

Measuring Up

How to Determine the Best Expanding Foams for Fenestration

by Rich Rinka

To perform as intended, an installed window must be an effective amalgam of many components. Among the possible combinations, there's a "sweet spot" in performance trade-offs at which you'll find optimum energy efficiency, structural integrity and integration with building envelopes. In the process, there are many types of sealants that play a role—including expanding aerosol polyurethane foams, which can greatly enhance the installation quality of prime and replacement fenestration products by sealing the rough opening against air leakage. Applied in the gap between the rough opening and the window or door frame, foam expands to assume the shape of the gap and hardens to provide a highly effective air barrier. When foam sealant that is not formulated for door and window installation is used, though, the pressure exerted by the foam as it cures and expands can induce frame deflection and compromise proper operation of sashes.

Fortunately, foam manufacturers have responded by developing products expressly for the installation of fenestration. Technically known as single-component polyurethane foams, these products exert minimal pressure on fenestration products.

To analyze foam performance, the most important characteristic includes expansion pressure. Once the maximum pressure has been established, it can be translated into the resulting window frame deflection by calculating the modulus of elasticity of framing materials and the moment of inertia.

But that isn't the whole story. Sometimes, a foam sealant can actually shrink after curing, potentially compromising the foam's ability to provide an effective air seal. Therefore, the second important performance characteristic of an expanding foam is its dimensional stability, defined as how much the cured foam shrinks or expands under standardized conditions.

These properties can be determined by laboratory testing, per the recently updated standard, AAMA 812-19, *Voluntary Practice for Assessment of Frame Deflection When Using One Component Polyurethane Foams for Air Sealing Rough Openings of Fenestration Installations*.

Pressure build is measured by filling a cavity in a wooden test fixture with foam and measuring the developed pressure with a pressure transducer as the foam cures. The maximum



Polyurethane foam can enhance the installation of doors and windows, but only when the correct products are selected.

pressure build is determined from the average of pressure (psi) versus time data for five specimens.

Deflection can be calculated using a formula provided in the document or actually measured using a described test in which a sample of the material is fastened to a substrate and foam injected between them. Actual deflection is monitored for 24 hours and maximum deflection is noted.

The test protocol for determining dimensional stability involves applying foam in the gaps formed by four layers of wood, which are then clamped together. After several days in specified temperature and humidity conditions, the spacing between the wood layers is measured and compared to the original value. This indicates if the foam can be expected to exhibit dimensional stability within the industry-accepted range of plus-or-minus 5 to 15%, depending on temperature and humidity.

While applying and measuring foam performance under laboratory conditions cannot take into account the influence of manufacturing variations, the information obtained allows a window manufacturer to more specifically determine which foams are suitable for use with its products. [DWM]



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