
Technical Service Bulletin

Fastener Sealability

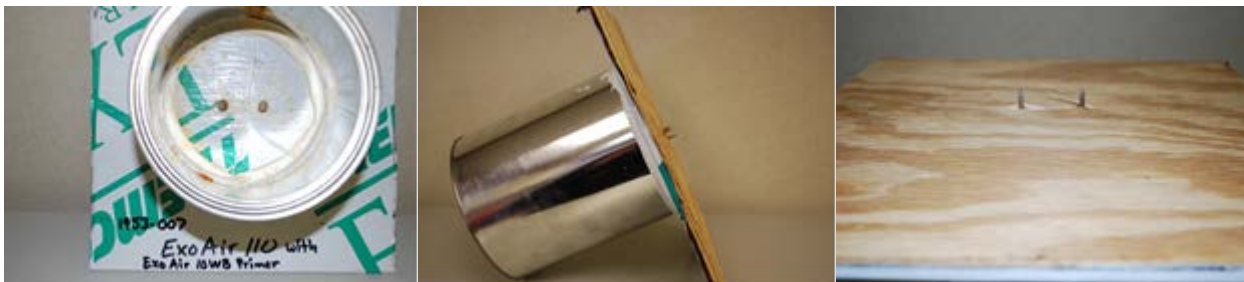
The reason why ASTM D1970 Section 8.9 is not a good representation of air barrier performance in commercial construction

The purpose of this bulletin is to educate individuals on what ASTM D1970 Section 8.9 is and why it is not a good representation of the air barrier performance on commercial construction projects.

ASTM D1970-09 is the Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used as Steep Roofing Underlayment for Ice Dam Protection. Section 8.9 of this test method specifically refers to Self Sealability of underlayment sheets in roofing applications. . All of the ExoAir air barrier membranes have been tested successfully to ASTM D1970 Section 8.9.

ASTM D1970 Section 8.9 test criteria summation:

1. The test specimen shall be a 12" (30 cm) x 12" (30 cm) sample of the air barrier membrane directly applied to a 12" (30 cm) x 12" (30 cm) APA grade plywood 3/8" (10 mm) thick.
2. At least two specimens shall be tested.
3. At 73°F (23 °C), install the membrane onto the plywood substrate.
4. With two pieces of lumber placed underneath the plywood for support, drive two 1 ¼" (32 mm) smooth shank galvanized roofing nails, 1" to 2" (25 to 51 mm) apart, so that the nail heads are flush with the surface of the sheet.
5. Back out the nail approximately ¼" (6 mm) by tapping the pointed ends of the nails.
6. Cut the bottom out of a 1 US gal. (4 L) can and center it on the membrane.
7. Apply a bead of silicone sealant completely around the outside rim of the can to bond it to the membrane.
8. Allow 2 hours for the sealant to cure set, and then apply another bead around the inside rim of the can.
9. After waiting 24 hours at ambient temperature, place this assembly atop another 1 US gal (4 L) can which has the lid removed and the bottom intact.
10. Fill the upper can to a depth of 5" (127 mm) with deionized or distilled water. Place the entire assembly in a refrigeration unit maintained at 40°F (5°C) for a period of 72 hours.
11. Disassemble and note any water located.
12. Observe and report whether or not water is found in the bottom can, on the nail shanks, on the underside of the plywood, or between the plywood and the underlayment sheet. Report as a failure if water is present in any of these areas, or as a pass if dry.



ASTM D1970 Section 8.9 is not a bad test; it is actually a very good test. The problem is that since there is no current industry standard for testing fasteners into concrete, exterior sheathing and other substrates found behind air barrier membranes, the industry is trying to use this test method as a fill-in until one is created. The challenge is that this test method is not representative of what will occur on most projects and the results produced from this test could vary significantly from the jobsite application.

Since there is no current industry standard to test fastener sealability to, Tremco has come up with its own internal criteria. Currently Tremco uses a modified version of ASTM D1970 Section 8.9 that it feels is more representable of typical field conditions.

Tremco modified ASTM D1970 Section 8.9 test criteria summation:

1. The test specimen shall be a 12" (30 cm) x 12" (30 cm) sample of the air barrier membrane directly applied to a 12" (30 cm) x 12" (30 cm) substrate determined based on project application.
2. At least two specimens shall be tested.
3. At 73°F (23 °C), install the membrane onto the substrate.
4. If the substrate is a sheathing element like plywood, OSB, or gypsum sheathing. A steel stud will be placed behind the substrate.
5. Drive two fasteners that will be used on the jobsite, 1" to 2" (25 to 51 mm) apart, so that the fastener heads are flush with the surface of the sheet. If the substrate is a sheathing element, ensure that the fastener is installed into the stud framing as would occur on a construction project.
6. Cut the bottom out of a 1 US gal. (4 L) can and center it on the membrane.
7. Apply a bead of silicone sealant completely around the outside rim of the can to bond it to the membrane.
8. Allow 2 hours for the sealant to cure set, and then apply another bead around the inside rim of the can.
9. After waiting 24 hours at ambient temperature, place this assembly atop another 1 US gal (4 L) can which has the lid removed and the bottom intact.
10. Fill the upper can to a depth of 5" (127 mm) with fluorescent traced deionized or distilled water. Place the entire assembly in a refrigeration unit maintained at 40°F (5°C) for a period of 72 hours.
11. Disassemble and note any water located.
12. Observe and report whether or not water is found in the bottom can, on the nail shanks, on the underside of the plywood, or between the plywood and the underlayment sheet. Report as a failure if water is present in any of these areas, or as a pass if dry.



Tremco feels these modifications to ASTM D1970 Section 8.9 are more indicative of what will occur on actual projects. This is a pretty extreme test as this is simulating 5 inches of hydrostatic head against two penetrations for a period of 72 hours. This would equate to approximately 0.18 psi (1,246 Pascal) of pressure or well over a 90 mph (144 kph) wind driven rain directly to the air barrier membrane. This is much more substantial exposure than the membrane would see during its service life once continuous insulation and the cladding system are in place.

Another test that is frequently run at Tremco to evaluate fasteners is ASTM E331.

ASTM E331 is the Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

ASTM E331 test criteria summation:

1. The test specimen is typically 8' (2.4 m) x 8' (2.4 m). The substrate is exterior grade glass fiber faced gypsum board mounted onto steel studs 16" (40 cm) on center.
2. The air barrier membrane is installed per the published application instructions.
3. Once the membrane has been installed and is fully cured, fasteners are installed into the substrate, mimicking field installation.
4. An air vacuum is pulled against the substrate at 0.019 psi (137 Pascal) to mimic a 34 mph wind.
5. A water-spray system is initiated, spraying a uniform spray of water at 5.0 US gal/ft²*h (3.4 L/m²*min).
6. Observe and report whether or not water is found on the interior side of any of the fasteners. Report as a failure if water is present in any of these areas, or as a pass if dry.



This test method is even more representative of what may occur on the job site throughout the life of the building. This water exposure is equivalent to 8 inches (203 mm) of rain per hour.

To compare that to what is seen on most construction sites, if this test standard was run for a full calendar year, the membrane would be exposed to 70,125.48 inches (1,781,187.192 mm) of water per year. The rainiest place on earth as reported by Guinness Book of World Records is Mawsynram, Meghalaya, India with an annual rainfall of 467.4 inches (11,870 mm). It would take 150 years for Mawsynram to accumulate the same amount of rainfall.

Using this modified version of ASTM D1970 Section 8.9 along with ASTM E331, gives Tremco documented performance that if our products and your tested fasteners are installed right, they will perform.

To find out if the fastener being used on your project has been tested, please contact Tremco Technical Service at 866.209.2404 with any questions regarding this bulletin.