

Building Codes and Measuring Air Barrier Performance

Air barrier systems control the unintended movement of air into and out of a building enclosure. With increasing demand for improved energy efficiency and building performance, the case for effective air barrier systems continues to grow. According to many designers and builders, closed-cell spray polyurethane foam (ccSPF) is one of the leading materials that helps meet (and in many cases, exceed) air barrier code and performance requirements. According to Dr. Joseph Lstiburek¹, a principal of Building Science Corporation, air barrier systems should be:

- Impermeable to air flow
- Continuous over the entire building enclosure or continuous over the enclosure of any given unit
- Able to withstand the forces that may act on them during and after construction
- Durable over the expected lifetime of the building

A building enclosure includes all “six sides” of a building — exterior walls, roof and foundation floor — and may also include separations within the structure. An air barrier system essentially “wraps” the building shell and protects the building from the effects of air leakage. Uncontrolled air leakage can have detrimental effects on how buildings function in terms of occupant comfort, indoor air quality and energy usage, and it reduces the life span of a building.

Air Barrier System Performance

- **Air Barrier Installation:**

Ensuring a successful air barrier system installation is critical and requires the use of well trained and certified installers. SPF manufacturers, the Spray Polyurethane Foam Alliance (SPFA) and the Center for Polyurethanes Industry (CPI) provide extensive contractor training as well as free online SPF health and safety training. By working with SPF installers who are formally trained and individually certified, you can be confident that your air barrier system will be well-installed and effective – with maximum long-term benefits.†

- **Air Barrier Performance Testing:**

To validate that air barrier materials will meet project expectations, specifiers and building teams can refer to laboratory testing standards such as ASTM E-2357, which tests air barrier assemblies for air leakage, and ASTM 2178, which tests for air permeance of building materials. It is a good idea to discuss air barrier system certifications and performance criteria with your SPF system provider as part of the planning discussions.

CcSPF Air Barrier Systems

CcSPF's unique benefits such as outstanding air sealing/insulating capabilities*, self-adhesion, moisture resistance, strength, and durability can help address the many considerations when designing an air barrier system. Along with its outstanding performance characteristics, ccSPF is growing in popularity due to its ability to simplify the air barrier system design process, compatibility with other materials/systems and ease of application.

Talk to a professional spray foam contractor about your next air barrier system. Also, consider specifying a ccSPF product that uses a blowing agent, such as Honeywell's Enovate® blowing agent (HFC 245fa) or Solstice™ Liquid Blowing Agent which has improved performance and environmental properties. These Honeywell blowing agents are approved by the U.S. Environmental Protection Agency (EPA) under the Significant New Alternatives Policy⁴ (SNAP) to replace ozone depleting substances. Honeywell continues to advance SPF blowing agent technology providing leadership to meet evolving industry requirements.

Discuss the latest in ccSPF and blowing agent technology with Honeywell or your spray foam supplier.

Air Barriers: Building Codes and Standards

Given the importance of air barrier system requirements, they are garnering significant interest within the codes and standards that affect building design and construction. In general, an increasing number of building/energy codes are following the lead of the Canadian Building Code, which has required air barriers since 1990.

- **State Building/Energy Codes:**

In the United States, the Massachusetts Commercial Energy Code² was the first jurisdiction to mandate air barrier systems in non-residential construction. This energy code conforms to Department of Energy (DOE) program goals to significantly reduce building energy consumption. It states, "The building envelope shall be designed and constructed with a continuous air barrier to control leakage into, or out of, the conditioned space." Recent changes in the 2012 residential codes now also require air tightness in residential buildings. With broad awareness for the benefits of using air barriers, a growing number of states have adopted or are considering similar codes and air tightness requirements. For more information about the status of building/energy codes and air barrier requirements for your state, the Building Codes Assistance Project (BCAP) website is a valuable resource. Visit: www.bcap-energy.org

- **ASHRAE Building Codes/Standards:**

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1 and the International Energy Conservation Code (IECC) provide important information for designers and builders about standard/code compliance. ASHRAE Standard 90.1-2010 and the commercial provisions of the 2012 IECC require that the building envelope be carefully designed to limit uncontrolled air leakage into and out of the building. Uncontrolled air leakage will lead to increased energy usage in the building as it introduces hot air into the building during the cooling months and cold air into the building during the heating months. Uncontrolled air leakage in humid regions of the country can also increase the latent load inside the building requiring the additional use of the building's cooling system to bring the level of humidity into acceptable levels.³ Both 90.1-2010 and the 2012 IECC require that all seams, penetrations, and transitions between approved materials or assemblies are sealed. CcSPF is a proven, cost effective means of meeting these requirements.



- **Best Practices/Specifications:**

A number of trade associations and organizations provide tools for designing and specifying air barrier systems. Two such organizations are the American Institute of Architects (AIA) and the Air Barrier Association of America (ABAA). For specific information about SPF, CPI and SPFA also provide useful resources. SPF manufacturers can also provide valuable guidance on system certifications and contractor selection.

Sources:

1. Dr. Joseph Lstiburek, Principal of Building Science Corporation: Understanding Air Barriers, Building Science Digest 104 (2006-10-24). www.buildingscience.com and www.ashrae.org - ASHRAE Journal (July 2005).
2. Massachusetts Energy Code: Section 1304.3 Air Leakage of 780 CMR, Chapter 13 – Energy Efficiency (includes air barriers). References – U.S. Department of Energy. www.energycodes.gov. and www.mass.gov.
3. Building Energy Codes Resource Center: Article #1705 – Meeting the Commercial Continuous Air Barrier Requirements for ASHRAE 90.1-2010 and 2012 ICC IECC – Code Notes: Website: www.energycodes.gov/resource-center
4. Significant New Alternatives Policy (SNAP) program. EPA website. www.epa.gov/ozone/snap/foams/lists/comm.html.

*Since many variables impact ccSPF material and installation costs, it is preferable to discuss the project budget, return on investment (ROI), potential energy savings and possible rebates, tax credits or green certification (e.g. LEED credits) with the SPF manufacturer or contractor. †Savings can vary. Check your SPF seller's fact sheet for specific R-values when comparing SPF to other insulations. © Energy Star is a joint program of the EPA and the U.S. Department of Energy.

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