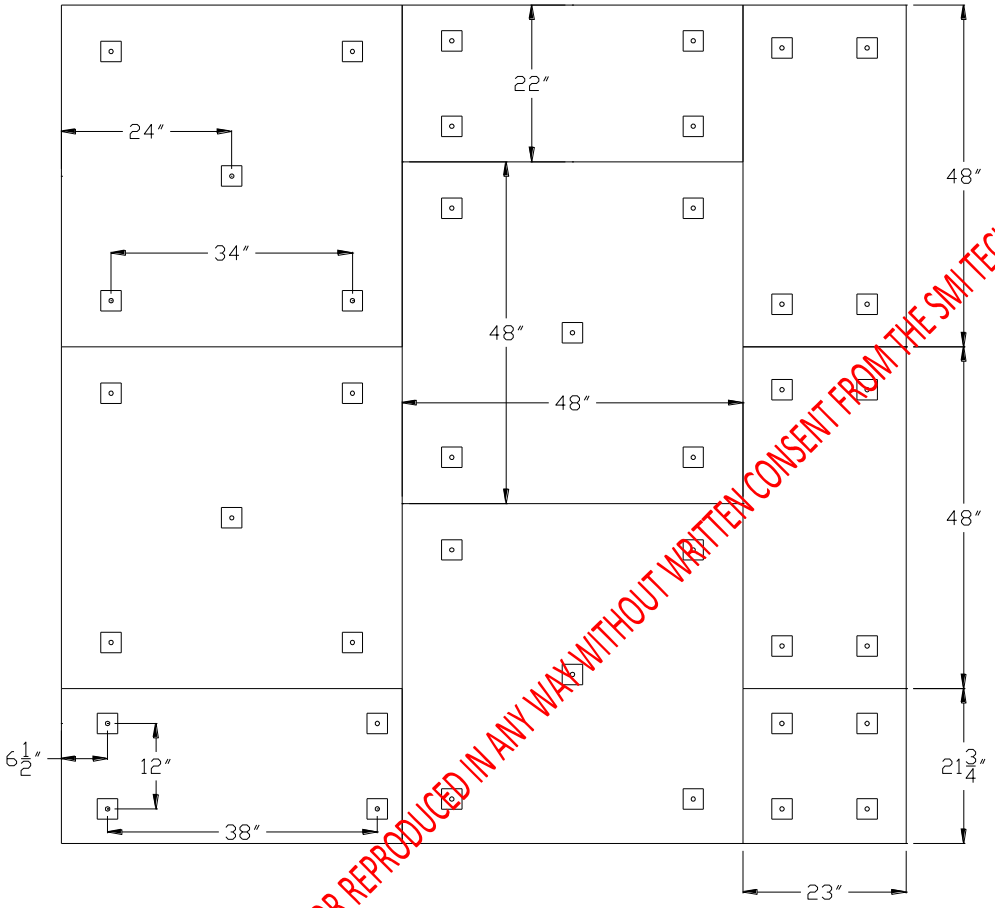

Figure 1: Insulation Pattern and Fastener Spacing

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
3	UL 580	PASS (Class 30,60, and 90)
	UL 1897 Maximum Combined Sustained Pressure	258.5
	UL 1897 Combined Failure Pressure	273.5

8.0 TEST SEQUENCE

Table 7 provides the test sequence for the specimen.

Table 7: Test Sequence

Specimen # 3
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)	Test 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)	Test 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)	Test 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	PASS
12	1	195	48.5	243.5	PASS
13	1	210	48.5	258.5	PASS
14	1	225	48.5	273.5	FAIL

10.2 Remarks

The highest combined pressure the test specimen successfully resisted for 1 minute was 258.5 psf. The specimen failed due to the panel seams buckling and bending. The failure occurred while the specimen was being ramped up to a sustained combined pressure of 273.5 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