

## 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  
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#### 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 ft<sup>2</sup>, 5.946 m<sup>2</sup>)

#### 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 Heckmann Pos-I-Ties spaced 16" o.c. and with 2 Rodenhouse Grip-Deck Screws and Thermal-Grip ci prong Washers. Owens Corning Thermafiber® RainBarrier 45 2" thick, 16" wide, straight edge,

mineral wool insulation board was secured to the other half of the specimen with 6 Rodenhouse Impaling Fasteners and Grip-Deck Screws and Heckmann 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 Thermafiber® 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), Heckmann Pos-I-Ties with ThermalClip and Rodenhouse Washers (installed on both the FOAMULAR® side and on the Thermafiber® 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 Thermafiber® 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](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/ft<sup>2</sup> 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).



Photos: Penetrated wall during air leakage and water resistance testing

### Weather Resistive Barrier

The International Code Council "Acceptance Criteria for Water Resistive Coatings Used as Water Resistive 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).

## Deformation Loading Sequence

Table 1

Test	# Cycles/Period	Pressure	Result
Deformation	1/60 minutes	+600 Pa (+12.54 psf)	No Damage
Deformation	1/60 minutes	-600 Pa (-12.54 psf)	No Damage
Cyclic Loading	2000/5 seconds (1000 each, infiltration & exfiltration)	+/- 800 Pa (+/- 16.72 psf)	No Damage
Gust Loading	2/3 seconds (1 each, infiltration & exfiltration)	+/- 1200 Pa (+/- 25.06 psf)	No Damage

## ASTM E2357, Air Leakage Rate After Loading Sequence (cfm/ft<sup>2</sup>)

Table 2

Tested at 75 pa (1.57 psf)	Air Infiltration	Air Exfiltration	ASHRAE 90.1 and ABAA Air Barrier Criteria	Qualifies as an Air Barrier Assembly
Opaque Wall	0.001	0.002	0.04 maximum	Yes
Penetrated Wall	0.000	0.001	0.04 maximum	Yes

\* The air leakage reported for this assembly is 0.0004 cfm/ft<sup>2</sup> (0.002 L/s•m<sup>2</sup>)

## ASTM E331, Water Exposure for Penetrated Wall

Table 3

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

The CavityComplete™ Wood Stud Wall System excludes the masonry veneer, wood studs, interior gypsum board and exterior sheathing. A detailed list of the components is available at [www.CavityComplete.com](http://www.CavityComplete.com).