

**ASTM E 1592  
TEST REPORT**

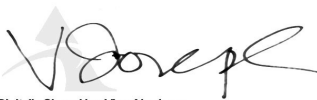
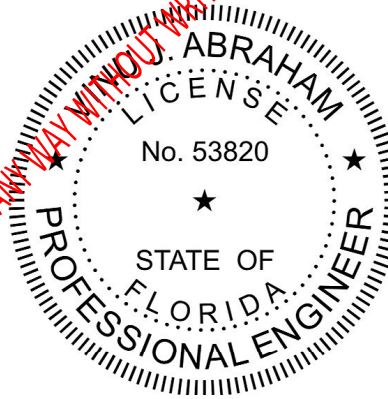
**Rendered to:**

**SHEFFIELD METALS INTERNATIONAL**

**MODEL DESIGNATION: SMI 2" Mechanical Seam over 1' and 5' Span Steel**  
**PRODUCT TYPE: Standing Seam Roof System (24 Ga. Steel)**

**This report contains in its entirety:**

**Cover Page:** 1 page  
**Report Body:** 10 pages



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<b>Report No.:</b>	B5170.20-450-18
<b>Test Dates:</b>	3/2-3/12
<b>Report Date:</b>	3/6/12
<b>Test Report Retention End Date:</b>	3/6/16



## Sheffield Metals International

SMI 2" Mechanical Seam over 1' and 5' Span Steel (ASTM E 1592)

Test Report #: B5170.20-450-18

### 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 uniform static ramp load testing on their SMI 2" Mechanical Seam over 1' and 5' Span Steel System per the requirements of ASTM.
- 3.2 Report Information: Table 1 provides the test dates for these specimens.

Table 1: Specimen Test Dates

Mock-Up	Specimen #	Test Dates
SMI 2" Mechanical Seam over 1' Span Steel	10	3/2/2012
SMI 2" Mechanical Seam over 5' Span Steel	11	3/3/2012

### 4.0 PRODUCT IDENTIFICATION

- 4.1 Product Type: Standing Seam Roof System
- 4.2 Model Designation: SMI 2" Mechanical Seam
- 4.3 Overall Size: Table 2 provides the overall size for these specimens.

Table 2: Specimen Overall Size

Mock-Up	Specimen #	Panel Assembly Size
SMI 2" Mechanical Seam over 1' Span Steel	10	114" (wide) x 143" (long)
SMI 2" Mechanical Seam over 5' Span Steel	11	141-1/4" (wide) x 312-1/4" (long)



- 4.4 General Description: These specimens consisted of structural support frames fabricated from 16 Ga. A36 steel. The roofing panels were fastened directly to the steel support frames.
- 4.5 Sample Source: Sheffield Metals provided the test specimens.

## 5.0 COMPONENT DESCRIPTION

- 5.1 Structural Support Frame:  
The structural support frame members were comprised of 16 Ga. A36 steel. Specimen #10 had eleven (11) intermediate purlins that were spaced 1' on center. Specimen #11 had six (6) intermediate purlins that were spaced 5' on center.
- 5.2 Metal Roof System:  
Table 3 provides the metal roof system components used in the test specimens.

Table 3: Metal Roof System Components

Item	Overall Cross-Section	Material	Coil Width	Description
Mechanical Seam Panel	Please see part drawing labeled "SMI 2" Mechanical Seam" for dimensions	24 Ga. steel	24"	Each panel had an effective covering width of 18". Each finished roof panel featured two (2), 2" vertical legs (one w/return flap). The roof panels were 143" long on Specimen #10 and 312-1/4" long on Specimen #11.
Float Clip 2" (Base)	2.390" x 4.300" (long) assembled size	16 Ga. G90 galvanized steel	N/A	Each two-piece panel clip (Part # M0413-MOD) consisted of a base and a tab that were each fabricated from two different thickness of steel. Each clip base had two (2) holes capable of accommodating 1/4" hex head screws.
Float Clip 2" (Tab)		22 Ga. G90 galvanized steel	N/A	

## 6.0 SPECIMEN CONSTRUCTION

- 6.1 Specimen Construction:  
Table 4 provides the specimen construction.

Table 4: Specimen Construction

Location	Description
Roof panel	Each finished roof panel featured an inside leg and an outside leg. These legs were overlapped around a float clip. There was one (1) clip per intermediate purlin at each panel seam. Each clip was mechanically attached to the steel support frame using two (2), 1/4-14 x 1-3/8" #2 point Weather Gard® self-drilling hex head screws. The legs were then mechanically seamed 180 degrees.
Panel edges	The panel edges at the perimeter of each roof panel assembly were attached to the steel support frame using a single row of 1/4-14 x 1-3/8" #2 point Weather Gard® self-drilling hex head screws spaced at 4" on center.



Table 4: Specimen Construction (continued)

Location	Description
Panel ends	The panel ends at the perimeter of each roof panel assembly were attached to the steel support frame using a single row of 1/4" x 1" pan head screws spaced at 2" on center.

## 7.0 TEST RESULT SUMMARY

Table 5 provides a summary of the test results for the tests conducted per ASTM E 1592.

Table 5: Summary of Test Results

Specimen #	Direction	Test Method	Test Conditions	Conclusion	Failure Load
10	Negative	ASTM E 1592	Ramp Load	PASS @ -210 psf	-240 psf
11	Negative	ASTM E 1592	Ramp Load	PASS @ -75 psf	-80 psf

## 8.0 TEST SEQUENCE

Table 6 provides the test sequence for the specimens.

Table 6: Test Sequence

Specimen # 10 & 11
1. Uniform static ramp load

## 9.0 UNIFORM STATIC RAMP LOAD TEST RESULTS

### 9.1 Deflection Gage Locations

Figures 1 and 2 show the deflection gage locations for the uniform static ramp load test.

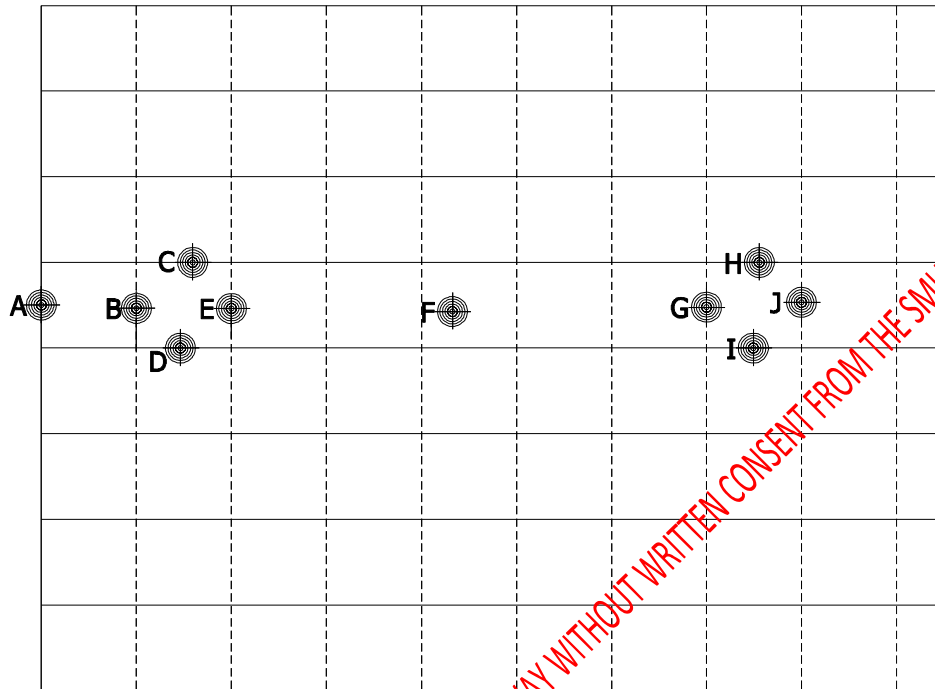


Figure 1: Deflection Gage Locations – Specimen #10

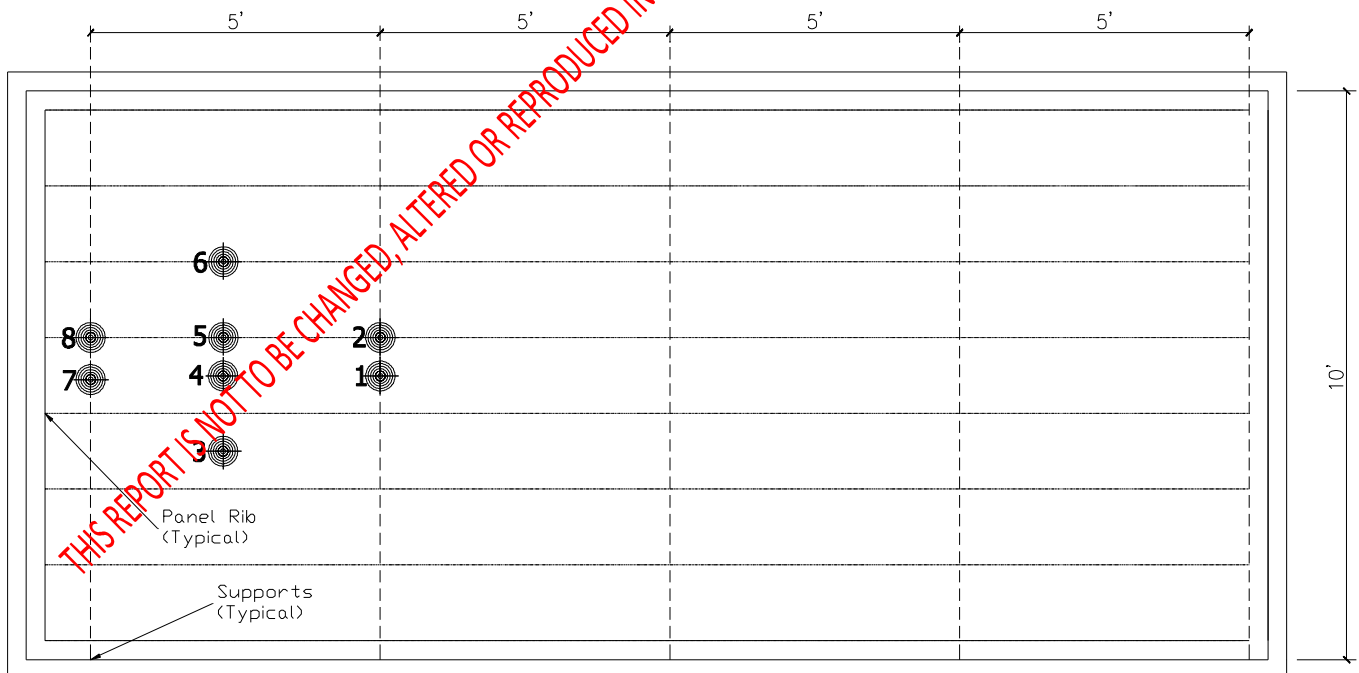


Figure 2: Deflection Gage Locations – Specimen #11



## 9.2 Test Parameters

Table 7 provides the test parameters for the uniform static ramp load test.

Table 7: Uniform Static Ramp Load Test Parameters

Specimen #	Step #	PSF	Duration
10 (negative)	1	30	1 minute
	2	60	
	3	90	
	4	120	
	5	150	
	6	150	
	7	180	
	8	210	
	Failure Load	240	
11 (negative)	1	10	1 minute
	2	20	
	3	30	
	4	40	
	5	50	
	6	60	
	7	70	
	8	75	
	Failure Load	80	

## 9.3 Negative Load Test Results

Tables 8 and 9 provide the negative uniform static ramp load test results for Specimens #10 and #11, respectively. The results are for the deflection gage locations shown in Section 9.1.

Table 8: Negative Uniform Static Ramp Load Test Results

Specimen #	Load (psf)	Gage Location	Deflection (in.)	Permanent Set (in.)	% Recovery
10	-30	A	0.125	0.000	100.00
		B	0.313	0.000	100.00
		C	0.000	0.000	100.00
		D	0.125	0.000	100.00
		E	0.125	0.000	100.00
		F	0.500	0.000	100.00
		G	0.125	0.000	100.00
		H	0.125	0.000	100.00
		I	0.313	0.000	100.00
		J	0.125	0.000	100.00



Table 8: Negative Uniform Static Ramp Load Test Results (continued)

Specimen #	Load (psf)	Gage Location	Deflection (in.)	Permanent Set (in.)	% Recovery
10	-60	A	0.000	0.000	100.00
		B	0.063	0.000	100.00
		C	0.063	0.000	100.00
		D	0.063	0.000	100.00
		E	0.125	0.000	100.00
		F	1.000	0.000	100.00
		G	0.125	0.000	100.00
		H	0.125	0.000	100.00
		I	0.063	0.000	100.00
		J	0.125	0.000	100.00
	-90	A	0.063	0.000	100.00
		B	0.125	0.000	100.00
		C	0.063	0.000	100.00
		D	0.125	0.000	100.00
		E	0.125	0.000	100.00
		F	2.125	0.375	82.35
		G	0.125	0.000	100.00
		H	0.125	0.000	100.00
		I	0.125	0.000	100.00
		J	0.125	0.000	100.00
	-120	A	0.063	0.000	100.00
		B	0.125	0.000	100.00
		C	0.125	0.000	100.00
		D	0.125	0.000	100.00
		E	0.125	0.000	100.00
		F	2.875	2.000	30.43
		G	0.125	0.000	100.00
		H	0.125	0.000	100.00
		I	0.125	0.000	100.00
		J	0.125	0.000	100.00
	-150	A	0.125	0.000	100.00
		B	0.250	0.000	100.00
		C	0.250	0.000	100.00
		D	0.500	0.125	75.00
		E	0.250	0.000	100.00
		F	3.625	2.000	44.83
		G	0.250	0.000	100.00
		H	0.250	0.000	100.00
		I	0.250	0.063	75.00
		J	0.125	0.000	100.00



Table 8: Negative Uniform Static Ramp Load Test Results (continued)

Specimen #	Load (psf)	Gage Location	Deflection (in.)	Permanent Set (in.)	% Recovery
10	-180	A	0.125	0.000	100.00
		B	0.250	0.000	100.00
		C	0.250	0.000	100.00
		D	3.000	2.500	16.67
		E	0.250	0.000	100.00
		F	4.500	3.000	33.33
		G	0.250	0.000	100.00
		H	1.000	1.000	0.00
		I	0.500	0.125	25.00
		J	0.125	0.000	100.00
	-210	No gages required			
	-240	Failure load			

Table 9: Negative Uniform Static Ramp Load Test Results

Specimen #	Load (psf)	Gage Location	Deflection (in.)	Permanent Set (in.)	% Recovery
11	-10	1	0.313	0.000	100.00
		2	0.125	0.000	100.00
		3	1.375	0.000	100.00
		4	0.750	0.000	100.00
		5	0.063	0.000	99.20
		6	0.000	0.000	100.00
		7	0.188	0.000	100.00
		8	0.000	0.000	100.00
	-20	1	0.313	0.000	100.00
		2	0.250	0.000	100.00
		3	1.438	0.000	100.00
		4	1.188	0.063	94.74
		5	0.125	0.000	99.60
		6	0.125	0.000	100.00
		7	0.250	0.000	100.00
		8	0.031	0.000	100.00
	-30	1	0.313	0.000	100.00
		2	0.313	0.031	90.00
		3	1.625	0.000	100.00
		4	1.500	0.000	100.00
		5	0.188	0.000	100.00
		6	0.188	0.063	66.49
		7	0.313	0.000	100.00
		8	0.031	0.000	100.00





Table 9: Negative Uniform Static Ramp Load Test Results (continued)

Specimen #	Load (psf)	Gage Location	Deflection (in.)	Permanent Set (in.)	% Recovery
11	-40	1	0.313	0.000	100.00
		2	0.375	0.150	60.00
		3	2.000	0.000	100.00
		4	1.875	0.063	96.64
		5	0.375	0.000	100.00
		6	0.313	0.063	79.87
		7	0.375	0.063	83.20
		8	0.063	0.063	0.00
	-50	1	0.313	0.000	100.00
		2	0.500	0.250	50.00
		3	2.375	0.094	96.05
		4	2.250	0.063	97.20
		5	0.438	0.063	85.71
		6	0.438	0.156	64.29
		7	0.375	0.063	83.20
		8	0.188	0.125	33.51
	-60	1	0.313	0.000	100.00
		2	1.000	0.563	43.75
		3	3.000	1.875	37.50
		4	2.813	1.688	40.00
		5	0.625	0.188	70.00
		6	0.563	0.250	55.56
		7	0.500	0.250	50.00
		8	0.188	0.125	33.51
	-70	1	3.313	1.625	50.94
		2	1.500	0.656	56.25
		3	4.125	2.938	28.78
		4	4.000	2.750	31.25
		5	1.500	0.563	62.50
		6	1.250	0.500	60.00
		7	0.688	0.438	36.36
		8	0.375	0.125	66.67
	-75	No gages required			
	-80	Failure load			

#### 9.4 Conclusion

The static load tests were conducted according to the test procedure outlined in ASTM E 1592. Pressures were held for the duration of one minute. Failure occurred on Specimen #10 when there was creasing at the seams while ramping up to -240 psf. Failure occurred on Specimen #11 when there was creasing at the seams while ramping up to -80 psf.



## 10.0 DESIGN LOADS

### 10.1 Design Load Table

Table 10 provides the design loads for the tested panel.

Table 10: Design Loads

Span (ft)	1592 Load (psf)	Design Load (psf)
1.00	210.00	105.00
1.50	193.13	96.56
2.00	176.25	88.13
2.50	159.38	79.69
3.00	142.50	71.25
3.50	125.63	62.81
4.00	108.75	54.38
4.50	91.88	45.94
5.00	75.00	37.50

### 10.2 Notes

- 1) All values are interpolated from tests performed at spans of 1'-0" and 5'-0".
- 2) The loads were derived from the uplift test results shown in Section 9.3.
- 3) Design Load contains a 2.0 factor of safety per AISI Specifications.
- 4) Design Load does not take into account the deflection limits of the panel.

## 11.0 CERTIFICATION AND DISCLAIMER STATEMENT

All tests performed on these test specimens 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 specimens 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 specimens contain 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 specimens tested. This report may not be reproduced, except in full, without the written approval of ATI.



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## 12.0 APPLICABLE CODES, STANDARDS, AND TEST METHODS

ASTM E 1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

## 13.0 WITNESSES (ALL OR PARTIAL)

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Jeff McGovern	Director – Regional Operations	ATI
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