

The Case for Improved Energy Performance in Commercial Buildings

Rising energy costs, environmental concerns, and more stringent building/energy codes are contributing to the need for more energy efficient buildings. Many architects, designers, construction professionals and building owners are turning to closed-cell spray polyurethane foam (ccSPF) as the preferred insulation/air barrier system for commercial construction and retrofits. With growing interest in high performance building envelopes, ccSPF provides consistent and unparalleled airtightness, superior thermal performance, outstanding moisture control and even structural benefits — all of which can improve energy efficiency and building durability.

What's Driving Demand for More Energy Efficient Buildings?

Before further exploring the benefits of ccSPF as an air barrier system, it is important to consider some of the factors that are driving demand for more energy efficient buildings. Some key factors include:

- Buildings account for about 36% of all energy use in the U.S. and 65% of electricity consumption.¹
- In the U.S., demand for energy is expected to increase by about 31% within 25 years; electricity demand will grow by at least 40% by 2032; and new power generation equal to nearly 300 power plants will be needed to meet electricity demand by 2030.²
- 30% of energy consumed in commercial buildings is used unnecessarily or inefficiently.³
- According to independent studies by Oak Ridge National Laboratory (ORNL) and the National Research Council of Canada (NRCC), between 30-50% of energy loss is attributed to air leakage and heat transfer in the building envelope.⁴
- Energy represents 30% of the typical office building's costs and is a property's single largest operating expense.⁵
- Businesses and organizations that are leaders in energy efficiency use about 30% less energy than their competitors. For example, corporate real estate owners can lower operating costs by approximately \$25,000 per year for every 50,000 square feet of typical office space.⁶
- Well designed air barrier systems are estimated to reduce air leakage in non-residential buildings by up to 83%, save on gas bills by more than 40% and cut down on electrical consumption in excess of 25%.⁷
- Government tax incentives are available. For example, section 179D of the Federal Tax Code provides a tax deduction for energy efficiency improvements to commercial buildings. The federal Energy Policy Act of 2005 established a tax deduction for energy-efficient commercial buildings applicable to qualifying systems and buildings placed in service from January 1, 2006, through December 31, 2007. This deduction was subsequently extended through 2008, and then again through 2013 by Section 303 of the federal Energy Improvement and Extension Act of 2008 (H.R. 1424, Division B), enacted in October 2008.⁸



High Performance Building Considerations

To address code requirements and improve energy efficiency, the design of the building envelope or “enclosure” plays a critical role. The envelope consists of building components that separate the conditioned from the unconditioned spaces. Commercial buildings are much more complex than residential structures in the way they are built, the materials used and how they are operated. For example, large pressure differentials, known as the “stack effect,” can cause the movement of mass quantities of air. This air also contains moisture, which may condense when it comes in contact with colder building materials. Trapped moisture in building cavities can cause serious problems, such as mold or mildew growth and structural deterioration.

Along with challenges in controlling air infiltration, commercial buildings are also more susceptible to “wind washing” and “thermal bridging.” Wind-washing occurs as unconditioned air moves within air-permeable cavity insulations, such as fiberglass, cellulose and board-stock. A thermal bridge results when an assembly or component in the building envelope transfers heat at a significantly higher rate than the surrounding insulated area. This can pose significant problems, causing heat loss and insulation underperformance in commercial buildings, particularly those that are steel-framed. The best practice is to select an air barrier material, such as ccSPF, designed to address these challenges.

Focus on Building Codes/Standards and the Environment



There are significant initiatives underway by federal, state and local governments to conserve energy in the commercial building sector to improve national energy security, reduce reliance on foreign oil and lower greenhouse gas (GHG) emissions. For example, the Energy Independence and Security Act of 2007 (EISA 2007) directed the U.S. Department

of Energy (DOE) to form the Net-Zero Energy Commercial Building Initiative, a public-private collaboration, in order to “develop and disseminate technologies, practices, and policies” to promote and facilitate the transition to zero net energy commercial buildings. EISA 2007 calls for all new commercial buildings to be zero net energy consumers by 2030 and all U.S. commercial buildings to be zero net energy consumers by 2050.⁹ There are many other initiatives that also promote energy efficiency in the commercial sector, including the DOE’s Better Buildings Challenge, which aims to make U.S. commercial and industrial buildings at least 20% more efficient during the next decade.¹⁰

Also, many building codes and standards are focusing on air barrier system requirements to improve energy performance. For example, the Massachusetts Commercial Energy Code was the first jurisdiction in the

U.S. to mandate air barrier systems in non-residential construction. This energy code conforms to DOE program goals to significantly reduce building energy consumption.¹¹ 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.” Also, 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.¹²” Both 90.1-2010 and the 2012 IECC require that all seams, penetrations, and transitions between approved materials or assemblies are sealed.

Why Is ccSPF Effective and How Is It Used?

CcSPF is a proven, cost-effective material that helps meet (and in many cases, exceed) air barrier code and building performance requirements, even when designing for severe weather conditions. CcSPF insulation is spray-applied by SPF professionals on site to provide a seamless, effective thermal, air and moisture barrier. It is sprayed as a liquid that immediately expands to approximately 30 times its original volume upon installation. As it expands into foam, it adheres and contours to the spray surface, filling in cracks and crevices that can cause air and water infiltration. CcSPF has a commonly accepted R-value* of >6.0 per one inch of thickness. It can be used throughout the interior and exterior of a structure (walls, foundation and slab) and may be applied to nearly any construction surface (i.e. masonry, gypsum board, wood, or metal). CcSPF is also an ideal roofing system because it can be sprayed on a new roof substrate, used for tear-off replacement, or applied over an existing roof as a re-cover.



Specify ccSPF For Your Next Air Barrier System

There are many considerations when designing an effective air barrier system for commercial buildings. CcSPF's many unique benefits such as self-adhesion, moisture resistance, strength, durability and outstanding air sealing/insulating capabilities, make it a preferred air barrier material. Along with its outstanding performance characteristics, ccSPF continues to grow in popularity due to its ability to simplify the air barrier system design process, compatibility with other materials/systems and ease of application.

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 Policy¹³ (SNAP) to replace ozone depleting substances. They are the preferred choice for many ccSPF products worldwide. 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.



Sources:

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9. DOE Building Technologies Program: Source: Center for Climate and Energy Solutions.
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11. Massachusetts Energy Code: Section 1304.3 Air Leakage of 780 CMR, Chapter 13 – Energy Efficiency (includes air barriers). www.energycodes.gov.
12. 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: <http://www.energycodes.gov/resource-center>.
13. Significant New Alternatives Policy (SNAP) program. EPA website. www.epa.gov/ozone/snap/foams/lists/comm.html.

*Savings can vary. R-value is a term used to rate an insulation's ability to resist conductive heat transfer. The higher the R-value, the greater the insulating power. Ask your seller for a fact sheet for specific R-values. .

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12-10-EBA
February 2013 Printed in U.S.A.
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