PERFORMANCE EVALUATION TEST REPORT

Rendered to:

NAAMM
National Association of Architectural Metal Manufacturers

PRODUCT: Expanded Metal Panels

Report No: B5874.01-106-31
Report Date: 05/21/12
Test Record Retention Period: 05/21/16

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Rendered to:

NAAMM
National Association of Architectural Metal Manufacturers
800 Roosevelt Road, Building C-312
Glen Ellyn, Illinois 60137

Report No:	B5874.01-106-31
Test Dates:	01/10/12
Through:	04/03/12
Report Date:	05/21/12
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Product: Expanded Metal Panels

Project Summary: Architectural Testing, Inc. was contracted by NAAMM to perform flexural testing and evaluation services for five styles of expanded metal panel. Performance results at a predetermined deflection limit (0.25 in.) were compared to concentrated load values at peak allowable deflection as presented in EMMA 557, Table F for 3#, 3.14#, 4#, 4.27# carbon steel and 2# aluminum products at 24 in. and 36 in. test spans. Loading of the test specimens was continued beyond the 0.25 in. deflection point in an effort to establish the elastic limit load (the point at which permanent deformation of the specimen is observed) for each product. This report details the procedures employed and results of this evaluation.

Test Methods: The test specimens were evaluated in general accordance with ASTM D 5456-09a, *Standard Specification for Evaluation of Structural Composite Lumber Products* and ASTM D 4761-05, *Standard Test Methods for Mechanical Properties of Lumber and Wood-Base Structural Material.*

Test Procedures: Testing was performed on materials which were provided by NAAMM and modified by Architectural Testing personnel as required for testing.

Flexural load was evaluated in accordance with ASTM C 5456, Section 6.5.1 (ref. ASTM D 4761-*Bending Flat-Wise-Center-Point Loading*). Three nominal 12.0 inch wide flexural specimens were prepared for evaluation for each of the five styles of expanded metal panel products (3#, 3.14#, 4#, 4.27# carbon steel and 2# aluminum) at test spans of 24 in. and 36 in. (total 30 specimens). Two inches at either end of the specimens (28 in. and 40 in. overall lengths as received) were spot welded at every second contact point of the lengthwise ends to 18.0 in. long sections of 3 in. steel angle iron to attain the desired test span for each series (24 in. and 36 in. respectively between the interior facing lips of the angle iron end restriction sections). The specimens were further reinforced lengthwise by 2.0 in. angle iron at either 30 in. or 42 in. lengths (as appropriate to test specimen length), which were welded to the 3.0 in. angle iron end-caps.

Test Procedures: (Continued)

The framed specimens were individually clamped into test fixtures mounted upon the test stage of a SATEC 50 UD Universal Testing Machine (ICN Y002011) so as to secure the specimen ends against movement (model: fixed-fixed end condition test) and concentrated load was applied at the specimen midspan through a 1.25 in. diameter loading rod arranged perpendicular to the span of the sample. In order to minimize the potential for seating error of the loading bar with regards to specimen deflection as measured by crosshead movement, a nominal 20 lb_f preload was applied to the specimen. With this preload maintained, the measured load and deflection were balanced to zero in order to establish a suitable test initiation condition. A 2.0 in. range Instron deflectometer (I3546-209T-ST) was employed at specimen midspan to verify measured deflection of the specimen and compressive force was applied at a rate of 0.1 in/min through both the 0.25 in. target deflection point and the graphically determined elastic limit load. In keeping with the load values presented in TABLE F as provided by NAAMM, flexural load was documented at 0.25 in. deflection from the zero load condition for all specimens.

Test Results: The results are summarized in the following table. Individual specimen data are located in Appendix A.

NAAMM Concentrated Load Evaluation Data Summary								
Expanded Metal Specimen		**Test Span (in)**	**Table F Reference**		**Mean Measured Load at 0.25 in. Deflection (lb_f) [1]**	**Load Ratio**	**Mean Elastic Limit [2]**	
Gage	**Nominal Width (in)**		**Deflection Limit (in)**	**Concentrated Load (lb_f)**			**Load (lb_f)**	**Deflection (in)**
Carbon Steel								
3.0#	12.0	24.0	0.25	275	274	1.00	501	0.43
		36.0	0.25	165	126	0.76	317	0.56
3.14#	12.0	24.0	0.25	375	340	0.91	371	0.28
		36.0	0.25	155	117	0.75	242	0.49
4.0#	12.0	24.0	0.25	440	468	1.06	672	0.36
		36.0	0.25	220	201	0.91	333	0.41
4.27#	12.0	24.0	0.25	400	419	1.05	751	0.45
		36.0	0.25	225	196	0.87	411	0.50

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Expanded Metal Specimen		**Test Span (in)**	**Table F Reference**		**Mean Measured Load at 0.25 in. Deflection (lb_f) [1]**	**Load Ratio**	**Mean Elastic Limit [2]**	
Gage	**Nominal Width (in)**		**Deflection Limit (in)**	**Concentrated Load (lb_f)**			**Load (lb_f)**	**Deflection (in)**
Aluminum								
2.0#	12.0	24.0	0.25	250	320	1.28	557	0.43
		36.0	0.25	100	136	1.36	297	0.51

[1] The mean measured loads as presented above represent experimentally determined load values from expanded metal specimens welded directly to the test specimen restriction frame lip at a fixed span of 24 in and 36 in. eliminating the need for an applied correction factor.

[2] Elastic limit values were determined graphically from the individual specimen loading curves and averaged for each test series. The values as presented represent a deviation of approximately 2% from the established chord modulus.

Architectural Testing 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 Architectural Testing, Inc. for the entire test record retention period.

Results obtained are tested values and were secured by using the designated tested methods. 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 specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.:

Scott D. Scallorn - Technician I
Components / Materials Testing

Gary Hartman, P.E. - Director
Components / Materials Testing

SDS:sds/nlb

Attachments (pages) This report is complete only when all attachments listed are included.
Appendix A - Datasheets (2)
Appendix B - Photographs (4)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	05/21/12	N/A	Original report issue.

APPENDIX A

Datasheets

NAAMM Concentrated Load Evaluation - Individual Specimen Results						
Specimen		**Test Span (in)**	**Specimen No.**	**Mean Measured Load at 0.25 in. Deflection (lb_f) [1]**	**Mean Elastic Limit**	
Gage	**Nominal Width (in)**				**Load (lb_f)**	**Deflection (in)**
Carbon Steel						
3.0#	**12.0**	**24.0**	**1**	252.9	486.0	0.43
			2	287.0	496.9	0.41
			3	282.9	519.7	0.44
			Mean	**274.3**	**500.9**	**0.43**
		36.0	**1**	124.0	317.0	0.57
			2	128.6	323.6	0.56
			3	125.5	311.6	0.56
			Mean	**126.0**	**317.4**	**0.56**
3.14#	**12.0**	**24.0**	**1**	345.8	376.5	0.28
			2	338.8	369.2	0.27
			3	334.2	366.6	0.28
			Mean	**339.6**	**370.8**	**0.28**
		36.0	**1**	125.3	259.8	0.49
			2	108.7	223.2	0.48
			3	117.8	241.7	0.49
			Mean	**117.3**	**241.6**	**0.49**
4.0#	**12.0**	**24.0**	**1**	447.1	616.3	0.35
			2	446.6	615.5	0.35
			3	511.8	785.6	0.38
			Mean	**468.5**	**672.4**	**0.36**
		36.0	**1**	210.1	306.2	0.37
			2	218.1	386.0	0.42
			3	175.5	305.6	0.44
			Mean	**201.2**	**332.7**	**0.41**
4.27#	**12.0**	**24.0**	**1**	461.1	800.1	0.44
			2	386.6	699.3	0.47
			3	410.3	752.6	0.46
			Mean	**419.3**	**750.7**	**0.45**
		36.0	**1**	199.8	398.4	0.45
			2	195.5	412.9	0.51
			3	193.4	421.4	0.54
			Mean	**196.2**	**410.9**	**0.50**

NAAMM Concentrated Load Evaluation - Individual Specimen Results						
Specimen		**Test Span (in)**	**Specimen No.**	**Mean Measured Load at 0.25 in. Deflection (lb_f) [1]**	**Mean Elastic Limit**	
Gage	**Nominal Width (in)**				**Load (lb_f)**	**Deflection (in)**
Aluminum						
2.0#	**12.0**	**24.0**	**1**	326.0	491.2	0.38
			2	333.5	686.7	0.51
			3	301.8	492.8	0.42
			Mean	**320.5**	**556.9**	**0.43**
		36.0	**1**	132.0	295.3	0.52
			2	132.4	289.8	0.50
			3	142.6	306.5	0.50
			Mean	**135.6**	**297.2**	**0.51**

APPENDIX B

Photographs

Photo No. 1
Typical Pretest Condition Restriction Frame Reinforced Specimens
(3# Product Depicted: 36 in. Span Left, 24 in. Span Right)

Photo No. 2
Typical Angle Iron Restriction Fixturing End-Weld Detail
(Weld-Points to Inside Lip of Angle Iron End-Cap to Define 24 or 26 in. Test Span)

Photo No. 3
Typical 24 in. Span Concentrated Load Restriction Frame Test Fixturing

Photo No. 4
Typical 36 in. Span Concentrated Load Restriction Frame Test Fixturing

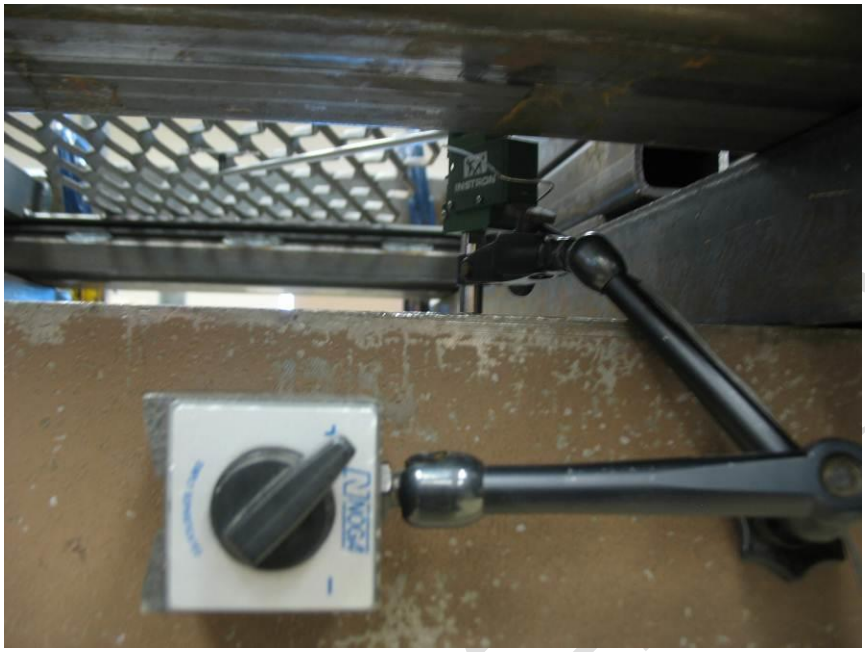

Photo No. 5
Typical Test Setup with Midspan Deflection External Deflectometer in Place

Photo No. 6
Zero Load/Deflection Condition (Post Pre-Load) Loading Rod Contact Detail

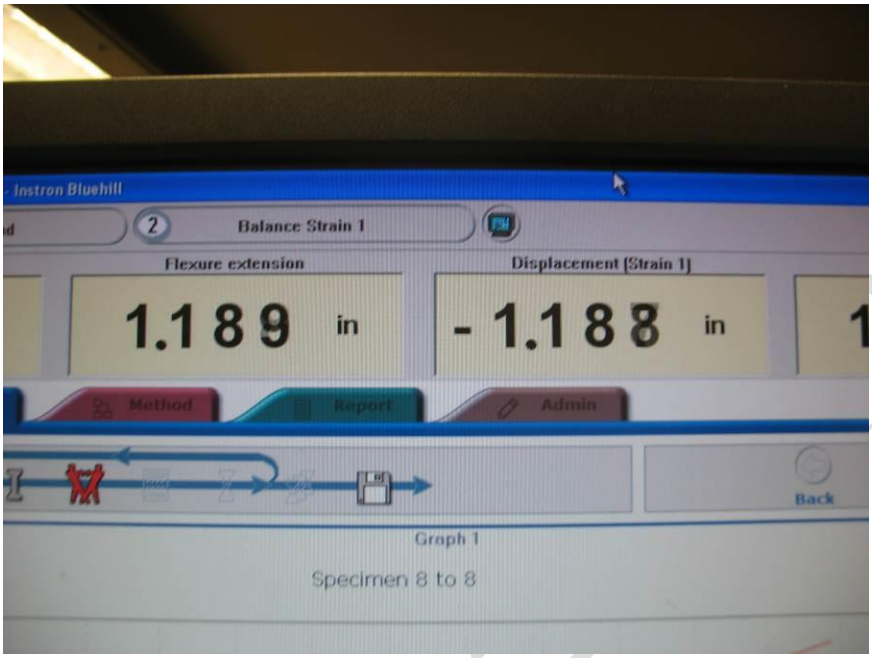

Photo No. 7
Verification of Crosshead Movement-Extensometer Measurement Consistency

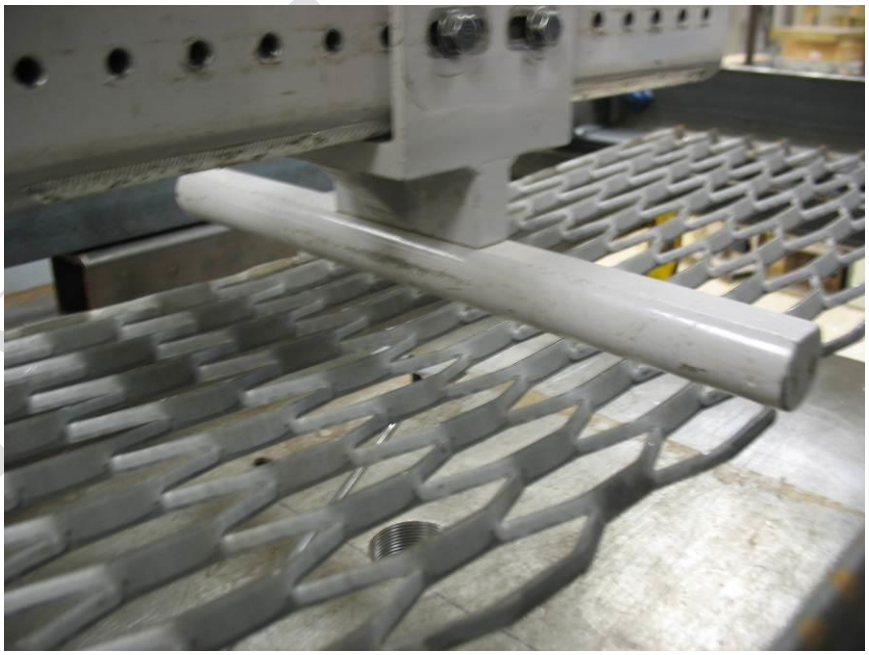

Photo No. 8
Typical Post-Evaluation Specimen Permanent Deformation Specimen Condition
(Loading Nose Shown Reset to Pretest Zero Load/Deflection Position)