



Air Leakage and Water Resistance

ASTM E2357, AC71, and AATC Test Method 127

Scope Statement

The Owens Corning® Enclosure Solutions Wall System for Steel Stud with Masonry Veneer has the option to use FOAMULAR® 250 XPS as the air and water resistive barrier system. In ASTM E2357 testing the system was subjected to thousands of positive/negative pressure cycles simulating wind/structural/thermal movement stress testing of the durability of the air barrier assembly. The system was tested in large scale simulations of both unpenetrated (opaque) and penetrated wall surfaces. In ICC-ES AC 71 testing FOAMULAR® XPS was subjected to UV exposure weathering tests and subsequent water-resistance tests in accordance with AATCC Test Method 127 to qualify as a water resistant barrier.

Testing

ASTM E2357:

Architectural testing

130 Derry Court, York, PA 17406-8405

Report #C1003.01-109.44, October 31, 2012

AC71 and AATCC Test Method 127

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Report #RJ1390P-3, September 12, 2011

Test Methods

- ASTM E2357-05 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
- ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels used as Water-Resistive Barriers, AC71
- AATCC Test Method 127, Water Resistance, Hydrostatic Pressure Test

Specimen Description

E2357:

- Test Specimen Size: 96" x 96" (64 ft², 5.946 m²)
ICC ES AC 71 & AATCC Test Method 127:
- (3) 8" square specimens (Water Resistance + Weather Testing)
- (6) 3" x 6" specimens (Joint-Sealing + Weather Testing)
- (3) 4' x 8' wall assemblies (Water Penetration Test of Wall Assembly)

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), 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 Owens Corning® Enclosure Solutions Wall System for Steel Stud with Masonry Veneer, and FOAMULAR® 250 XPS Air Barrier, 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 Owens Corning® Enclosure Solutions Wall System described had the air leakage rates shown in Table 2 measured at 75 pa (1.57 psf).

Opaque Wall (ASTM E2357)

2x6, 18 gauge galvanized steel studs, spaced 16" o.c., 1-1/2" thick FOAMULAR® 250 XPS foam sheathing, secured with Pos-i-tie brick ties, combined with Thermal-Grip washer, spaced 16" o.c., foam sheathing applied to create 8' horizontal seam and two 4' vertical seams in accordance with ASTM E2357 standard requirements, seams were sealed with JointSealR foam joint tape centered on the joint.

Penetrated Wall (ASTM E2357)

Same as the opaque wall described above except with wall penetrations prescribed by the ASTM E2357 test standard, and with all Owens Corning® Enclosure Solutions Wall System components installed.

Penetrations included:

- 24" x 36" window opening with a 23" x 35" mock window insert (wood 2 x 4 frame, plywood, and was sealed with FlashSealR® flashing tape).
- 4" x 4" HVAC Duct
- 4" x 4" square junction box
- 4" x 4" octagonal junction box
- 1-1/2" diameter PVC pipe
- All gaps around the penetrating items SealR® Flashing Tape, the junction boxes and PVC pipe used a foam spray that complied with AAMA 812-04 around the interior of the wall.



Water Resistance

Three 8" square specimens were placed face-up in a UV chamber and the surface of the specimens subjected to weathering tests in accordance with Section 3.5 of ICC ES- AC 71 (see below). After completion of the weathering tests, the specimens were placed on a level surface and the exposed surfaces of the specimens subjected to a hydrostatic head of 21.6 inches (55 cm) for a period of five hours in accordance with AATCC Test Method 127.

Water Resistance Test on Foam Plastic Insulation Boards per Section 3.1 of ICC ES AC71

Requirements	Results
Weathered specimens shall not exhibit water leakage on the underside of any specimen	No Water Leakage

Joint Sealing

Six 3" x 6" specimens were divided into three sets. Two specimens from each set were aligned so that the 6" edges were butted together and Owens Corning® JointSealR™ Foam Joint Tape was applied over each 6" joint resulting in three 6" x 6" square test specimens. The three test specimens we placed face-up in a UV chamber and the surface of the specimens subjected to weathering tests in accordance with Section 3.5 of ICC ES- AC 71 (see below). After completion of the weathering tests, the specimens were placed on a level surface and the exposed surfaces of the specimens subjected to a hydrostatic head of 21.6 inches (55 cm) for a period of five hours in accordance with AATCC Test Method 127.

Joint-Sealing Treatment Test per Section 3.2 of ICC ES AC71

Requirements	Results
Weathered specimens shall not exhibit water leakage on the underside of any specimen.	No Water Leakage

Water Penetration Test of Wall Assembly per Section 3.4 of ICC ES AC71

Three 4' wide by 8' high wall assemblies were constructed of 20 gauge metal studs spaced 16" on center and incorporated one window, one pipe penetration, and one eve condition. The FOAMULAR® XPS specimens were mechanically attached to the exterior side of the metal studs using No. 6 x 1-5/8" self-drilling screws and 1" diameter steel washers spaced 12" on center. A minimum of one vertical and two horizontal unbacked joints were included in each assembly representative of normal installation.

Owens Corning® JointSealR™ Foam Joint Tape was applied to all joints, openings, and penetrations following the manufacturer's installation instructions. The exterior side of the panel.

The exterior side of the panel was subjected to water spray at a minimum rate of 5 gallons per hour per square foot along with a test pressure differential of 6.24 psf in accordance with IBC Section 1403.2, Exception 2, and ASTM E331. The water spray was delivered to the exterior side of the panel through a water spray system consisting of spray nozzles spaced 24" on center and at a distance of 16" from the panel. The water spray system was calibrated in accordance with ASTM E331. Test pressures were applied to the exterior side of the panel using a controllable blower system and measured using digital manometer with n accuracy of ±1%.

Water Penetration Test of Wall Assembly per Section 3.4 of ICC ES AC71

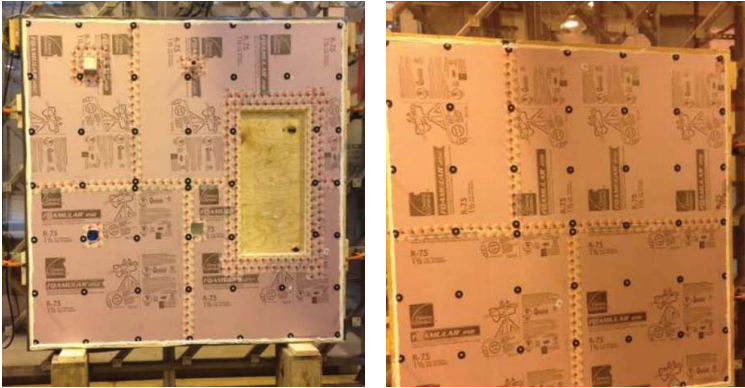
Requirements	Results
Water shall not penetrate to the unexposed face of the foam plastic insulation.	Water did not penetrate to the unexposed face of the foam plastic insulation.

Weather Testing

Three 8" by 8" square specimens (see Water Resistance above) and three 6" by 6" square specimens (see Joint Sealing above) were placed face-up in a UV chamber and the surface of the specimens subjected to 210 hours (10 hours a day for 21 days) of ultraviolet light at a test temperature between 135°F and 140°F.

Weathering Test per Section 3.5 of ICCES AC71

Requirements	Results
There shall be no delamination or blistering of the facing layer.	No visible delamination or blistering of the facing layer observed.



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/ft²)

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	0.0003	0.0002	0.04 maximum	Yes
Penetrated Wall	0.0005	0.0006	0.04 maximum	Yes

