Applied Science: Effective Air Barriers that are Easy to Install

3M leverages of a long history with acrylic adhesive technologies to create high-performance air and watertight solutions that don't require primers

According to Oak Ridge National Laboratory (ORNL), the US constructs approximately one million new buildings every year. A growing trend in this market is the inclusion of air barriers into wall assemblies to reduce air leakage and contribute to substantial energy savings. To meet these needs, 3M developed two key solutions – 3M™ Air and Vapor Barrier 3015 and 3M™ Air Barrier with Permeable Backing 3015VP. These primerless, self-adhered membranes carry a wide installation temperature range, long UV exposure rating and high compatibility with most sealants and tapes.

Tests performed by ORNL on 3M™ Air and Vapor Barrier 3015 and 3M™ Air Barrier with Permeable Backing 3015VP, demonstrated that 3M air barriers performed better than incumbent technologies and produced air leakage rates that were more than 60% lower than the 0.4 cfm/ft² at 75 Pa specified in the 2015 International Energy Conservation Code (IECC).

The Science Behind the Technology

3M utilizes a proprietary acrylic adhesive technology to create market-disrupting products – in this case, air barriers with a pressure sensitive adhesive (PSA) that can be installed year-round in most climates. 3M started development of acrylic adhesives in the 1940s and has established chemistries and processes that allow our air barriers to adhere to most substrates at surface temperatures from 0°F to 150°F without a need for primer. In addition, these crosslinked acrylic adhesives do not rely on plasticizers for adhesive performance. Consequently, not only does the outside of these products have excellent compatibility with most construction sealants, adhesives and tapes, but the adhesive does not plasticize construction sealants the way certain bitumen-based products do.

Although other air sealing technologies are available, their installation procedures are typically complex, time-consuming and rely heavily on quality of workmanship. This is especially significant when installing systems that require multiple steps and components; generally, fewer installation steps reduces the risk of installation errors.

3M's acrylic adhesive technology eliminates the need for a primer, thus removing time-consuming process steps and saving users up to 50% in installation time without any reduction in performance of the building. Furthermore, 3M™ Air Barrier with Permeable Backing 3015VP has a unique product construction that can reduce this time even further by allowing installation straight off the roll without having to handle a loose sticky sheet.

Proving Out Results
3M teamed up with ORNL to evaluate the performance of 3M air barriers. The first evaluation compared 3M air barriers against incumbent products on a set of six identical sensor-equipped experimental buildings over a period of two years. Both 3015 and 3015VP performed better than the largest incumbents in these building evaluations. Furthermore, not only did both 3M air barriers perform much better than the 2015 IECC air leakage rates of 0.4 cfm/ft² at 75 Pa, they also achieved results well below the stringent U.S. Army Corps of Engineers' requirement (0.25 cfm/ft² at 75 Pa) in these tests.

The second and third evaluations were conducted on commercial structures utilizing 3M air barriers. In the second evaluation, 3M™ Air and Vapor Barrier 3015 was installed on the new LifeSource headquarters in Minneapolis, MN. With the 3M™ Air and Vapor Barrier 3015, the building measured an average air leakage of 0.06 cfm/ft² at 75 Pa – 85% lower than the 2015 IECC limit. According to ORNL's simulation results, LifeSource lowered its annual heating and cooling costs by about $4,600 or 10% when compared to a similar building that lacked an air barrier system.

In the third evaluation, 3M™ Air Barrier with Permeable Backing 3015VP was installed on a new Sierra Trading Post store in Woodbury, MN. The building showed an air leakage rate of 0.15 cfm/ft² at 75 Pa or 63% lower than the 2015 IECC limit. In this instance and according to simulation results, Sierra Trading Post lowered its annual heating and cooling costs by about $5,900 or 41% when compared to a similar building that lacked an air barrier system.

Summary
3M, utilizing its long expertise in acrylic adhesive technology and innovation, has developed air barrier solutions that require fewer installation steps and therefore lead to fewer installation errors. In addition, these air barriers do not have the common compatibility issues seen with bitumen-based products and can be left exposed to the elements for up to a year without affecting performance. In field testing of 3M™ Air and Vapor Barrier 3015 and 3M™ Air Barrier with Permeable Backing 3015VP demonstrates performance that exceeds current incumbents and provides air tightness exceeding the stringent U.S. Army Corps of Engineers' requirement of maximum air leakage of 0.25 cfm/ft² at 75 Pa.

Learn about 3M's advanced technologies for controlling airflow and optimizing the indoor climate at 3M.com/airbarrier or contact your 3M representative at 866-513-4026.

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