Building Code Change Prompts Testing of Comprehensive Air Barrier Assemblies to Document Building Envelope Performance Passing NFPA 285 Fire Test

TREMCO®
Commercial Sealants & Waterproofing

National Fire Protection Association (NFPA) 285 is a full wall assembly burn test designed to determine that materials used in the wall assembly, when exposed to fire on the exterior face of the wall, do not spread flame over the surface or through the core of the otherwise non-combustible wall assembly. In the past, the International Building Code (IBC) mandated that all wall assemblies containing plastic foam insulation pass NFPA 285. Changes in the 2012 editions of the IBC now require exterior wall assemblies for Type I, II, III and IV construction greater than 40 feet in height contain **combustible water-resistive barriers** to pass NFPA 285.

In addition, Chapter 13 of the 2012 IBC is the International Energy Conservation Code (IECC) which calls for a **continuous air barrier** throughout the building thermal envelope and provides guidelines related to air leakage. Since the air barrier system often functions as the water-resistive barrier, air barrier systems, including membranes, sealants and transitions, are being tested as a part of the wall assembly when NFPA 285 is required.

Acceptable Design Options

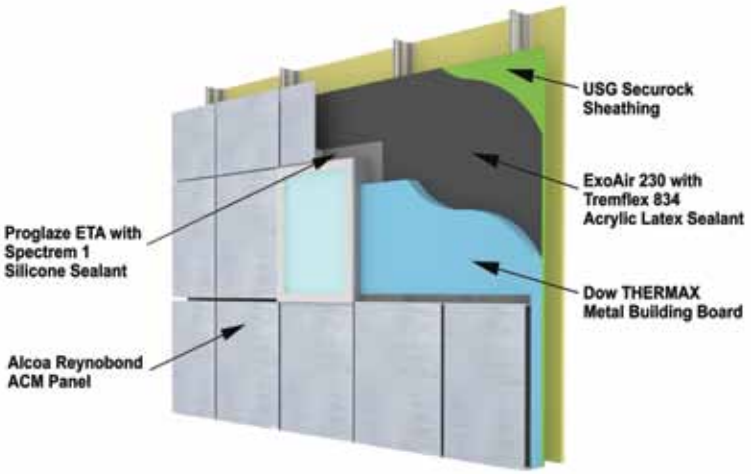
Wall assemblies are a collection of components, including the weather-resistive air barrier system, with connections to other assemblies. NFPA 285 is an assembly test so Tremco has partnered with insulation and cladding manufacturers to test a variety of assemblies. Since an effective air barrier system requires sealants and transitions to achieve the required performance levels, Spectrem® 1 Silicone Sealant, Tremflex® 834 Acrylic Sealant and Proglaze® ETA Engineered Transition Assembly were incorporated into the assemblies. Though not required by the test today, the resulting test data documents how the air barrier system, not just the membrane, will impact the fire resistance properties of the exterior wall.

Tremco's ground-breaking ExoAir® 230 Synthetic Fluid-Applied Vapor-Permeable Air Barrier Membrane was selected as the air and weather barrier membrane in the test assemblies. It is a monolithic, synthetic membrane designed to seal exterior above-grade walls from air infiltration/exfiltration, while serving as a weather-resistive barrier to keep water out yet remaining permeable to the passage of water vapor. Formulated to include UV resistance, it provides the flexibility to install rainscreen systems with open joints or to allow the membrane to be exposed during the construction process. It also withstands temperatures up to 240° F (115° C) and ASTM E 84 testing for flame spread and smoke development had already shown it contributes to life safety issues.

In addition, wall assemblies with ExoAir 230 and the sealants and transitions required for proper installation and connectivity have also been tested to *ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies* and *ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.* **With one resource, designers will now be able to see what assemblies have been tested and can be used to be code compliant for fire propagation, water and air leakage.**

History with interior perimeter fire barrier joints provides added "peace of mind"

Tremco is uniquely positioned to respond to the issues raised by NFPA 285 since it is the only building materials manufacturer with solutions for both interior and exterior fire-rated joints. With more than 25 years of experience in fire testing for both fire-resistive joints and perimeter fire barrier joints, Tremco has the knowledge and expertise to be able to assist with engineering judgments for wall designs that may not exactly match existing testing.



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Testing with multiple cladding systems

NFPA 285 provides a method of determining the flammability characteristics of exterior, non-load-bearing wall assemblies, which contain combustible components. The test method is intended to simulate the "full-scale" fire performance of the wall assembly being evaluated. The primary performance characteristics evaluated in this test are the capability of the test wall assembly to resist:

1. Flame propagation over the exterior face of the system,
2. Vertical flame spread within the combustible core components from one story to the next,
3. Vertical flame spread over the interior (room side) surface of the panels from one story to the next, and
4. Lateral flame spread from the compartment of fire origin to adjacent spaces.

The above are assessed through visual observations and temperature data obtained during the test.

To provide sufficient data for designers to ensure assembly performance with different systems, transitions and construction types, Tremco constructed assemblies using different types of frequently used cladding, types of insulation and one assembly without insulation to allow a more direct attack on the air barrier. The intent was to assess the relationships between the insulation, the air barrier system and other components and whether they would feed each other under common facades.

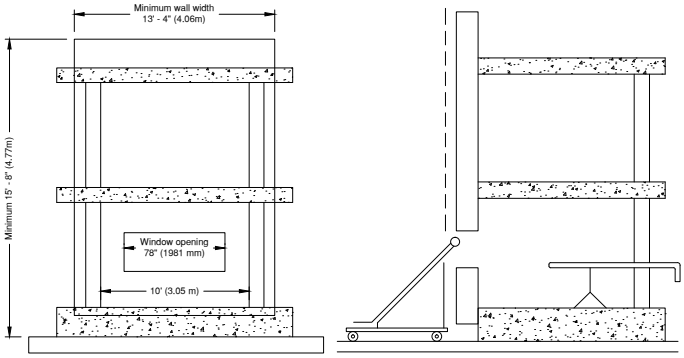
Brick cavity wall

Insulated and non-insulated metal panels

The full scale testing conducted by Tremco with Brick, Insulated Metal Panels and Non-Insulated Metal Panels cladding systems provided significant data which can applied to a range of assemblies that meet NFPA 285, all of which include sealants and transitions.

The Test Methodology

The 30-minute test is conducted on a full-scale two-story wall assembly built as it would be in the field. The test wall has a centered window opening in the lower floor. A flashover fire is generated in the lower story room emitting a fire plume out of the room of origin through the window and spreading up the exterior surface of the wall. To pass, the wall assembly must demonstrate limited fire spread vertically and horizontally away from the window. The extent of the spread is determined visually, measured in feet (not reaching a vertical elevation of 10 feet from the top of the window opening or



a lateral distance of 5 feet from the vertical centerline of the window opening any time during the test), and by temperature that is measured by thermocouples placed throughout the wall assembly.

Documented Performance Ensures "Real World" Effectiveness

NFPA 285 is an assembly test that takes into consideration all elements of the wall. Another common test is ASTM E1354 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products using an Oxygen Consumption Calorimeter. This test exposes 4″ x 4″ samples of material to a heat source and measures flame and heat characteristics. The resulting data is then compared with performance characteristics of materials that have successfully tested to NFPA 285 in order to predict performance of a full-scale test. It is not a substitute for the full assembly test. When tested as an assembly, data can be gathered on how the materials function as a system. This is a similar concept to how air leakage is measured for air barrier materials and systems. There are requirements both for the individual air barrier products (ASTM E2178) and the full assembly, which includes penetrations and a window (ASTM E2357).

As the assemblies are dissected after the test, the extent of damage is exposed. In this case, though the aluminum skin started to peel away and the plastic core started to ignite, damage was contained to areas directly above the window and the assembly passed the test.

The key to designing high-performance, sustainable buildings that meet performance requirements for **air, water** and **fire** resistance is ***integrated*** design. Continuity throughout the building envelope is critical. Components must be compatible and tested to ensure not only initial performance but sustainability over the long term. With the broadest range of building components in the industry, Tremco is uniquely positioned to provide comprehensive systems for use in assembly testing rather than having our products engineered into assemblies. In addition, Tremco is continually pushing the envelope with ongoing controlled testing of uncontrolled air and moisture infiltration/exfiltration in air barrier systems and building enclosures at the Tremco Sustainable Building Solutions Test Facility.

Contact your local Tremco field sales representative for additional information on assemblies tested to NFPA 285 or meeting other design requirements.