



NATIONAL CERTIFIED TESTING LABORATORIES

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MOCK-UP TEST REPORT

Report No: NCTL-110-11828-3
Test Dates: 06/22, 07/23-27/10
Test Dates: 08/23-25/10
Report Date: 08/26/10

Client: Alumil N.A. Corporation
4401 21st. Street, Suite 203
Long Island City, NY 11101

Test Site: National Certified Testing Laboratories, 5 Leigh Drive, York, PA 17406

Test Specimen: Alumil N.A. Corporation's "M6 System"

Test Methods for Mock-Up Performance: ASTM E 283-04, "Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors"; ASTM E 330-02, "Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference"; ASTM E 331-00, "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference"; AAMA 501.1-05, "Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure."

TEST PROCEDURE

Air Leakage: A test chamber was constructed surrounding the interior of the test specimen. The intent of the air leakage test is to measure extraneous infiltration through operable sash/panel/vent crack length, fixed glazing, hardware, etc. within the area enclosed by the window frame. Other sources of air infiltration (i.e. through fasteners holes in the side frames, frame corner seals around the frame, through interior trim and interior mullion covers, through exterior panning systems, through leakage in the test equipment or the chamber attachment to the test area are referred to as extraneous air and must be measured and accounted for.

Extraneous air is determined by applying a "blank" of thin plastic sheeting to the exterior of the window frame. The net air passing through the window is calculated by subtracting the measured amount of air infiltration with the "blank" from the total measured air infiltration without the "blank" (gross air). The air leakage is calculated in cubic feet per minute (cfm) of net air infiltration per amount of area (ft²). Air leakage tests were conducted at a static test pressure differential 6.24 psf across the test specimen equivalent to a 49 mph wind load. The allowable air infiltration rate was 0.06 cfm/ft².

Static Water Penetration: A calibrated water spray grid was provided at the exterior of the test specimen to uniformly deliver water against the exterior surface of the test specimen at a minimum rate of 5.0 gph/ft². This water spray was also delivered against all joints, cracks or openings between the window assembly and adjacent wall construction. The test chamber was applied to the interior wall construction in such a manner as to create a pressure differential across the entire window assembly (including sub-frame/receptor and/or panning) and the perimeter seals.

Structural Loads: When the designated structural load (psf) is applied to the test specimen, deflection measurements are taken at the locations selected by the architect/consultant. The maximum allowable deflection is $L/175$ for the 100% load and the maximum allowable permanent set is 0.2% at the 150% load.

Dynamic Water Penetration: During delivery of the water spray a calibrated dynamic wind source (airplane engine) shall be used to provide dynamic wind pressure across the exterior face of the test specimen and surrounding construction for a duration of fifteen (15) minutes.

When testing the specimen, no uncontrolled water shall pass the innermost plane of the system as defined by the vertical face of the innermost panel or frame member, or enter the wall cavity during the water penetration test.

For purposes of this testing, acceptable, controlled water leakage is defined as follows:

1. Water contained and drained back to the exterior or the collection of up to one-half ounce of water in the 15-minute test period on top of an interior horizontal window surface that does not spill onto the adjacent finishes or materials is acceptable.
2. The penetration of water in the 15-minute test period through exterior panning, sub-frame, flashing and perimeter joint is acceptable providing the installed window system is designed to collect and drain this leakage to the exterior (i.e. sub-sill, drained flashing, etc.,) without damage to adjacent construction.
3. A small amount of percolation (less than 10 drops), through meeting rails or over the sills that is visible on adjacent finishes or materials is acceptable.

Water penetration tests were conducted at static test pressure differentials of 10.0 psf (62.5 mph), 12.0 psf (68.5 mph) and 15.0 psf (76.55 mph) and a dynamic test pressure differential of 15.0 psf (76.55 mph) with no uncontrolled water leakage allowed.

SPECIMEN DESCRIPTION

General: The test specimen was an as-built Alumil N.A. Corporation “M6 Curtain Wall System Mock-Up” consisting of twenty (20) fixed windows within one (1) mock-up “L” return mock-up opening measuring 176” wide by 57” wide (“L” return) by 264” high.

SPECIMEN TEST RESULTS

Note: All specimen designations are from an interior view.

<u>Test</u>		<u>Results</u>	<u>Allowed</u>
<i>Initial-Preload Deflection</i>			
+ 25.0 psf	<i>Mock-Up Assembly</i>	<i>N/A</i>	<i>N/A</i>
- 25.0 psf	<i>Mock-Up Assembly</i>	<i>N/A</i>	<i>N/A</i>
<i>Initial-Air Leakage</i>			
6.24 psf (49.37 mph)	<i>Mock-Up Assembly</i>	<i>Passed / <0.01 cfm/ft²</i>	<i>0.06 cfm/ft²</i>
<i>Initial-Air Leakage</i>			
14.3 psf (74.7 mph)	<i>Mock-Up Assembly</i>	<i>Passed / <0.01 cfm/ft²</i>	<i>0.06 cfm/ft²</i>
<i>Initial-Static Water Penetration</i>			
10.0 psf (62.5 mph)	<i>Mock-Up Assembly</i>	<i>Passed / No Leakage</i>	<i>No Leakage</i>
<i>Initial-Static Water Penetration</i>			
12.0 psf (68.5 mph)	<i>Mock-Up Assembly</i>	<i>Passed / No Leakage</i>	<i>No Leakage</i>
<i>Initial-Static Water Penetration</i>			
15.0 psf (76.55 mph)	<i>Mock-Up Assembly</i>	<i>Passed / No Leakage</i>	<i>No Leakage</i>
<i>Initial-Dynamic Water Penetration</i>			
15.0 psf (76.55 mph)	<i>Mock-Up Assembly</i>	<i>Passed / No Leakage</i>	<i>No Leakage</i>
<i>Initial-Uniform Load Deflection Test</i>			
+ 50.0 psf		<i>Passed / 0.137”</i>	<i>0.856”</i>
<i>Initial-Uniform Load Deflection Test</i>			
-50.0 psf		<i>Passed / 0.356”</i>	<i>0.856”</i>
<i>Repeat #1- Air Leakage</i>			
6.24 psf (49.37 mph)	<i>Mock-Up Assembly</i>	<i>Passed / <0.01 cfm/ft²</i>	<i>0.06 cfm/ft²</i>
<i>Repeat#1-Air Leakage</i>			
14.3 psf (74.7 mph)	<i>Mock-Up Assembly</i>	<i>Passed / <0.01 cfm/ft²</i>	<i>0.06 cfm/ft²</i>
<i>Repeat #1-Static Water Penetration</i>			
10.0 psf (62.5 mph)	<i>Mock-Up Assembly</i>	<i>Passed / No Leakage</i>	<i>No Leakage</i>

SPECIMEN TEST RESULTS (Continued)

Note: All specimen designations are from an interior view.

Repeat #1-Static Water Penetration

12.0 psf (68.5 mph) Mock-Up Assembly Passed/No Leakage No Leakage

Repeat #1-Static Water Penetration

15.0 psf (76.55 mph) Mock-Up Assembly Passed/No Leakage No Leakage

Repeat #1-Dynamic Water Penetration

15.0 psf (76.55 mph) Mock-Up Assembly Passed/No Leakage No Leakage

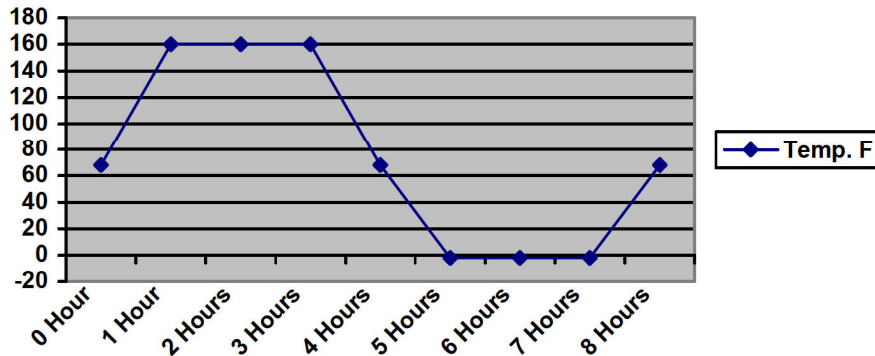
Test for Wind and Seismic Drift (Lateral Load) - The load shall be applied 3 times horizontally in both a left and right direction in order to cause a movement of 3/8" deflection in each direction.

Passed/ No Structural Damage

Test for Wind and Seismic Drift (Vertical Load) - The load shall be applied 3 times vertically in both an up and down direction in order to cause a movement of 3/8" deflection in each direction.

Passed/ No Structural Damage

Thermal Cycling Condensation Resistance-AAMA 501.5



The above chart is representative of the average exterior temperature of the test specimen during the three (3) thermal performance cycles.

For the duration of the three (3) thermal performance cycles an average interior temperature of 71° F and 31% relative humidity was maintained.

At the conclusion of the thermal performance testing there was no damage to the test specimen from either expansion or contraction of the test unit.

SPECIMEN TEST RESULTS (Continued)

Note: All specimen designations are from an interior view.

<u>Test</u>		<u>Results</u>	<u>Allowed</u>
Repeat #2- Air Leakage 6.24 psf (49.37 mph)	Mock-Up Assembly	Passed / <0.01 cfm/ft ²	0.06 cfm/ft ²
Repeat#2-Air Leakage 14.3 psf (74.7 mph)	Mock-Up Assembly	Passed / <0.01 cfm/ft ²	0.06 cfm/ft ²
Repeat #2-Static Water Penetration 10.0 psf (62.5 mph)	Mock-Up Assembly	Passed / No Leakage	No Leakage
Repeat #2-Static Water Penetration 12.0 psf (68.5 mph)	Mock-Up Assembly	Passed / No Leakage	No Leakage
Repeat #2-Static Water Penetration 15.0 psf (76.55 mph)	Mock-Up Assembly	Passed / No Leakage	No Leakage
Repeat #2-Dynamic Water Penetration 15.0 psf (76.55 mph)	Mock-Up Assembly	Passed / No Leakage	No Leakage
Uniform Load Test (150%-Safety Factor Loads) + 75.0 psf		Passed / 0.018"	0.300"
Uniform Load Test (150%-Safety Factor Loads) - 75.0 psf		Passed / 0.025"	0.300"

Witness Log: (All or Partial)

Saranto Nikolakkos	Alumil N.A.
Antonis Rizos	Alumil S.A.
Kyp Bazenikas	Alumil N.A.
Jed Walker	NCTL
Robert Wm. DeFayette	NCTL
George Edleblute	NCTL

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A handwritten signature in black ink, appearing to read 'Robert Wm. DeFayette', is written over a small circular logo. The logo contains the letters 'NCTL' and the text 'National Certified Testing Laboratories' below it.

ROBERT Wm. DeFAYETTE
Field Testing/Curtainwall Coordinator

RWD/amb