

TL-0017 — Proof of Air Barrier Assembly Testing Performance ASTM E 2357 Testing Technical Letter (US Version)

Introduction

To provide proof that our air barrier assemblies function as a continuous air barrier, GCP Applied Technologies (GCP) has successfully completed independent testing on its PERM-A-BARRIER® air barrier products in accordance with ASTM E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies. Testing PERM-A-BARRIER® Liquid, PERM-A-BARRIER® VPL/VPL LT, PERM-A-BARRIER® VPS and PERM-A-BARRIER® Wall Membrane, the ASTM E 2357 test entails installing a full air barrier assembly onto an 8 ft by 8 ft (2.5 m by 2.5 m) mock-up of a realistic exterior wall assembly. Measuring performance simulating real-life commercial structures, the mock-up includes a tie in to a foundation wall, tie in to a roof, duct and pipe penetrants, electrical outlet penetrants, a window opening and post applied brick ties. All these conditions must be sealed and flashed to the air barrier assembly to withstand positive and negative sustained wind and wind gust loading simulating real life in place conditions.

The ASTM E 2357 Standard

The ASTM E 2357 Standard was developed to provide a uniform method to evaluate a full air barrier assembly. Until this test method was developed, one could only evaluate pieces of the air barrier assembly such as the air barrier material alone, the flashing material alone and the sealing materials alone. This method also incorporates wind loads that will push and pull on the air barrier assemblies, exposing weak areas that could leak air, which is an advancement from the previous test methods.

The Test



The mock-up is exposed to positive and negative sustained wind loading of 12.5 psf (600 Pa) for a one-hour duration in each direction. The wind gust loading reaches 25 psf (1200 Pa), which is equivalent to wind gusts of 99 mph, again in both the positive and negative direction. After all of the wind loading is completed the air barrier assembly is measured for air leakage in both the positive and negative direction.

ASTM E 2357 Test Results

GCP Applied Technologies Product Assembly Tested	Independent Test Results ⁽¹⁾
PERM-A-BARRIER® Liquid	<0.0008 cfm/ft ² (2)
PERM-A-BARRIER® VPL/VPL LT	<0.0008 cfm/ft ² (2)
PERM-A-BARRIER® VPS	<0.0008 cfm/ft ² (2)
PERM-A-BARRIER® Wall Membrane	<0.0008 cfm/ft ² (2)

¹ABAA specified requirement is 0.04 cfm/ft².

² Air leakage rates below detectable limit of laboratory test equipment

“Air barrier products have abounded on the market place in recent years as the industry has embraced a new understanding in building construction, which itself is a rare occurrence. By providing test results utilizing ASTM E 2357 a product manufacturer can demonstrate the sufficiency of their materials when combined into an assembly that will work with the whole building system. This enables all interested parties to make informed decisions with assurance for the buildings design and sustainability. GCP is to be congratulated for their accountability in this process.”

Lance E. Robson, Jr., AIA
Building Envelope Technologies, Inc.

The Results

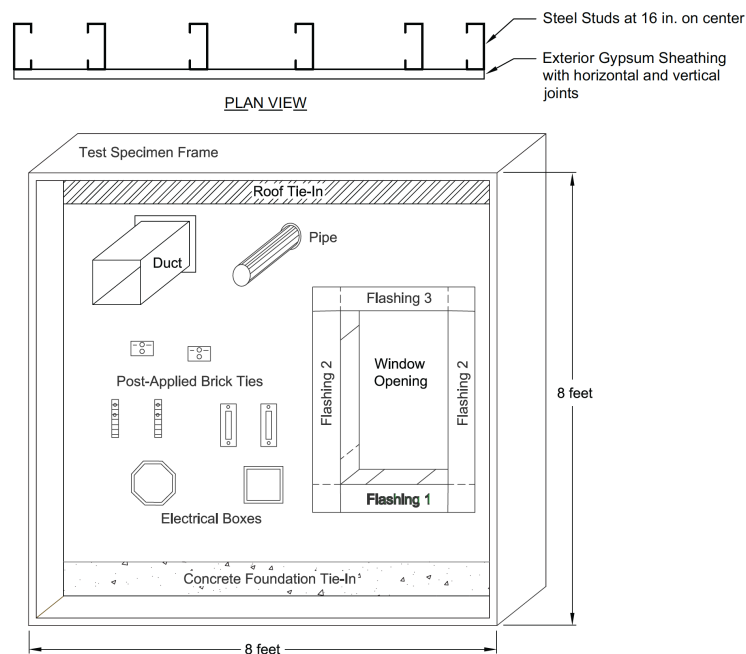
With test results of <0.0008 cfm/ft² (0.004 L/s*m²), PERM-A-BARRIER®Liquid, PERM-A-BARRIER® VPL/VPL LT, PERM-A-BARRIER®VPS and PERM-A-BARRIER®Wall Membrane all achieved air leakage rates below the detectable limits of the test laboratories equipment and are 50 times below the allowable air leakage rates specified by the Air Barrier Association of America (ABAA) and a proposed revision to ASHRAE 90.1 of 0.04 cfm/ft² (0.2 L/s*m²).

PERM-A-BARRIER®Flashing was used to flash the window opening on all three mock-ups and Bituthene® Liquid Membrane was used in areas required by standard GCP details and recommendations, such as water bucking laps of flashing membrane and annular space around the duct, pipe and electrical box penetrants.



After successfully completing the ASTM E 2357 testing on the air barrier assemblies, GCP chose to subject the assemblies to extreme wind loading beyond the requirements of the test. The PERM-A-BARRIER® air barrier assemblies withstood the equivalent of 168 mph wind gusts, air pressures of 72 psf (3445 Pa), before allowing air leakage through the assembly. The dramatic photo below shows how the steel studs, steel fasteners and gypsum sheathing were brought to failure prior to the air barrier assembly finally giving way and allowing air leakage. This is proof positive that GCP Air Barrier Assemblies provide an air barrier solution for real life air barrier conditions.

ASTM E 2357 Test Assembly



“ASTM E 2357 is the only test method that gives the user any information on the performance of an installed air barrier assembly. Every building contains multiple air barrier materials. It is only when a material is selected and combined into an assembly does it actually perform the function of an air barrier. ASTM E 2357 determines the air leakage rate after being conditioned under real world loads which provides the user with a precise air leakage rate and confidence that it will provide this performance when installed. Data from ASTM E 2357 is critical to every design professional.”

Mr. Laverne Dalglish

Executive Director of the Air Barrier Association of America

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Last Updated: 2019-03-15

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