

RADCO TEST REPORT
Test Report No. RAD-5240
Project No. C2470A

Water Penetration Test on Diamond-Furr™ System

Prepared for

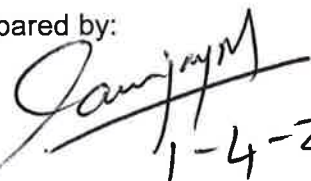
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Sample Description (3 pages total)



1.0 INTRODUCTION

At the request of Brand X Metals a water penetration test was conducted on one 8 ft. x 8 ft. wall assembly described below in accordance with ASTM E331-00(2009).

The purpose of this testing was to evaluate the performance of the Brand X Metals, Inc.'s Diamond-Furr™ metal lath attachment system when subjected to wind driven rain.

2.0 TEST SPECIMEN

An 8ft. x 8ft. fully assembled wall was submitted to RADCO for testing. RADCO did not witness or document the construction details. The plaster application was done at RADCO. The description of the wall assembly was submitted to RADCO by Brand X Metals. This description is attached to the appendix of this report.

The scratch coat was applied on Friday December 7, 2012. The brown coat was applied on Monday December 10, 2012. The test was conducted on Wednesday December 19, 2012.

3.0 WATER PENETRATION TEST, ASTM E331-00(2009)

Setup & Apparatus

The test was conducted per *ASTM E331-00(2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.*

The test was conducted in a chamber designed to test one 8 ft x 8 ft. (2.44 m x 2.44 m) panel. The water spray system consisted of a grid of spray nozzles and was calibrated prior to conducting the test to assure that it delivers a uniform spray of water to the exterior face of the test specimen at a minimum rate of 5.0 US gal./ft.²/hr. The negative pressure was achieved by evacuating the air inside the test chamber using a vacuum pump. The pressure was measured using a Dwyer Instruments inclined manometer capable of reading pressure in 0.02 inch increments of water column (w.c.). This reading was converted to psf using the relation 1" of w.c. = 5.20 psf.

The panel was mounted in the test chamber with the exterior face facing the water spray and interior face facing the negative pressure chamber. The outside perimeter of the panel was sealed with caulking material and a 3/8" (9.5 mm) rubber gasket to create a water and air tight seal. The window installed in the panel was covered with plastic and sealed such that the window itself was not subjected to the water spray.

The panel was subjected to a uniform water spray at a minimum rate of 5.0 gallons per square foot per hour, and a simultaneously applied pressure differential of 2.86 psf (137 Pa). The water spray and pressure was maintained on the panel for 15 minutes during which time the interior surface of the panel was constantly monitored for water penetration.

After the initial 15 minutes of water exposure, the negative pressure was increased to 6.24 psf (300 Pa) for an additional 15 minutes of water exposure, to 12.0 psf (575 Pa), 15.6 psf (747Pa) and 18.2 psf (871 Pa).

Condition of Acceptance: There shall be no visible water penetration at the interior face of the wall panel.

Test Results

No signs of failure as described above, especially at sheathing joints or the window / panel interface, were observed when the panel was subjected to the negative pressures and water spray duration shown in the table below.

Negative Pressure	Water Spray Duration	Result
2.86 psf (137 Pa)	15 minutes	Pass
6.24 psf (300 Pa)	15 minutes	Pass
12.0 psd (575 Pa)	15 minutes	Pass
15.6 psf (747 Pa)	15 minutes	Pass
18.2 psf (871 Pa)	15 minutes	Pass

NOTE: The 2012 International Building Code (IBC), Chapter 14 *Exterior Walls*, Section 1403, exception 2 states, in part, the following:

Compliance with the requirements for a means of drainage, and the requirements of Sections 1404.2 and 1405.4, shall not be required for an exterior wall envelope that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E331 under the following conditions:

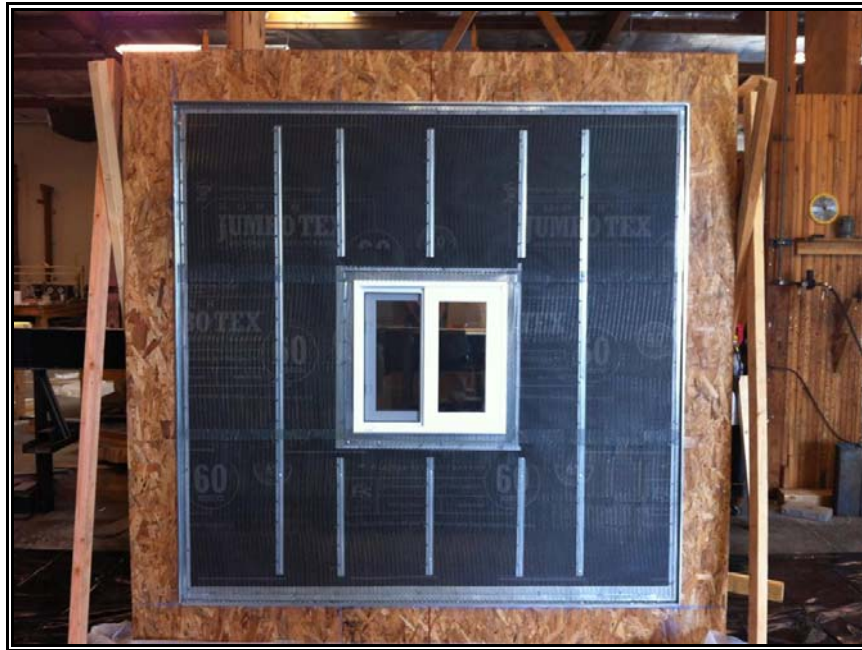
- 2.3 Exterior wall envelope assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (psf) (0.297 kN/m²).
- 2.4 Exterior wall envelope assemblies shall be subjected to a minimum test exposure duration of 2 hours.

Observation: The Brand X Metals wall panel was tested to a pressure of 18.2 psf, which is almost three times the pressure required by the 2012 IBC. This test pressure was maintained for 15 minutes instead of the 2 hours required by the IBC.

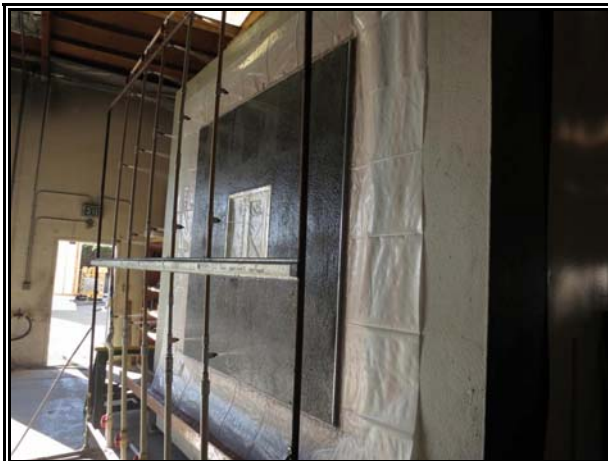
END OF REPORT

4.0 PHOTOGRAPHS

8'X8' PANEL SUBMITTED FOR TESTING



FRONT & REAR VIEW OF PANEL IN TEST FIXTURE



APPENDIX
Sample Description (3 pages total)

RADCO FENESTRATION TEST OF DIAMOND<>FURR® SYSTEM 12-19-12

Brand X Metals, Inc. commissioned RADCO to perform fenestration testing for the Diamond<>Furr® System of lath attachment using the following wall assembly design. The structure was assembled at Brand X Metals, Inc. Anaheim, California headquarters and transported without plaster to the Radco offices in Long Beach, California. The plaster was applied by Select Plastering at the RADCO offices under their supervision.

Framing:

1. The framing for the test wall was constructed from Douglass Fur 2" x 4" framing members. The framing was set at 16" on center with double studs around perimeter of the wall and window opening.

Sheathing:

1. The sheathing used was a standard 7/16" OSB sheathing fastened with 8d framing nails directly to the framing members per current California building code.

Window:

1. The window used was a standard Milguard® nail on vinyl window measuring 2' x 2'. The window has a built in plaster ground allowing for a 7/8" depth of Portland cement plaster. The window was manufactured with a standard 1-1/4" vinyl nailing fin.

Flashing:

1. The flashing under the nailing fin of the window was a standard paper flashing. The flashing was not self adhering and installed with standard construction staples. The flashing was installed over the sheathing and was not installed through the rough opening, only flush with the outside edge of the opening. Fortifiber SK-10 was used.

Caulking:

1. The caulking used was a standard white vinyl caulk, from a standard tube container, applied in a continuous bead by a caulking gun. Sikaflex Professional Construction Sealant was used.

Moisture Barrier:

1. The moisture barrier used was a standard 60 minute asphalt building paper. Two layers of material were installed using standard construction staples to fasten the material to the sheathing.

Diamond<>Furr Products:

1. The proprietary Diamond<>Furr® System was fastened using standard #8 1- 5/8” wafer head sharp point screws where required.
2. Product part number DFS-375 was used to encapsulate the Portland cement plaster around three sides of the perimeter of the test wall. Fasteners attaching the parts were installed through the sheathing to the framing members at approximately 12” intervals.
3. Product part number DFR-375 was used to sheet metal flash the perimeter of the vinyl window and attached by fasteners approximately every 12” through the sheathing to the framing members.
4. Product part number DF-375 was used to allow for lath attachment and furring of the lath in the field area of the test wall. The parts were installed on 16” centers of the vertical framing members. The parts were fastened at a maximum spacing of 16” as per ICC ESR 3232, breaking only for the window opening dimensions. These parts were attached through the final layer of moisture barrier, through the sheathing and into the center of vertical framing members.
5. Product part number DFW-375 was used at the base of the test wall to act as a weep screed. The parts were attached approximately every 12” through the sheathing into the framing members by the fasteners.

Lath:

1. The lath used was standard CEMCO 3.4 metal lath.

Wire Tie:

1. The lath was attached to the Diamond<>Furr® System products by standard 18 gauge galvanized ‘hank’ wire. The tie method used was a standard butterfly tie. The lath was attached at a maximum of 6 ½ “as per ASTM C 1063.

Plaster:

1. The test wall was plastered in two steps using a standard Portland cement. The ‘scratch coat’ was applied by hand trowel in typical fashion with a grooved finish and allowed to cure for 3 full days. No cracking of the plaster was visible upon inspection by the RADCO staff on the test wall prior to the second coat of plaster being applied. The ‘brown coat’ was applied by hand trowel as well and allowed to cure for 7 full days prior to the fenestration testing. No ‘finish coat’ was used in the test, but plaster was a full 7/8” depth.

Installation Procedure:

1. Framing was assembled, square and plumb.
2. Sheathing was installed with opening for the window.
3. Diamond<>Furr® part number DFW-375 was installed at the base of the test wall as a weep screed.
4. Diamond<>Furr® part number DFS-375 were installed on the three remaining sides of the test wall to encapsulate the Portland cement plaster. The parts were lapped over the weep screed at the base of the wall.
5. Paper flashing was installed at sill and jambs of window opening. Jambs lapped over sill.
6. Caulking was applied in a continuous bead over paper flashing and sheathing in such a manner so as to be covered by the nailing fin of the window.
7. Window was installed over caulk, pushed flat to the sheathing, and then squared prior to being nailed off. Three nails per side were used to secure the window.
8. Excess caulking protruding through the nailing fin holes was wiped flush with paper towels.
9. The head of the window was flashed with flashing paper, over the nailing fin as is typical.
10. One layer of standard 60 minute building paper was slid under the sill flashing paper and stapled to the sheathing to allow for the proper drainage plain shingling. The building paper spanned the length of the test wall and was trimmed to fit the area.
11. Caulking was again applied in a continuous bead on the top of the nailing fin of the window and over the head flashing paper. The caulking bead was centered on the nail fin of the window.
12. A pre-fabricated window flashing pan, constructed from Diamond<>Furr® part number DFR-375 was installed using ½' removable wooden spacers at the head of the window to keep the correct position of the pan while fastening to the framing. The pre-fabricated window flashing pan is built to have correct downward laps prior to spot welding.
13. The remainder of the 60 minute building paper was installed in typical shiplap fashion and secured with standard staples as is typical. The building paper was trimmed to the edge of the Diamond<>Furr® parts using their furring component as a guide. There was typically a ¼" to ½" of space open between the furring component and the termination of the building paper. The edges of the building paper were held down by 26GA x ¾" flat strap. The flat straps were held in place by sliding ¾" roofing nails parallel to the sheathing through the built in attachment holes in the Diamond<>Furr® DFS and DFW series parts. These nails were not removed and remained embedded in the plaster. No tape or caulk was used to secure the building paper at termination points for this test.
14. Diamond<>Furr® part number DF-375 were installed on 16" centers through the moisture barrier, sheathing and into the center of all of the vertical framing where required.
15. The metal lath was installed and trimmed to fit the test wall area and secured by wire ties. Laps were approximately 1" and wire tied between framing where there was no backing per ASTM C 1063.
16. The 'scratch coat' of Portland cement was applied and cured.
17. The 'brown coat' of Portland cement was applied over the dried 'scratch coat' and cured.