"Real World" Testing of Air Barrier Assemblies Under ASTM E 2357 Reaches New Level

TREMCO®
GLOBAL SEALANTS DIVISION
Commercial Sealants & Waterproofing

ASTM E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies was developed by the American Society for Testing and Materials (ASTM) to ensure that a particular air barrier assembly would effectively prevent air leakage. The test was designed to provide a holistic approach to evaluating "real world" performance of the air barrier assembly components which included the air barrier, the flashing and the sealing materials.

To evaluate air barrier performance, ASTM E 2357 defines the specimen wall assembly and the test protocol to be used. The wall assembly is 8' x 8' wood frame designed to mimic an actual building façade with window block-out and typical wall penetrations for hexagonal and rectangular electrical junction boxes and PVC pipe. The air barrier assembly to be tested is then applied to the wall. The Air Barrier Association of America (ABAA) states that "for a manufacturer to declare that they provide an air barrier assembly, the manufacturer must determine what materials will be used, what components will be used to join the materials together and how penetrations will be dealt with. This is a major benefit to the design professional as issues such as compatibility are dealt with by the manufacturer rather than the design professional using a trial and error method." In a position paper on placing air barrier requirements in a separate section, **ABAA states that a unified single source for the main exterior wall air barrier assembly best serves the owner's interests.**

A controlled blower is then utilized to create various uniform levels of sustained wind loads, cyclic wind loads and gust wind loads at both positive and negative air-pressure differentials across the entire wall assembly, simulating real-world conditions. A calibrated manometer was used to measure the pressure while an air flow meter was used to measure the cubic feet of air flow per minute through the system. A calibrated caliper was also used to measure maximum deflections of the specimen between supports. Initial air leakage tests were performed first with air infiltration rates recorded at specified test pressures and then exposed to pressure cycling at the specified test pressures and time periods.

Sustained Load – 600 Pa (12.53 psf or the equivalent of 70 mph) for one hour

2000 Cyclic Loads (Positive and Negative) – 800 Pa (16.71 psf or the equivalent of 81 mph) pulses for three seconds. This is performed with positive and negative loads for 2000 cycles each.

Wind Gusts – 1200 Pa (25.06 psf or the equivalent of 99 mph) for three seconds

After each stage of the testing, the assembly is evaluated to determine any signs of damage, loosening or other problems that might affect performance. Following the wind loading, the air-leakage rate is measured at reference pressures of +25, +50, +75, +100, +150, +250 and +300 and negative pressures at the same values.

Testing was done with **ExoAir™ 110 Air & Vapor Barrier Sheet Membrane** applied to the DensGlass Gold® Exterior Sheathing which had been primed with **ExoAir 10 Primer**. Tremco's patent-pending **Proglaze® ETA Engineered Transition Assembly** was sealed to the window perimeter and to ExoAir 110 with **Spectrem® 1 Silicone Sealant**. All penetrations were capped on the exterior and sealed to ExoAir 110 with **ExoAir Thru-Wall Flashing**. The same test was repeated with **ExoAir 220 Fluid-Applied Vapor Permeable Air Barrier Membrane** and **ExoAir 120 Fluid-Applied Air & Vapor Barrier Membrane.**

The Air Barrier Association of America (ABAA)-specified requirement for an air-barrier assembly tested according to ASTM E 2357 is 0.04 cfm/ft² or less. All of the complete wall assemblies tested met or surpassed these requirements.

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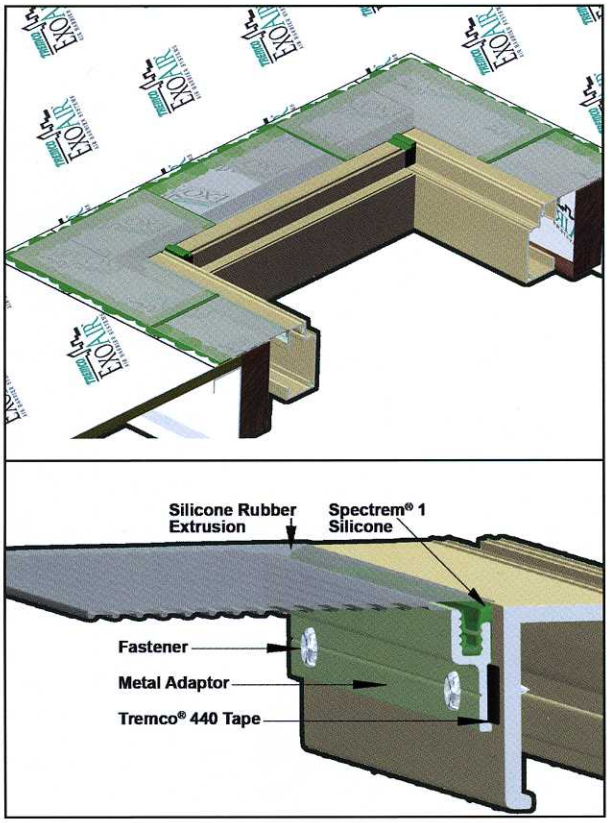
Inclusion of Proglaze® ETA with Air Barrier Assembly Provides Continuity at Critical Transition from Wall to Window Assembly

The key to preventing air and moisture infiltration which can lead to decreases in energy efficiency, structural damage and other mold problems is providing continuity throughout the building envelope and not just within the air barrier assembly itself. Any small gaps at the transition from the wall assembly to the window or curtain wall system will cause more damage than if there were no air barrier assembly at all. Building design or construction tolerances resulting in large gaps between curtain walls and adjoining walls, material incompatibilities, lack of adhesion with dissimilar materials and other problems can occur on any job, creating major problems.

To ensure ultimate protection throughout the complete wall assembly, Tremco included the patent-pending Proglaze ETA Engineered Transition Assembly in the assembly being tested, sealing it to the window perimeter and ExoAir Self-Adhered Air & Vapor Barrier Membrane. This innovative transition assembly was developed to eliminate the potential for air and moisture leakage at the window-wall interface and has been independently tested for air and moisture penetration. By providing a continuous bridge between the air and vapor barrier materials and the window or curtain wall system, even irregular window geometries can be spanned and sealed while absorbing dynamic movement and wind-loading stresses without pulling apart. Compatibility and adhesion between the sealant used in the assembly and the sheet membrane in the air barrier system is also ensured, eliminating a common industry problem which ultimately can lead to failure of the air barrier system. The ribbed translucent silicone material used in the transition assembly allows for easy inspection through the gasket to confirm sufficient sealant has been applied and ensures sufficient sealant is in place.



Documented Performance Ensures "Real World" Effectiveness

Despite the fact that most windows and curtain wall systems are designed and constructed to meet or exceed exterior wall performance requirements for most regions, building envelope repair and replacement cost in North America remains a multi-billion dollar expenditure. One study conducted by the Canada Mortgage and Housing Corporation determined that over half of the building set examined experienced building envelope problems within the initial years of occupancy, and that most of the problems were moisture-related and caused either by air leakage or exterior moisture penetration. It is estimated that as much as 90% of all water intrusion problems may occur within the one percent of the total building exterior surface area which contains the terminations and transition detailing[1].

By raising the bar during ASTM E 2357 testing to include Proglaze ETA and those critical transitions from the wall assembly to the window or curtain wall system, Tremco has provided PROVEN performance throughout the building envelope from the foundation to the roof. Used as a comprehensive system, the trial and error is eliminated as well as the risk. There is no more uncertainty or interpretation required on the job. It is easily specified, easily installed and it is warranted.

The performance of an air barrier assembly is just as important as the air permeance of the building materials themselves. By including ASTM E 2357 in project specifications, test results will include the amount of air that passes through the materials as well as the air leakage that results from joining all the pieces together, providing critical data that will enable the design team to make sound decisions and ensure long-term sustainability. Tremco's Building Envelope Solutions Team can also review job specifications for compliance with current standards as well as analyze building envelope or air barrier assembly configuration to ensure optimal performance.

Contact the Tremco field sales representative in your area to make sure you are designing long-term success into your project.

[1]Kubal, Michael T., "Waterproofing the Building Envelope," McGraw-Hill Professional, New York City, NY, 1992.