

IMPROVING COMMERCIAL BUILDING PERFORMANCE AND SUSTAINABILITY

Going beyond code requirements to create healthier, greener and functional spaces through the use of low-density (open cell) spray foam insulation



ICYNENE®

OVERVIEW

The Commercial Building Environment

Commercial buildings account for 18% of the nation's energy use and nearly 18% of our greenhouse gas emissions.¹ Improving their performance is a key priority for building owners and operators.

The Opportunity

A unique opportunity is at hand for commercial architects to shape a healthier and more energy efficient future of commercial building design and construction. By 2035, 75 percent of all buildings will be either new or renovated.¹

Low-density (open cell) spray foam insulation like ICYNENE can play a major role in this effort, offering compelling reasons to go beyond the code to create buildings that exceed expectations for comfort, performance and functionality.

The Argument for Low-Density (open cell) Spray Foam

Open cell spray foam insulation (also known as ½ pound foam) is often associated with residential construction, but its air-sealing characteristics, ability to minimize moisture and temperature-related issues and capacity to enhance the performance of other building materials make it ideal for commercial projects.

In fact, the most common reasons for not using open cell spray foam insulation in commercial building can actually be key advantages if designers know how to take advantage of them in their buildings.

For example, designers often cite "rigidity" and "structural strength" as reasons for choosing medium-density closed cell foam over low-density open cell foam. Yet, it is precisely the flexibility of open cell foam that allows it to move with the building to avoid delamination and cracking. The air sealing capability of low-density open cell foam is retained for the life of the building.

REASONS TO USE LOW-DENSITY (OPEN CELL) SPRAY FOAM

With open cell spray foam insulation commercial architects can:

- Reduce upfront insulation costs by taking advantage of its higher yield and ability to provide an air barrier without complex air sealing and finishing materials
- Reduce ongoing energy costs by up to 50% by creating an air-barrier to minimize air infiltration, while maintaining long-term thermal (R-value) performance
- Lower equipment costs via reduced HVAC loads
- Improve the indoor environment with more consistent building envelope performance to enhance workplace productivity and performance
- Easily manage hard-to-insulate areas like floor areas over unconditioned space, complicated framing, etc.
- Explore design options not feasible with other forms of insulation (complex angles, curves, etc.)

For architects, who typically specify fibrous, or rigid board insulation, here are four compelling reasons to make (open cell) spray foam insulation a pillar of their commercial building designs:

Reason #1 Open cell spray foam is the ideal choice to create an effective air barrier for optimal building performance

A recent Wall Energy Rating (WER) study² shows that, without an air barrier, insulation alone cannot deliver optimal energy efficiency and comfort. This is why air barriers are now a critical part of code and industry standards such as ASHRAE 90.1.

Furthermore, of the insulation and air barrier alternatives studied, low-density open cell foam was the most effective air barrier material.

The arguments for open cell spray foam insulation are very compelling:

- Has the highest expansion (100 to 1) of any spray foam insulation product giving it the greatest ability to flow into and seal, cracks and gaps
- Has the widest application envelope (temperature and humidity) giving it maximum flexibility to mesh with tight construction schedules and deadlines
- Doesn't trap moisture allowing it to escape and thereby dry adjacent materials

For commercial projects open cell spray foam insulation delivers optimal building performance by providing an insulation and air barrier in one step to:

- Control conductive heat loss
- Help eliminate convective heat and moisture flow in wall and ceiling cavities
- Control air leakage into and out of the building

REASONS TO USE LOW-DENSITY (OPEN CELL) SPRAY FOAM

Reason #2 Open cell foam is cost effective

The high yield of low-density foams (yield is a measure of the expansion capability of a foam) makes it more cost effective than other alternatives.

Low-density foam has a yield that is three to four times higher (100:1 versus 30:1) than medium-density foam making it more cost effective to maximize the air barrier benefits of spray foam.

Designers of buildings for cold climates (most of Canada and Zones 5 to 8 in the U.S.) often still select medium-density foam thinking they require its vapor diffusion retarder properties. But using a vapor retarder paint primer on the drywall or low-density open cell foam in the wall can provide the code-required vapor diffusion control and take advantage of open cell's drying potential.

Reason #3 Open cell spray foam enhances building durability

Air leakage can lead to concealed condensation and moisture damage. It stands to reason that good building design, using an effective air barrier such as ICYNENE low-density open cell spray foam, can contribute to improved durability and performance of building envelope assemblies.

According to ASHRAE, moisture damage contributes to 90% of all building and building material failures.³ Moisture issues in commercial buildings can contribute to everything from corrosion of metal components (i.e. ducts, framing) and degradation of building materials (gypsum sheathing, ceiling tiles, wood products, etc.) to the growth of mold and poor indoor air quality.⁴

For this reason creating an air barrier with low-density (open cell) spray foam insulation can pay off in a longer life of commercial building assemblies, helping prevent the need for costly repairs and lost operational time down the road.

Low-density spray foam such as ICYNENE can play multiple roles in moisture issue prevention and performance improvements for commercial building owners and occupants by:

- Minimizing moisture-related problems caused by random air leakage
- Helping to prevent condensation by stopping conditioned internal air from meeting cold surfaces
- Helping to prevent the formation of mold (most open cell spray foam products are not a food source for mold and they will readily dry should they be exposed to minor wetting)
- Enhancing the ability to dry out via diffusion
- Allowing moisture to drain through making it easier to spot the source of leaks and thereby permitting any roof repairs to be made more easily

Vapor Retarder vs. No Vapor Retarder?

When open cell spray foam insulation is used, a separate vapor retarder may or may not be necessary. In U.S. climate zones 1 through 4, a vapor retarder is not required by code, with the exception of places with high interior relative humidity, such as interior swimming pools.

When a separate vapor retarder is needed it can often be achieved by applying a vapor retarder paint (such as Benjamin Moore® Fresh Start Primer or CORO-BOND™ Universal Primer) to the interior drywall or by spraying it directly onto cured spray foam insulation.

REASONS TO USE LOW-DENSITY (OPEN CELL) SPRAY FOAM

Reason #4 Open cell spray foam insulation helps make commercial projects more environmentally appropriate

For architects, low-density open cell spray foam insulation can be a valuable building feature, whether they are looking to achieve LEED project certification (the U.S. Green Building Council's internationally recognized green building program) or simply want a more energy efficient, sustainable design:

- The high yield of low-density foam makes it more resource-efficient than medium-density foams, requiring fewer raw materials to achieve equivalent thermal performance.
- The chemistry of low-density foam, using water as a blowing agent, results in the lowest Global Warming Potential (GWP of 1) of any spray foam product.
- Spray foam gets shipped to the jobsite in its unreacted state, so it is more compact and minimizes transportation energy use.

These properties help ICYNENE low-density open cell spray foam achieve the highest point total of any insulation product on the LEED and NAHB green rating scales.

LEED selling features for building owners and tenants:

- Reduced energy consumption and environmental impact
- Lower operating costs
- Better indoor environmental quality
- Average building life cycle savings that are 10 times the initial investment in construction costs
- Comparable construction costs to buildings not seeking LEED certification
- Higher occupancy rates and building values

A Long-standing Record of Performance

ICYNENE has a 25-year track record of durability and long-term performance in formulating low-density open cell spray foam for the North American construction market. That track record is supported by hundreds of thousands of successful projects.



ICYNENE®

LOW-DENSITY OPEN CELL SPRAY FOAM: DESIGN WITHOUT COMPROMISE

Low-density open cell spray foam insulation like ICYNENE expands the horizon of design opportunities for commercial architects beyond what is feasible with fibrous or rigid board insulation options.

This means that architects can push the design envelope while meeting the energy efficiency, overall performance and functional needs of a building. Open cell spray foam insulation tackles design challenges and problem areas that are difficult or impossible with other types of insulation including:

- Cathedral ceilings
- Steel structures
- Domed ceilings
- Arches and other unusual shapes
- Plumbing, electrical, telecommunications and other service entry points

With spray foam insulation like ICYNENE complex detailing is simplified without having to compromise on energy efficiency or overall building performance.

Commercial Applications for ICYNENE Open Cell Spray Foam Insulation

ICYNENE low-density spray foam products are approved for International Building Code (IBC) construction types: I, II, III, IV, V. Here is an example of the types of applications for which ICYNENE open cell spray foam can be used:

- ✓ Roof (ceiling)
- ✓ External wall (on inside of wall)
- ✓ Internal wall
- ✓ Cantilevered floor or floor above unconditioned space
- ✓ Basement wall (on inside of wall)

Please contact commercialapplications@icynene.com to check which ICYNENE products can be used for your project.

End notes

1. 2011 Fast Facts: ENERGY STAR Commercial Building Design
2. National Research Council Canada (NRC) produced a Wall Energy Rating factor that compared the performance that was delivered during testing versus the expected performance based on Nominal R-value. Spray foam consistently performed at more than 90% of nominal R-value whereas air-permeable, fibrous insulation performed in the range of 35% to 65% of nominal R-value. See: Development of energy ratings for insulated wall assemblies, Elmahdy, A.H.; Maref, W.; Swinton, M.C.; Saber, H.H., Glazer, R., October 2009, <http://www.nrc-cnrc.gc.ca/obj/irc/doc/pubs/nrcc51419.pdf>
3. Using Tools To Predict and Resolve Moisture and Mold Problems In Building Envelopes; André Desjarlais, Ken Wilkes, and Achilles Karagiozis - Oak Ridge National Laboratory (U.S. Department of Energy)
4. Moisture in Buildings; John Straube, Ph.D. (ASHRAE Journal – January 2002)

Call 1.800.758.7325 or email commercialapplications@icynene.com to learn more about the application of ICYNENE's portfolio of open and closed cell spray foam insulation products for commercial building design and construction.

Explore the gallery of commercial building projects at www.icynene.com/commercial

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