

**CLIENT:** American Frame Manufacturing  
7560 Bristow Ct. Unit B  
San Diego, CA, 92154  
Attn: Mario Riguer

**Test Report No: RJ1679-P**

**Date: January 12, 2012**

**SUBJECT:** Structural Performance Testing on Decorative Stone Panels.

**SAMPLE ID:** Tongue and Groove, Decorative Stone Panels measuring approximately 24" x 48" x 1" thick.

**DATE OF RECEIPT:** December 14, 2011.

**TESTING PERIOD:** December 21 through 23, 2011.

**AUTHORIZATION:** Signed QAI Test Proposal MB121211-2 dated December 12, 2011.

**TEST PROCEDURE:** Testing was performed in accordance with ASTM E 330-02, *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*. Details of the test procedure are provided on page 2 of this report.

**TEST RESULTS:** See page 2 of this report for detailed test results.

**FINDINGS:** The decorative stone panel wall cladding system met the Manufactured Home Construction and Safety Standards for Wind Zone Areas I, II, and III when tested in accordance with ASTM E330 for both positive and negative pressure.

**Prepared By**



Larry Burmer  
Project Specialist

**Signed for and on behalf of  
QAI Laboratories Inc.**



Rhonda Byrne  
Laboratory Manager



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## **UNIFORM LOAD TEST PER ASTM E330**

**Test Panel Construction:** Six 4' wide by 8' high test panels were constructed for the test. Each wall panel consisted of nominal 2 x 4, SPF, wood studs spaced 16 inches on center, <sup>15</sup>/<sub>32</sub>-inch thick, APA, OSB sheathing board, Tyvek<sup>®</sup> Housewrap weather resistive barrier and tongue and groove decorative stone panels.

The OSB sheathing was fastened to the wood framing with 6d galvanized nails spaced 6 inches on center around the perimeter and 12 inches on center in the field. The Tyvek<sup>®</sup> Housewrap was placed over the OSB sheathing and stapled into place. Four tongue and groove decorative stone panels were horizontally placed over the weather resistive barrier and fastened to the wood framing with 2½-inch long deck screws.

One screw was placed at the top, middle, and bottom of each foam panel approximately 11 inches on center at the edge of the framing. To simulate in field installation, each decorative panel was cut so that one tongue and groove joint was located over one stud 16 inches on center. The panels were installed in such a manner so that the joints were staggered from top to bottom in the wall assembly. One screw was located at each tongue, approximately 12 inches on center at each vertical joint, a minimum of 1-inch from each end of the tongue.

A total of three horizontal and four vertical joints were incorporated in each wall panel assembly. A total of 13 deck screws were used to secure one 24-inch by 48-inch decorative stone panel. A total of 52 deck screws were used to secure the foam panels to the framing which incorporated a 4' x 8' (32 sq.ft.) test area. The screws were placed directly through the exterior side of the foam panel and counter sunk approximately ⅛-inch. A photograph of the exterior side of the wall panel assembly is provided in the appendix of this report.

**Test Procedure:** Testing was performed in accordance with ASTM E 330, Procedure B. Three panels were tested under positive load conditions and three panels were tested under negative load conditions.

After initial mid-panel deflection readings were recorded, a test load was applied to the panel and increased in 15 psf increments for positive load tests and 10 psf increments for negative load tests until an ultimate load was reached. The test load was held for a minimum of 10 seconds at each increment while deflection readings at the midpoint of the panel, between framing members, were recorded. Once the ultimate load was reached, the load was reduced to zero and the mode of failure recorded. The panel was then removed from the chamber and examined for component failure and cracking of the finish.

For positive load tests, the panels were individually placed horizontally, face up, on a vacuum chamber. The exterior side of the panel was covered with a 2 mil. thick plastic film thus facilitating a positive load on the exterior side of the panel. The plastic film was then sealed around the perimeter of the test chamber. To prevent failure in the framing, the studs were supported between the panel and the chamber floor.

For negative load tests, the panels were individually placed horizontally, face down, on the test chamber and an airtight seal provided around the perimeter of the panel. To prevent failure in the framing, two, 6-inch wide steel "C" channels were attached across the back of the studs, approximately 32 inches apart. The loads were uniformly applied to the exterior side of the panel using a reversible controllable blower system.

A photograph of the negative load test set-up is provided in the appendix of this report.



**UNIFORM LOAD TEST PER ASTM E330 (CONT.)**

**Test Requirements:** The test assemblies shall meet the basic wind zone requirements for Zones I, II, and III as set forth by the Manufactured Home Construction and Safety Standards as follows:

- Zone I: 70 mph
- Zone II: 100 mph
- Zone III: 110 mph

**Test Results:**

**Positive Load Test**

Applied Load (psf)	Mid-Panel Deflection (in)		
	Panel #1	Panel #2	Panel #3
0	0.000	0.000	0.000
15	0.005	0.008	0.004
30	0.012	0.016	0.010
45	0.020	0.024	0.019
60	0.032	0.035	0.027
75	0.042	0.046	0.034
90	0.053	0.053	0.044
105	0.064	0.061	0.050
120	0.074	0.069	0.057
150	0.089	0.082	0.069
180	0.102	0.095	0.079
210	0.113	0.106	0.092
240	0.125	0.116	0.102
270	0.135	0.135	0.112
300	0.146	0.147	0.120

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**UNIFORM LOAD TEST PER ASTM E330 (CONT.)**

**Test Results (Cont.):**

**Positive Load Test (Cont.)**

Panel #	Observations
1	The test panel withstood an ultimate test load of 300 psf without failure. No cracking of the exterior finish was observed.
2	The test panel withstood an ultimate test load of 300 psf without failure. No cracking of the exterior finish was observed.
3	The test panel withstood an ultimate test load of 300 psf without failure. No cracking of the exterior finish was observed.
<b>The average ultimate test load for the three panels is 300 psf.</b>	

Comment

In order to establish pass/fail criteria for the test, allowable wind load determinations can be made based on the results of positive load tests conducted on the wall assemblies. Typically, for uniform load tests conducted on exterior wall cladding systems, a *minimum* safety factor of 3 is applied to the average ultimate loads achieved during the test. Since testing resulted in an average ultimate load of 300 psf, the allowable load for the wall assemblies would be 100 psf which is equivalent to a wind speed of 200 mph.

**Negative Load Test**

Applied Load (psf)	Mid-Panel Deflection (in)		
	Panel #1	Panel #2	Panel #3
0	0.000	0.000	0.000
10	0.006	0.004	0.004
20	0.008	0.009	0.007
30	0.010	0.012	0.009
40	0.014	0.015	0.011
50	0.016	0.016	0.013
60	0.018	0.018	0.015
70	0.020	0.020	0.017
80	0.023	0.022	0.020
90	0.026	0.024	0.023
100	0.028	0.026	0.026
110	---	0.028	---
120	---	0.030	---

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**UNIFORM LOAD TEST PER ASTM E330 (CONT.)**

**Test Results (Cont.):**

**Negative Load Test (Cont.)**

Panel #	Observations
1	At a test load of 109 psf, the heads of the deck screws pulled through the foam panels.
2	At a test load of 125 psf, the heads of the deck screws pulled through the foam panels.
3	At a test load of 109 psf, the heads of the deck screws pulled through the foam panels.
	<b>The average ultimate test load for the three panels is 114 psf.</b>

A photograph showing the typical mode of failure is provided in the appendix of this report.

**Comment**

In order to establish pass/fail criteria for the test, allowable wind load determinations can be made based on the results of negative load tests conducted on the wall assemblies. Typically, for uniform load tests conducted on exterior wall cladding systems, a *minimum* safety factor of 3 is applied to the average ultimate loads achieved during the test. Since testing resulted in an average ultimate load of 114 psf, the allowable load for the wall assemblies would be 38 psf which is equivalent to a wind speed of 123 mph.

Allowable loads are limited to the lower of the two series of tests (positive and negative), and in this case that would be 38 psf. or 123 mph.

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**APPENDIX**

Photograph No.1  
Decorative Stone Test Panel

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**APPENDIX**

Photograph No.2  
Negative Load Test Set-Up

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**APPENDIX**

Photograph No.3  
Typical results of the negative load test  
Fasteners pulled through the foam panels