

TECH TIP # 3

Building Envelope Control Layer Performance with Closed-cell Spray Polyurethane Foam

In response to the demand for more energy efficient, durable, and healthier homes, builders and designers now have an innovative yet proven system – closed-cell sprayed polyurethane foam (SPF) - creating a superior building envelope to act as the basic building block to meet that demand.

Can You Build a House Too Tight?

Americans spend 80% of their time indoors. Due to this fact, our goal is to provide a home with the four essential construction components that distinguish an energy efficient, safe home from the rest. These four elements are indoor air quality control, moisture control, operational cost control and durability. Control of the building envelope affords the owner the ability to control their own environment. That ability begins with a solid, airtight exterior shell of the building. You must build tight, insulate, and ventilate right. The introduction of mechanical ventilation systems will ensure the best indoor air quality. Airtight construction practices can often reduce the building envelope air change rate by 25-35%, allowing the “right-sizing” of the HVAC system at a cost savings that often pays for the inclusion of a mechanical ventilation system.

Water, Air, and Moisture barriers

Liquid water problems in buildings are due mainly to significant imperfections in the cladding, flashing detail, leaking roofs or poor site drainage. A “drainage plane” or rain screen interior of the cladding can minimize water entry into the wall system caused by wind, capillarity, gravity, and air pressure differences. Closed-cell WALLTITE® SPF from BASF applied to the interior of the drainage plane, cladding or in the façade/block interstitial space in concrete block construction acts as a continuous second line of defense against the intrusion of the most dangerous form of moisture: liquid water.

Airflow also carries moisture, which will impact the indoor environment. Movement of moist air into the building envelope driven by temperature and pressure differences will allow growth of pathogens and allergens in the stud cavities. This moisture and air movement will also degrade thermal performance of fibrous or large open celled insulation by up to 50% and could affect the structural integrity of the building in a relatively short time period.

The International Energy Conservation Code (IECC) Section C402 on Air Barriers and Section 5.4 of the Canadian National Building Code have established performance criteria for any material to act as an air flow barrier under wind loading of 75 Pa of air pressure. WALLTITE closed cell SPF has been tested to these standards and meets the requirements for air barriers in various construction methods. Wall details were constructed using various sheathing and interior finishes commonly found in residential construction. These assemblies were sprayed with foam and then tested for air infiltration under both positive and negative, static, and dynamic air pressures simulating constant and gusting wind loads. Even when the fiberboard sheathing was pulled off the studs of one of the assemblies under high wind loads, the closed cell SPF continued to meet the air infiltration performance standard.

WALLTITE applied in framed walls will significantly simplify the construction process by performing multiple roles in the building envelope with a single material. Tested under actual field conditions, WALLTITE has proven that in one application, it satisfies the performance criteria required to act as an air infiltration barrier as well as a vapor and water retarder. WALLTITE spray foam insulation provides the homeowner with the continuous airtight construction that is essential to controlling moisture and airflow, which will lower operational costs, allow better management of indoor air quality and enhance the durability and value of the home.