Air Leakage and Water Resistance
ASTM E2357 and ASTM E331

Scope Statement
During testing, the CavityComplete® Wall System for Wood Stud with Masonry Veneer was subjected to thousands of positive/negative pressure cycles simulating wind/structural/thermal movement stress testing of the durability of the air/water resistive barrier assembly. The system was tested in large scale simulations of both unpenetrated (opaque) and penetrated wall surfaces.

Testing Conducted By
PRI Construction Materials Technologies LLC
6412 Badger Drive, Tampa, FL 33610

Testing Date
December 1, 2016- January 27, 2017

Test Report No
• OCF-299.02-01

Test Methods
• ASTM E 2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
• ASTM E331-00 (2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

Specimen Description
Test Specimen Size: 96" x 96" (64 ft², 5.946 m²)

Opaque Wall
The opaque wall was constructed from nominal 2" x 4" spruce/pine/fir studs spaced 16" o.c. 1/2" OSB sheathing secured to the studs with 1-5/8" bugle head, rust-resistant, coarse thread sharp point screws spaced 8" o.c. Sheathing contained a horizontal as well as a staggered vertical joint in accordance with ASTM E2357 description. The wall was detailed with PROSOCO Joint & Seam Filler and coated with PROSOCO R-Guard Cat-5 vapor permeable Air Barrier at a nominal 500sf/gal and a target dry film thickness of 12 mil. Owens Corning FOAMULAR® 250 XPS, 2" thick, 48" wide straight edge, extruded polystyrene insulation board was attached to half of the specimen with 6 Rodenhouse Impaling Fasteners and Grip-Deck Screws and Heatmann Pos-I-Ties masonry veneer anchors with ThermalClip and Rodenhouse Thermal-Grip Washers spaced at 16” o.c.

Penetrated Wall
Same as the opaque Wall described except with wall penetrations prescribed by the ASTM E2357 test standard and with all CavityComplete® Wall System components installed. The penetrations included two 625mm by 1225mm rough openings with metal frame window blank (one installed in the FOAMULAR® side and one in the Thermalfiber® side), a 100mm by 100mm HVAC duct, a 38mm PVC pipe, and two junction box penetrations; one square and one octagon per ASTM E2357. Additional penetrations included a TotalFlash flashing/termination bar/drainage mesh fabricated panel system from Mortar Net Solutions installed along the base of the system and trimmed to allow sealing of the specimen wall, Rodenhouse Grip-Deck screws with Thermal-Grip ci Prong washers (2 both on XPS side), Heatmann Pos-I-Ties with ThermalClip and Rodenhouse Washers (installed on both the FOAMULAR® side and on the Thermalfiber® side spaced at installed on each stud and spaced at 16" o.c. vertically), and six Rodenhouse Impaling Fasteners with Washers (all installed on the Thermalfiber® side). All penetrations were sealed with PROSOCO Joint & Seam Filler or FastFlash fluid-applied flashing.

Test Results Summary and Codes/Standards Compliance

Air Barrier
When tested in accordance with ASTM E2357, both ASHRAE 90.1 (commercial building energy standard, Section 5.4.3.1.3 b), and The Air Barrier Association of America (ABAA, http://www.airbarrier.org/materials/assemblies_e.php), define an air barrier assembly as having an average air leakage not to exceed 0.04 cfm/ft² at a pressure of 75 pa (1.57 psf).

The CavityComplete® Wood Stud Wall System with Masonry Veneer, as described in this technical bulletin, was tested per ASTM E2357 and successfully qualified as an air barrier assembly. After thousands of pressure loading cycles as specified in ASTM E2357 (see Table 1), the CavityComplete® Wood Stud Wall System described had the air leakage ratings shown in Table 2 measured at 75 pa (1.57 psf).
**Deformation Loading Sequence**

**Table 1**

<table>
<thead>
<tr>
<th>Test</th>
<th># Cycles/Period</th>
<th>Pressure</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deformation</td>
<td>1/60 minutes</td>
<td>+600 Pa (+12.54 psf)</td>
<td>No Damage</td>
</tr>
<tr>
<td>Deformation</td>
<td>1/60 minutes</td>
<td>-600 Pa (-12.54 psf)</td>
<td>No Damage</td>
</tr>
<tr>
<td>Cyclic Loading</td>
<td>2000/5 seconds</td>
<td>+/- 800 Pa (+/- 16.72 psf)</td>
<td>No Damage</td>
</tr>
<tr>
<td>Gust Loading</td>
<td>2/3 seconds</td>
<td>+/- 1200 Pa (+/- 25.06 psf)</td>
<td>No Damage</td>
</tr>
</tbody>
</table>

**ASTM E2357, Air Leakage Rate**

**Table 2**

<table>
<thead>
<tr>
<th>Tested at 75 pa (1.57 psf)</th>
<th>Air Infiltration</th>
<th>Air Exfiltration</th>
<th>ASHRAE 90.1 and ABAA Air Barrier Criteria</th>
<th>Qualifies as an Air Barrier Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque Wall</td>
<td>0.001</td>
<td>0.002</td>
<td>0.04 maximum</td>
<td>Yes</td>
</tr>
<tr>
<td>Penetrated Wall</td>
<td>0.000</td>
<td>0.001</td>
<td>0.04 maximum</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* The air leakage reported for this assembly is 0.0004 cfm/ft² (0.002 L/s·m²)

**ASTM E331, Water Exposure for Penetrated Wall**

**Table 3**

<table>
<thead>
<tr>
<th>(hr:min:sec)</th>
<th>00:15:00</th>
<th>02:00:00</th>
<th>Qualifies Against Water Penetration Testing per ICC Acceptance Criteria 212, Section 4.5, Water Penetration Resistance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested at 137 Pa (2.86 psf)</td>
<td>No leakage</td>
<td>NA</td>
<td>Yes No visible water penetration at 15 minutes</td>
</tr>
<tr>
<td>Tested at 300 Pa (6.27 psf)</td>
<td>No leakage</td>
<td>No leakage</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Weather Resistant Barrier**

The International Code Council “Acceptance Criteria for Water Resistant Coatings Used as Water Resistant Barriers over Exterior Sheathing”, AC 212, Section 4.5, requires that specimens be tested in accordance with ASTM E331, and that the specimen show no visible water penetration for 15 minutes at an air-pressure differential across the specimen of 2.86 psf (137 Pa). The CavityComplete™ Wood Stud Wall System passed the prescribed criteria, and further, held water tight for 120 minutes, at more than 2x the required pressure, 6.27 psf (300 Pa).

Photos: Penetrated wall during air leakage and water resistance testing