
An Introduction to
Spray Foam
Insulation
ICYNENE®
The Evolution of Insulation

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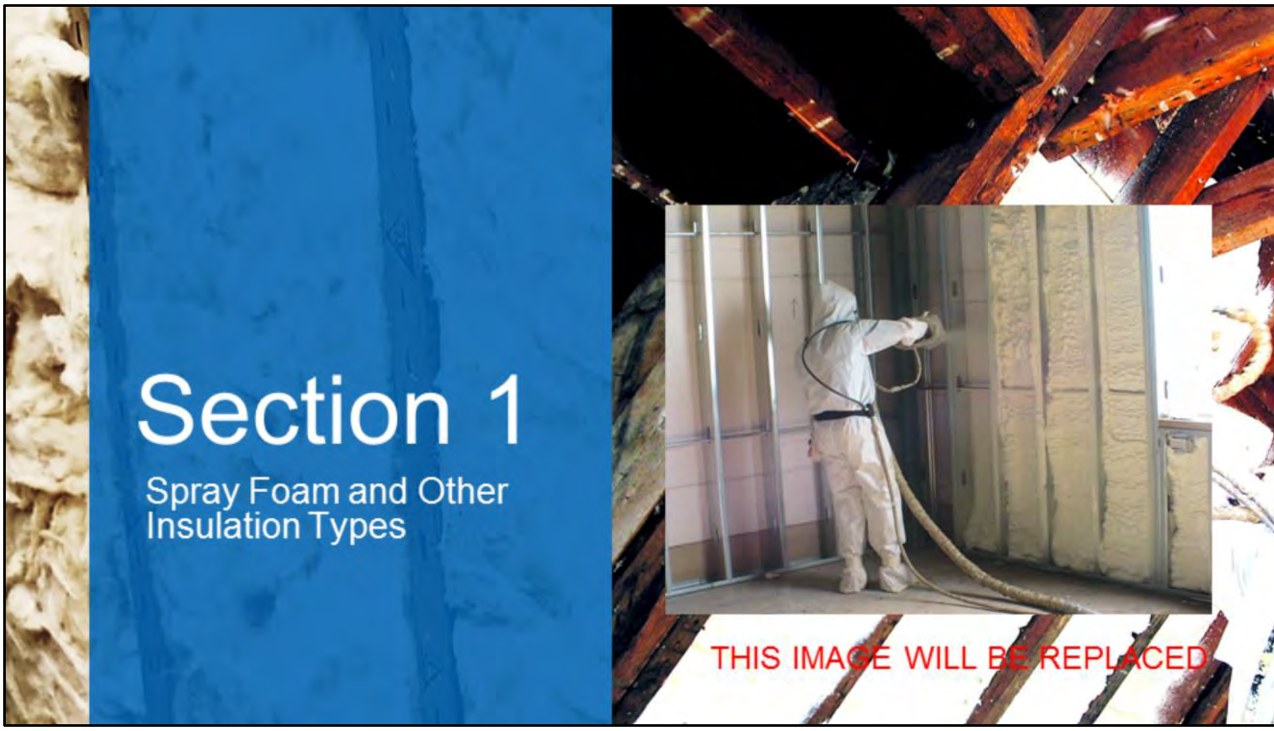
Course Overview

Of all the different insulation options available today in commercial construction, spray foam can provide outstanding thermal performance while also contributing to air sealing, moisture control, and even structural integrity. This learning unit will provide an overview of spray foam insulation, how it differs from conventional insulation types, its most appropriate applications, and how the material is allowed to be used in fire-resistant construction.

Learning Objectives

Upon completion of this course, the student should be able to:

- Explain the benefits of and the differences between open-cell spray foam insulation and closed-cell spray foam insulation.
- Describe the most appropriate applications for open-cell and closed-cell spray foam in commercial designs.
- Discuss how spray foam insulation can be used in assemblies requiring fire resistance.
- Define the differences between thermal barriers and ignition barriers, and explain insulation fire ratings.

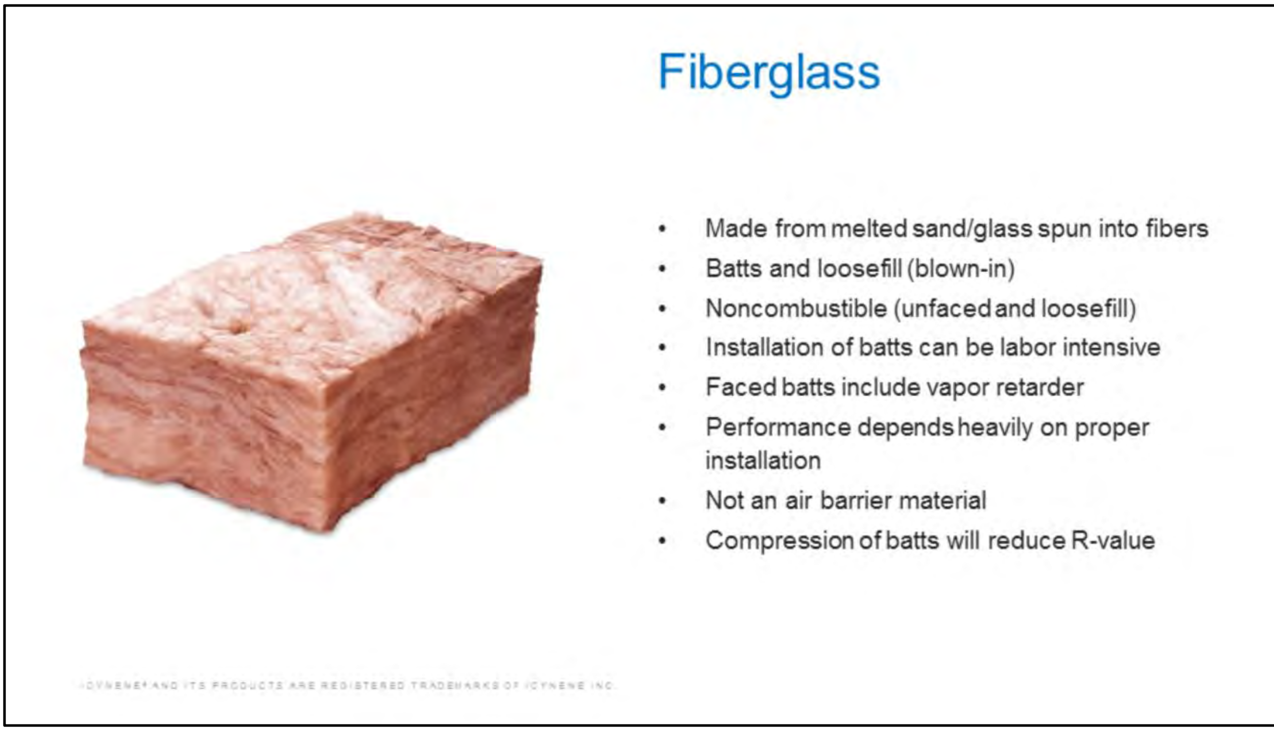


Spray foam insulation has outstanding insulation properties when compared to traditional insulation materials. It can be an important tool in designing and installing a well-sealed, energy-efficient building envelope. This section will briefly look at the most common types of insulation used in commercial construction today, comparing them to both open- and closed-cell spray foam from the standpoint of R-value, weight, and speed of installation.

Common Types of Insulation

- Fiberglass
- Mineral wool
- Cellulose
- Rigid foam
- Spray foam

There have never been more options for insulating commercial buildings. Although these options give designers the opportunity to pick products that match the goals and budget of a project, they also require deeper knowledge of each product's attributes. Among the most commonly used and available insulation types are fiberglass, mineral wool, cellulose, rigid foam, and spray foam.



Fiberglass insulation is made from sand or glass that has been melted at high temperatures and spun into fibers. It can be mixed with a binder and formed into blankets and batts, or it can be installed as loosefill, in which case a mechanical blower is used to blow chopped-up pieces of fiberglass insulation into cavities.

Fiberglass insulation is relatively inexpensive, and it is a widely used insulation material. Noncombustible fiberglass insulation is lightweight, making it easy to transport and handle.
Fiberglass batts have R-values between R-2.9 and R-3.8 per inch, while “high-performance” batts have R-values between R-3.7 and R-4.3 per inch. Loosefill or blown-in fiberglass R-values are slightly lower, but this varies depending on the density of the blown-in material. Compression of batts will reduce R-value

Fiberglass batts are fairly labor intensive to install. Kraft-faced batts incorporate a vapor barrier, potentially saving time required for a separate installation; however, proper installation is critical for full enjoyment of both the insulating benefits and performance of the vapor barrier. Neither batts nor blown-in fiberglass is considered an air barrier material.

Mineral Wool

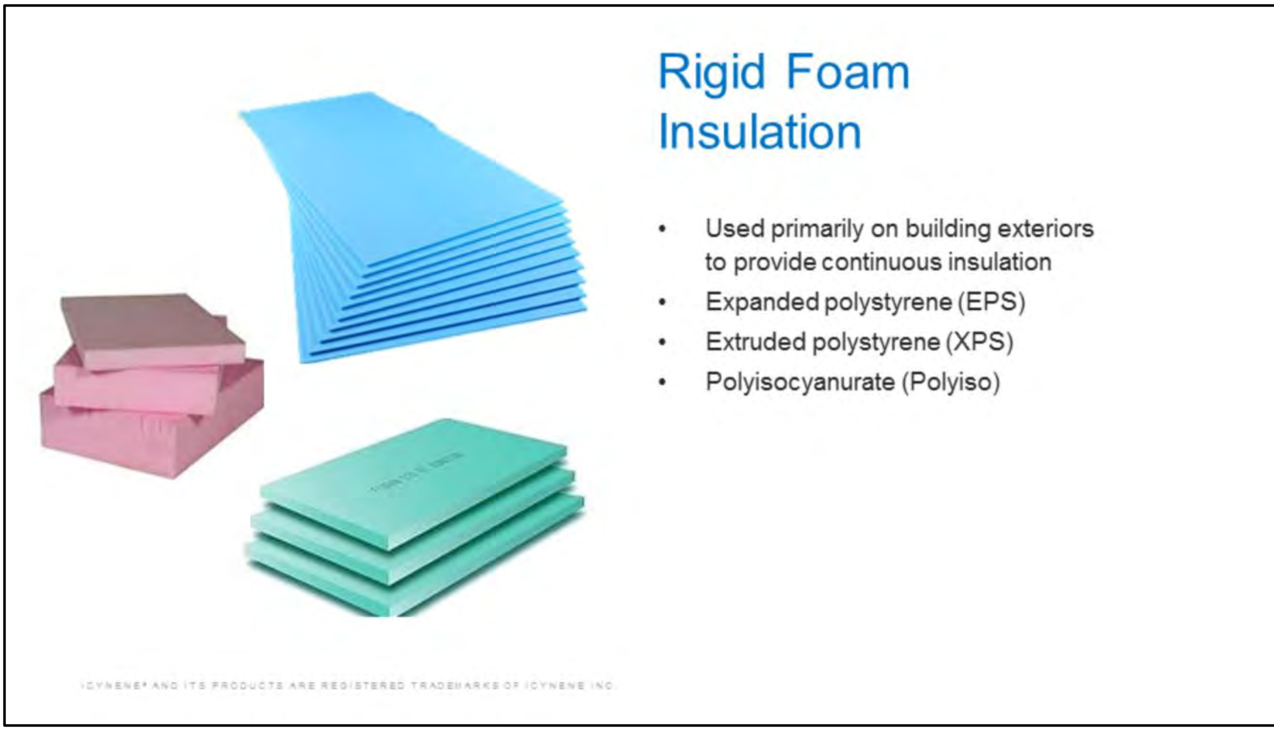
- Made from melted stone or slag spun into fibers
- Batts, loosefill, and rigid boards
- Noncombustible
- Installation of batts can be labor intensive
- Can be used as continuous (nonstructural) exterior insulation
- Not an air barrier material

Also called stone wool, mineral wool is made from stone or slag that has been melted and spun into short fibers. It is formed into batts or rigid boards; like fiberglass and cellulose, it also can be blown in. Mineral wool is naturally noncombustible and achieves slightly higher R-values per inch than fiberglass. The batts are easy to cut to fit cavities, but as with other batt products, installation is fairly labor intensive. Its density also makes it heavy. Rigid mineral wool boards can be installed on the exterior of buildings, similar to rigid foam products, although mineral wool cannot serve as structural sheathing or as a water resistive barrier. Also, it is not considered an air barrier material.

Cellulose Insulation

- Made from recycled newsprint or other paper products
- Treated with fire retardant
- Blown in as dry fiber or “damp sprayed” into cavities
- R-3.5 per inch
- Not an air barrier material

Cellulose insulation is made from recycled newsprint or other paper; it is treated with boric acid or other fire retardant to increase its fire resistance. Cellulose insulation has a high recycled content (75 percent or more). It can be formed into batts or installed with a mechanical blower as a dry fiber (enclosed cavities) or “damp sprayed” into open wall cavities, where the damp cellulose sticks to sheathing and studs. In damp-sprayed applications, cavities must stay open until the moisture content drops below at least 25 percent. The R-value of cellulose insulation is around R-3.5 per inch. In general, it controls air movement better than fiberglass insulation, although it too is not considered an air-barrier material. Also, cellulose insulation can settle over time, compromising its performance, and care must be taken to manage moisture and density for a successful installation.



Rigid foam insulation is usually used on building exteriors to form a continuous insulating layer. The three most common materials used in rigid foam are expanded polystyrene (EPS), extruded polystyrene (XPS), and polyisocyanurate. Each has its pros and cons. EPS is the least-expensive option, but it also has lower R-values (depending on density, between R-3.6 to R-4.2 per inch.)

EPS is susceptible to damage and is vapor permeable, so it is not typically used as exterior sheathing on walls or below-grade applications; instead, it is most often used in structural insulated panels (SIPs) and insulated concrete forms (ICFs). XPS is a denser material with a high R-value (R-5 per inch). Its density and water resistance makes it a good choice for below-grade applications; however, the blowing agents used to make XPS have a high global warming potential. "Polyiso" has an R-value of R-6.0 to R-6.5 per inch; however, it performs poorly in cold temperatures. Because it can absorb water, it is not a good choice for underneath slabs or foundation walls. It does not use ozone-depleting blowing agents.

Rigid Foam Insulation

- Few rigid foam insulation products have been tested as part of an air barrier system.

Few rigid foam insulation products have been tested as part of an air barrier system. Ether the sealing of board joints, which is labor intensive, or the widespread use of a supplemental product, such as a housewrap or membrane, would be required to achieve the airtightness characteristics needed.

Spray foam is a polyurethane product that is created on-site using specialized equipment. The foam expands upon application.

Spray foam can be used to provide continuous insulating and air sealing in roof, floor, ceiling, and wall assemblies. Spray foam is characterized by high R-values (up to R-7.1 per inch). In addition, all spray foam products restrict and reduce air leakage and minimize airborne moisture transfer. There are two kinds of spray foam: open-cell, or low-density spray foam, and closed-cell, or medium-density spray foam. Together, these options enable a wide range of applications. Open-cell spray foam can be used to fill cavities within building interiors, and closed-cell spray foam can also be used in exterior applications such as continuous insulation. The material conforms to virtually any building geometry and shape.

Closed-cell medium-density spray foam acts as a water resistive barrier. Its performance and ability to combine multiple functions in one product make it a cost-effective choice over the long run.

This section will explore the unique qualities of spray foam insulation. We will consider the differences between open-cell and closed-cell spray foam, as well as how each type can be used effectively to address specific areas of the building assembly.

Unlike other insulation materials, spray foam achieves its final form at the jobsite. It is made through a chemical reaction in which isocyanates (ISO) are mixed with a proprietary resin mix; the reaction causes rapid expansion (“foaming”) and also releases heat.

One of the main benefits of spray foam is how it changes insulation delivery. Spray foam is delivered directly to the jobsite in a rig. The spray foam chemicals come in separate 55-gallon drums and are mixed and manufactured on site according to strict specifications followed by the installer. “Side A” contains the isocyanates; “side B” typically contains a resin blend consisting of polyols, catalysts, blowing agents, flame retardant, and surfactants. The side B formulation gives each spray foam its unique performance characteristics, which vary from manufacturer to manufacturer.

Blowing agents are the gases used to expand the cells of foam and provide additional insulating properties. One of the environmental concerns with spray foam is the high global warming potential (GWP) of these blowing agents.

Some of the blowing agents used in spray foam products are an environmental concern because of their high global warming potential (GWP).

The blowing agent used in low-density (open-cell) spray foam is water. During the chemical reaction, water reacts with isocyanate to produce carbon dioxide, which is trapped within the cell structure. The global warming potential of open cell spray foam is 1.0, which is the same as carbon dioxide, and is the lowest for a foam product.

Blowing Agents

- Some blowing agents for closed-cell foam have high global warming potential (GWP)
- Lower GWP blowing agents are available and are being adopted

Closed-cell foams typically use synthetic compounds as blowing agents, the latest generation being non-ozone depleting. The global warming potential of these blowing agents varies depending on the manufacturer, but typically ranges from 725 to more than 1,400. However, several spray foam manufacturers use a low-GWP blowing agent or a water blowing agent in their medium-density foam products. More products will contain these "next-generation" blowing agents with lower GWP in the near future, as manufacturers are in the process of fully adopting them.

Low-density spray foam, also called open-cell foam or half-pound foam, is a soft, flexible foam with an open-cell composition; its density is usually around 0.5 pounds per cubic foot, and it has an R-value of between 3.7 and 4.5 per inch. Various codes and standards recognize low-density spray foam as an air barrier material. However, it does not qualify as a water-resistive barrier and can only be used in interior applications. Its softer composition makes it ideal for hard-to-insulate spaces, as it can conform around and seal the edges and perimeters of stud and joist cavities. It is also flexible enough to maintain its seal when subject to small-scale building movements. Low-density spray foam also enhances acoustic control in wall assemblies.

Low-Density Spray Foam Applications

- Interior applications only
- Ceilings, wall cavities, unvented attics, floors, roof, and basement wall interiors
- Conforms to shape of substrate

Low-density spray foam is only used in interior applications, such as framing cavities or continuously against a surface. Its physical flexibility and air-sealing characteristics make it ideal for ceilings, unvented attics, walls (both exterior and interior partition walls), cantilevered floors and floors above unconditioned spaces, roof interiors and basement wall interiors. Because spray foam conforms to the shape of the substrate, it is also ideal for cathedral ceilings, arches, and other unusual shapes, as well as for insulating smaller areas such as band joist areas.

Medium-Density or Closed-Cell Spray Foam

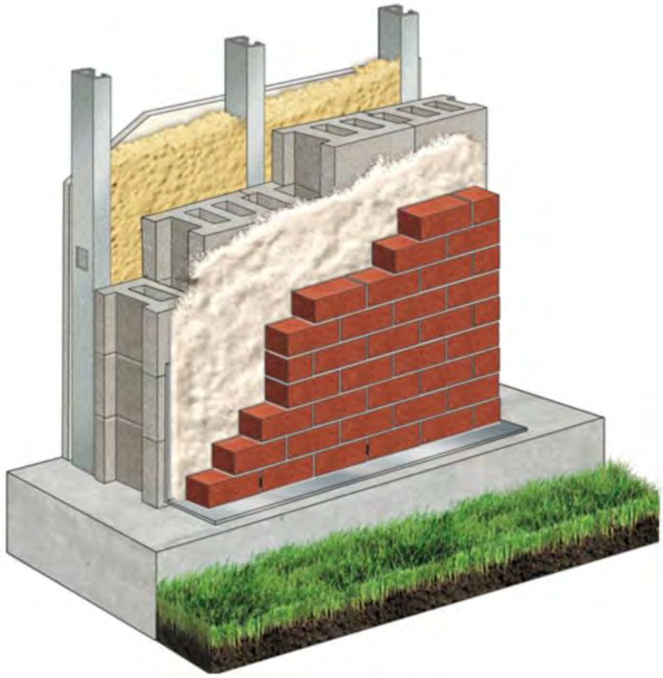
- Harder, rigid foam (density: 2.0 to 2.4 pounds per cubic foot)
- R-value: up to R-7.1 per inch
- Water-resistant barrier and air barrier
- Class II vapor retarder typically at 1.5 inch thickness
- Interior, exterior, and below-grade applications

Medium-density foam, also called closed-cell foam or 2-pound foam, is a harder, more rigid foam that achieves R-values of up to R-7.1 per inch. Medium-density spray foam has unique properties. It can function as a water-resistive barrier and full air barrier; it also has low water vapor permeance and qualifies as a Class II vapor retarder. Medium-density spray foam can be used in either interior or exterior applications, including below grade. Note that exterior below-grade applications typically require separate water management considerations.

Medium-Density Spray Foam Applications

- Cavity insulation
- Continuous insulation
- Below grade and on building exteriors
- Better solution than rigid foam board when installed on curved surfaces

Medium-density spray foam is appropriate for cavity applications in walls and ceilings and in unvented attics. It can also be applied below grade and on building exteriors as continuous insulation. The rigid board insulation often installed as continuous insulation cannot bend or easily adapt to irregularities in the wall surface. Often, a separate barrier or membrane is required to resist water and air movement, as many rigid board products are not rated to perform this function on their own. But spray foam is not influenced by the shape of the building, making it an ideal solution for continuous exterior insulation on curved surfaces, arches, or irregular-shaped wall surfaces.

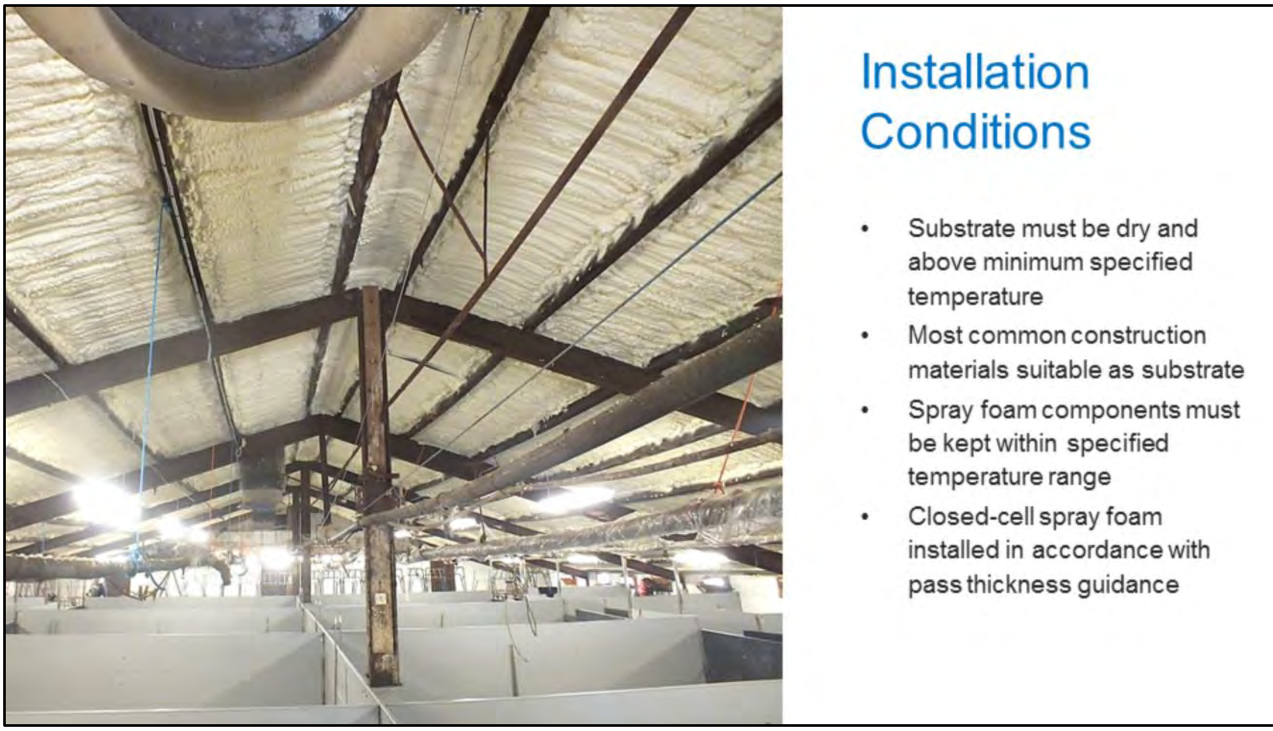


Dual Applications Within an Assembly

- Wall assemblies with both open-cell and closed-cell insulation
- Achieve high R-values and air sealing with no thermal bridges
- Strategy limits moisture ingress from exterior and interior

A wall assembly can include both open-cell and closed-cell spray foam insulation; for example, closed-cell spray foam can serve as continuous exterior insulation, while open-cell spray foam fills the stud cavities. Such a combination is ideal for projects requiring continuous insulation and for those seeking higher R-values, but where space on the exterior cavity wall side may be limited by design. This approach also can help limit moisture ingress from the exterior and interior and can help control cavity temperatures, which helps avoid condensation.

Spray foam is a cost-effective solution. Open-cell spray foam costs significantly less than closed-cell spray foam, and it achieves thermal insulation and air sealing in a single step. While more expensive, medium-density spray foam combines four functions—thermal insulation, air sealing, water-resistant barrier, and vapor retarder—in a single product. Both save labor and material costs compared to multicomponent assemblies. Open-cell spray foam also can be applied in a single continuous application to full depth in most cases, whereas closed-cell spray foams must be installed in 2- to 5-inch lifts, as per manufacturer's guidance, to allow for settling and curing. Because of its superior insulating and air sealing qualities, spray foam also saves energy and money over the long run by reducing energy demand.



Open-cell and closed-cell spray foam have installation requirements for optimal performance. While neither should be applied when the temperature of the substrate temperature falls below the specified temperature, open-cell spray foam can be installed under colder and more humid conditions (exact specifications vary depending on the manufacturer). In addition, the substrate must not be wet, and the chemical components (side A and side B) must be kept within a given temperature range to ensure optimal foaming. Common substrates are wood, concrete, concrete block, metal and gypsum board products. Whereas open-cell spray foam can be applied in one “pass,” closed-cell spray foam needs to be installed in recommended increments, allowing each application to cure and settle properly.

One of the advantages spray foam insulation has over conventional insulation materials is that it is flexible enough to be used in many different applications. This section will explore some of the lesser known but effective applications for modern spray foam insulation.

Continuous Insulation

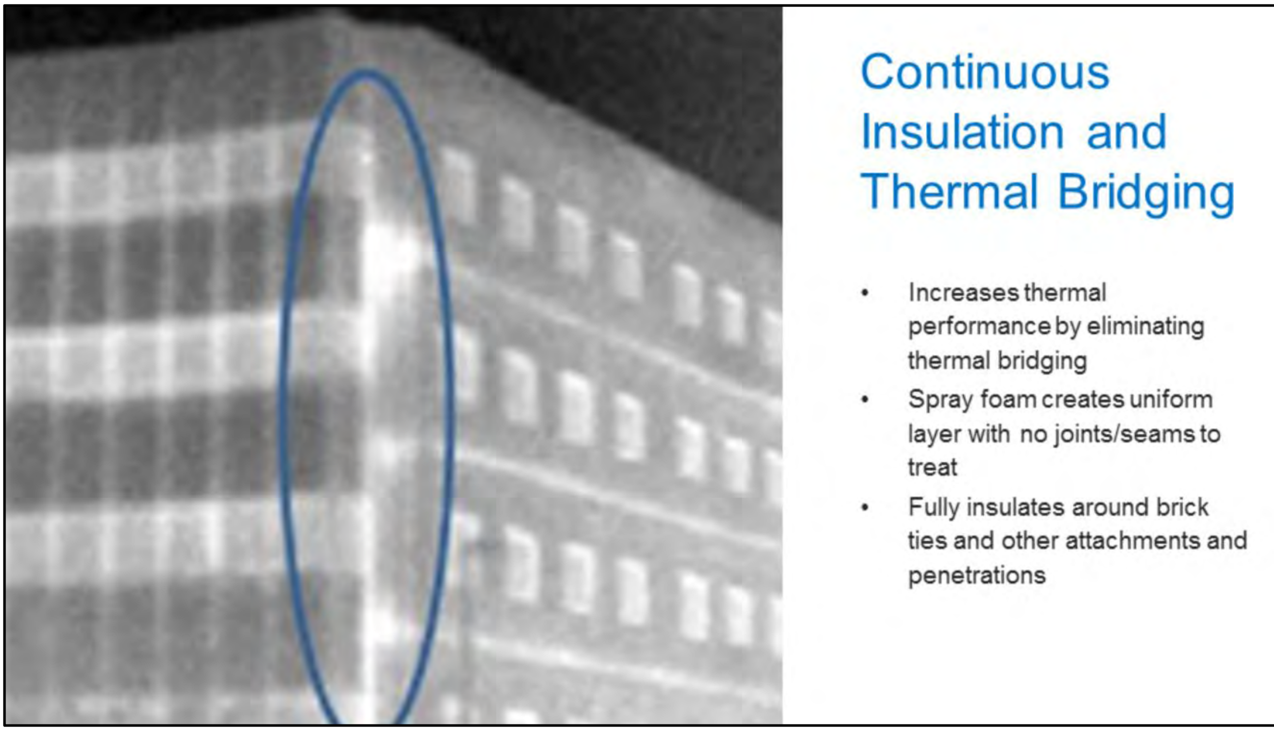
- Commonly applies to exterior of buildings but can occur on building interior too
- Combines four functions in one product (medium-density cell foam)
- Adheres to curves and other irregular shapes
- Adheres to most materials without a primer

While architects and builders may be familiar with the typical “between-the-studs” application, closed-cell spray foam also can be applied on the exterior of buildings in much the same manner as rigid foam insulation. Medium-density spray foam offers several advantages over rigid foam.

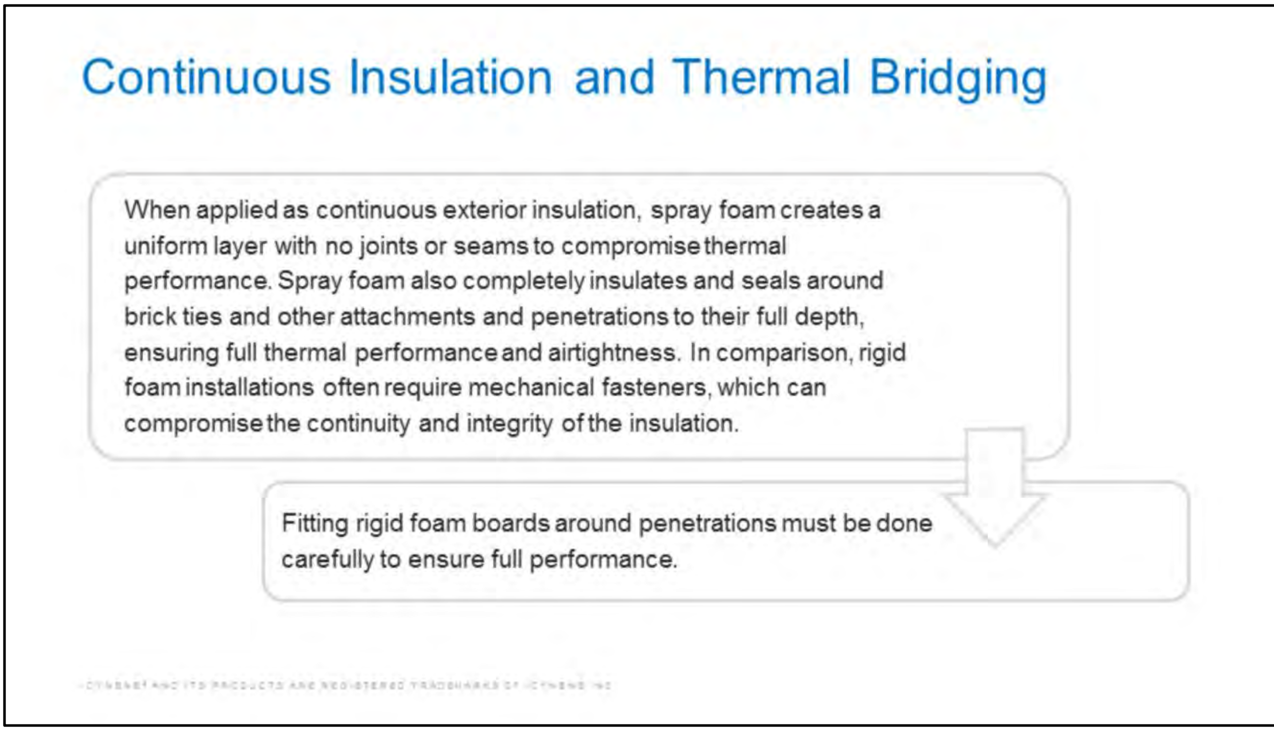
As we saw earlier, medium-density spray foam combines the benefits of four products in one. In addition to its insulating properties, it serves as an air barrier, water-resistant barrier, and Class II vapor retarder.

Continuous Insulation

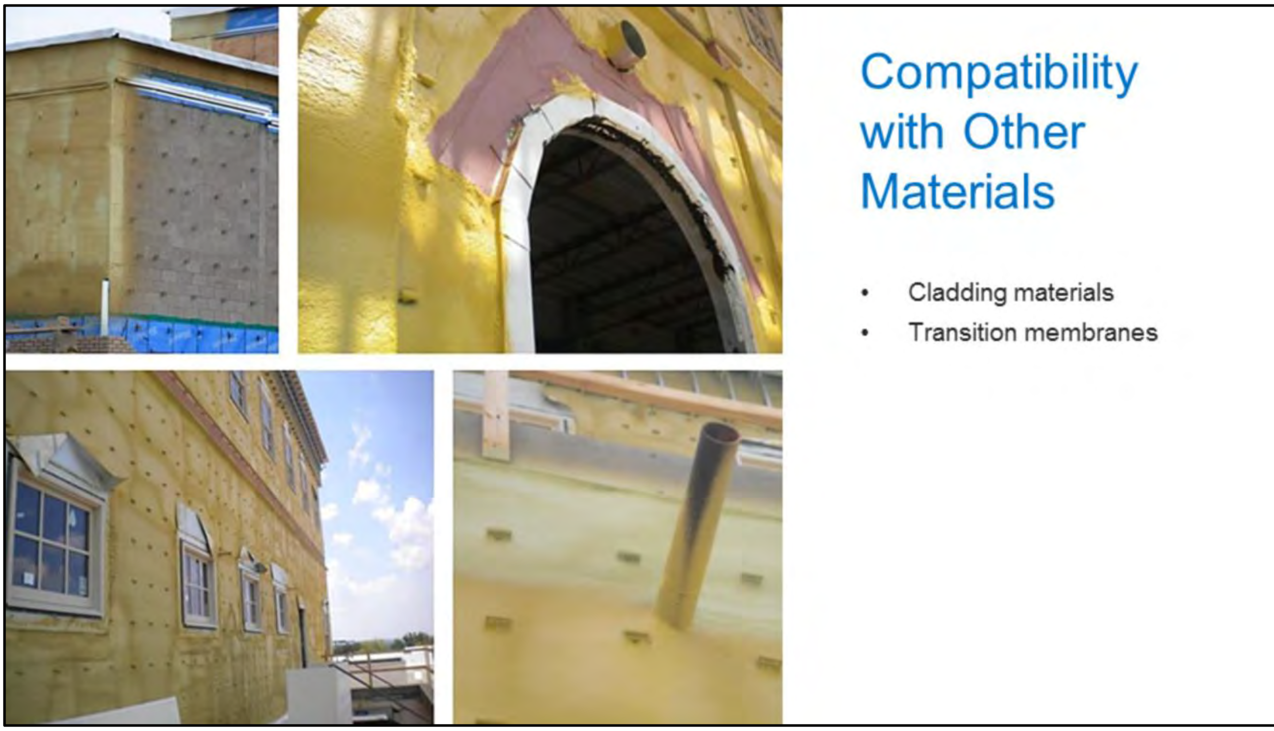
- From a design standpoint, medium-density spray foam expands the possibilities, as it can adhere to curved, irregular, and unique shapes and conditions without compromising its performance. In addition, medium-density spray foam can adhere to most common construction materials without the use of a primer.



Energy codes and standards recognize that continuous insulation dramatically increases the effective thermal performance of a wall by eliminating thermal bridges in the building envelope. Thermal bridging refers to the conduction of heat through framing and structural materials, which results in energy losses. An exterior continuous insulation system can eliminate common significant thermal bridges, such as those created by metal or wood wall stud framing, perimeter concrete floor edges, exposed concrete and steel structural columns, and beams. Similarly, an interior continuous insulation system is a favored choice when renovating older buildings.



When applied as continuous exterior insulation, spray foam creates a uniform layer with no joints or seams to compromise thermal performance. Spray foam also completely insulates and seals around brick ties and other attachments and penetrations to their full depth, ensuring full thermal performance and airtightness. In comparison, rigid foam installations often require mechanical fasteners, which can compromise the continuity and integrity of the insulation. Fitting rigid foam boards around penetrations must be done carefully to ensure full performance.



To be an effective air barrier on a wall's exterior, a product must be compatible with adjacent materials, including flashing and the transition membranes commonly found at windows and doors. Medium-density spray foam is compatible with many of these materials. It can also be used easily in conjunction with a wide variety of cladding materials.

Exterior Continuous Insulation: Air-Barrier Performance

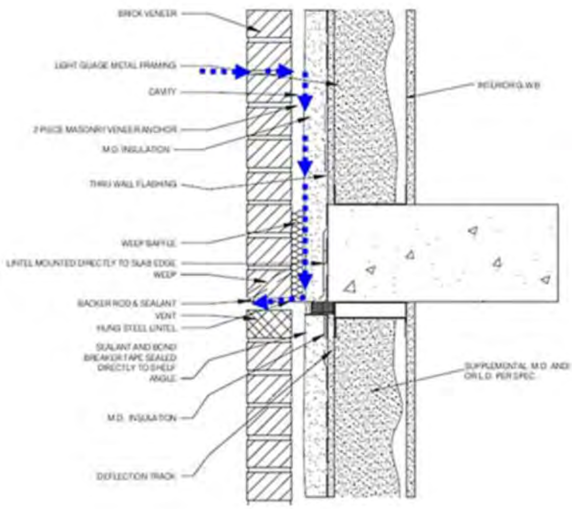
- Medium-density spray foam typically acts as an air barrier at 1 to 1.5 inches
- Few rigid foam board products tested
- Rigid foam board require sealants, tape, or a membrane to be applied to cover joints and gaps

Most medium-density spray foam products have been tested and found to be air impermeable—i.e., they can serve as an air barrier material—at a thickness of between 1 and 1.5 inches.

Comparatively, fewer rigid foam products have undergone such testing. Rigid foam requires additional labor and materials if it is to serve as an air barrier.

Either sealants or tape must be applied at all board joints or an air-barrier membrane must be used to cover the gaps in the joints between boards.

This presents issues with material compatibility, especially in severe environmental conditions. Fasteners and staples also can compromise its performance as an air barrier.



Exterior Continuous Insulation: Water Resistance

- Medium-density spray foam can serve as a water-resistive barrier (WRB)
- Rigid foam as WRB
  - Joints must be taped or sealed
  - Some rigid foams not rated as WRB
- If insulation too vapor impermeable, wall may not be able to dry to outside

Medium-density spray foam can also serve as the water-resistant barrier, a role often filled with felt paper, housewraps, self-adhered, and liquid-applied membranes. Proper integration of other water-resistant materials is required to ensure positive drainage, particularly at windows, doors, and other penetrations. As was mentioned, many medium-density spray insulations are chemically and adhesively compatible with a wide variety of WRB accessory materials, such as flashing and transition membranes (liquid and self-adhered).

If rigid foam is to serve as the water-resistant barrier, the joints between boards must be taped or sealed, which can be a labor intensive process. In addition, many rigid foam board products are not rated as water-resistant barriers, in which case a separate membrane is needed.

Exterior Continuous Insulation: Water Resistance

- Prevention of exterior water vapor into a wall is important, but if the wall is too vapor tight at its exterior, it may have trouble drying to the outside should it become wet.
- Compared to other continuous insulations, medium-density spray foam typically provides a wall with equal or greater drying potential to the outdoors, which should enhance durability and longevity.

Unvented Attics in Type V Wood Frame Structures

- Low-density or medium-density spray foam applied to underside of roof deck
- Creates indirectly conditioned attic space
- Improves HVAC efficiency
- Temperature and humidity conditions usually close to occupied space below

Both low-density and medium-density spray foam can be applied directly to the underside of a roof deck, which converts the space below to an “unvented” or indirectly conditioned attic. Unvented attics have several advantages. Locating HVAC equipment and ductwork in such a space improves their energy efficiency and helps to ensure occupied spaces receive properly conditioned air. In these assemblies, the temperature of the attic space typically remains within 5–10 degrees Fahrenheit of the conditioned living space below, and the relative humidity is typically much lower than ambient conditions. This significantly reduces the potential for condensation and structural rot.

Basements, Foundations, and Below-Grade Walls

- Insulation and air barrier; helps prevent condensation
- Below grade: medium-density spray foam
  - Can be used in zones subject to flooding
  - Can serve as Class II vapor retarder
- Low-density spray foam allows wall moisture to dry more easily

Either medium- or low-density spray foam insulation can be applied on the interior of basement walls to provide insulation and an air barrier. Using spray foam in this application minimizes the potential for warm, moist air to move through the building envelope and to contact cooler surfaces, thus preventing condensation. In below-grade applications, framing should be inset from concrete and block walls to allow the insulation to be sprayed as a separator between framing and concrete. Open-cell spray foam has the benefit of allowing moisture in a wall to dry more easily (to the interior).

Basements, Foundations, and Below-Grade Walls

- Medium-density spray foam insulation is ideal for below-grade applications because it will not absorb moisture; in fact, it may be specified by some authorities (e.g. FEMA) to provide extra protection in areas where there is a higher risk of flooding. It also can be used as a Class 2 vapor retarder where required by the applicable code

Unvented Crawlspaces

- Spray foam installed in walls of crawlspace
- Improves HVAC efficiency and protects pipes
- Improves energy efficiency and indoor air quality

Medium-density spray foam is a good choice for insulating crawl spaces. In this solution, a vapor barrier is installed on the crawlspace walls, and the walls (not the ceiling) are insulated. Similar to an unvented (conditioned) attic, having an insulated crawlspace provides an indirectly conditioned space for HVAC equipment and ducting. It also protects pipes from freezing. The superior air sealing and water resistant properties of spray foam ensure a clean, airtight crawlspace that prevents the condensation and moisture intrusion that can support mold growth. Low-density spray foam can also be used on crawl space walls to provide air sealing and insulation in areas where vapor control is not required. In addition to saving energy, this solution can also improve indoor air quality in occupied spaces above.

In addition to its outstanding thermal and air sealing properties, spray foam insulation also can be an important part of the fire-prevention strategy. However, in order to successfully use spray foam in this capacity, it is important to understand the difference between thermal barriers and ignition barriers. This section will discuss fire ratings for insulation, fire resistance standards such as NFPA 285, and considerations when specifying spray foam insulation.

Fire Code Requirements

- All foam plastic insulation products including rigid board and spray foam are classified as combustible materials.
- However, rigid foam board and spray foam insulation are commonly permitted within noncombustible assemblies once fire and safety code requirements have been met.

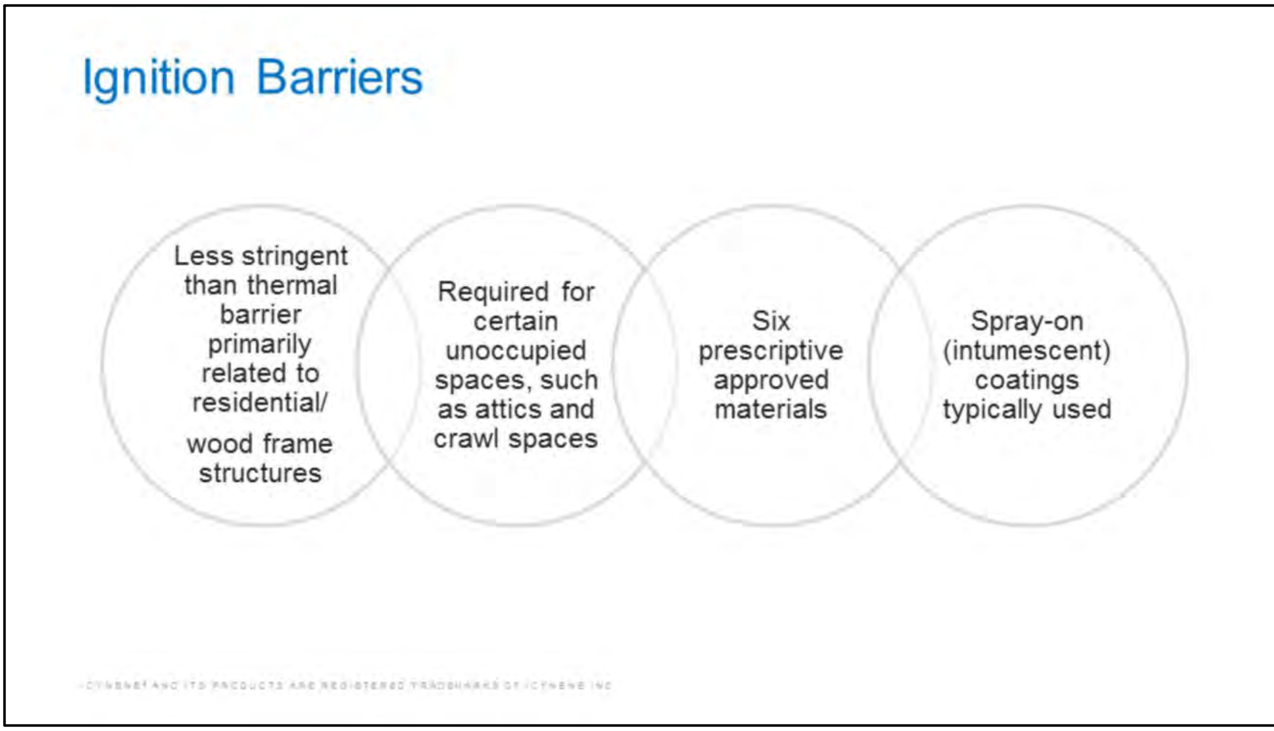
Both rigid foam boards and spray foam are considered combustible materials. However, they are permitted in noncombustible assemblies provided that fire-resistance related requirements in the building code are met. This means that the insulation must be protected and isolated with an appropriate thermal barrier, such as gypsum board, concrete, or masonry. The material also must meet specific fire safety code requirements for surface burning. The thermal barrier and less-stringent ignition barrier requirements are applicable for both commercial and residential buildings as outlined in their respective codes.

Fire Code Requirements

- NFPA 285 required for non-load bearing assemblies with foam plastics
- ASTM E119 (UL 263) required for fire resistance rating

Exterior non-load bearing walls in certain commercial buildings that include spray foam or rigid foam board must comply with the NFPA 285 test standard (as per IBC 2603.5.5: Fire Propagation). If an assembly is required to have a fire-resistance rating, data or engineering judgements based on ASTM E119 or UL 263 test results are required (as per IBC 2603.5.1: Fire-resistance-rated section).

Building code requires all spray foam insulation, as well as rigid foam board, to be covered (separated from the building interior) by an approved thermal barrier. Gypsum wallboard, which is often installed on perimeter walls and as the ceiling in an interior finish area, is the most common thermal barrier. It also qualifies as a prescriptive thermal barrier, meaning it can be installed over any spray foam product. Other thermal barrier options include spray-on (intumescent) coatings. This option must be officially fire tested as a thermal barrier over the specific spray foam insulation product installed. Wood panel products are accepted as a prescriptive thermal barrier in floor constructions. In addition, the 2015 IRC recognizes ¾-inch nominal thick wood product panels a prescriptive thermal barrier, similar to ½-inch drywall.

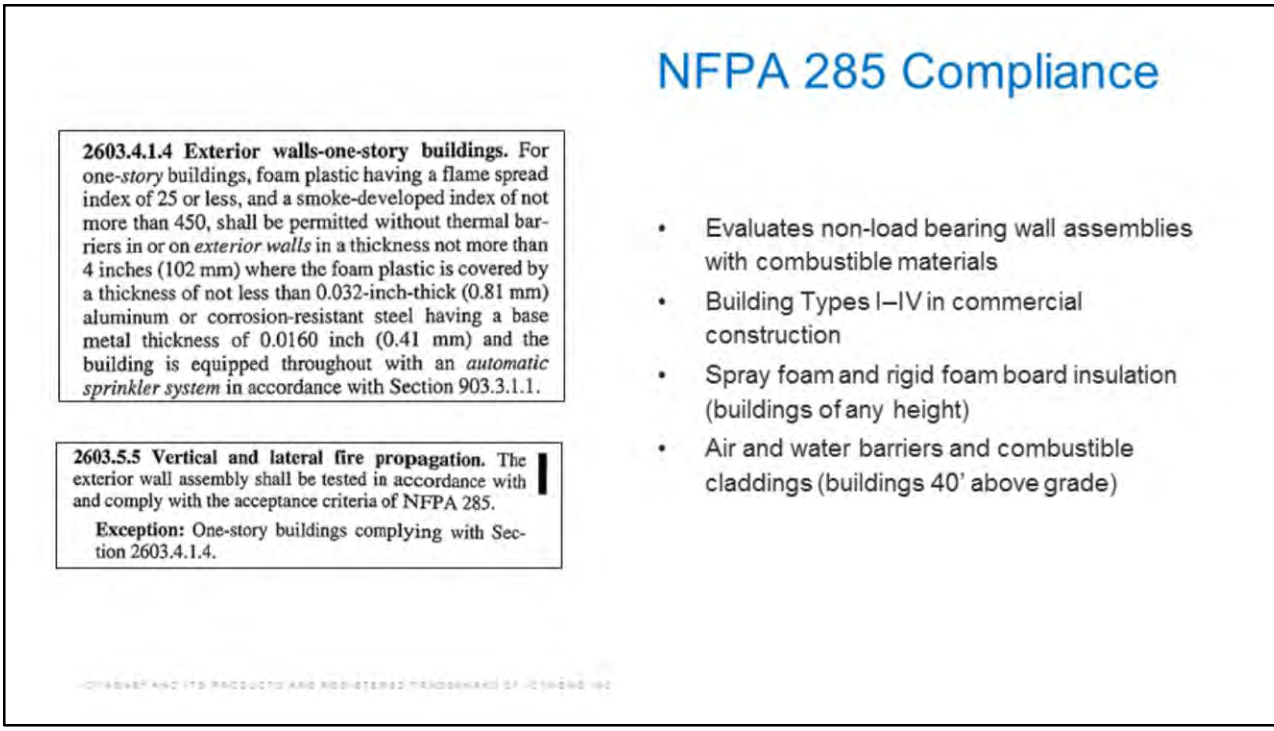


An ignition barrier is a less stringent requirement than a thermal barrier. Ignition barriers are required in limited-access spaces: unoccupied spaces that can be accessed but are not used for storage or living space, such as crawlspaces and attics. The IBC defines an ignition barrier as one of the following materials: 1.5-inch mineral fiber insulation; quarter-inch wood structural panels, particleboard or hardboard; 3/8-inch gypsum board; or 0.016-inch corrosion-resistant steel. In addition, spray-on (intumescent) coatings are often used as an ignition barrier (non-prescritive). They need to be officially fire tested as an ignition barrier coating over the specific spray foam insulation product installed.

Surface Burning Characteristics

- Class B (required): SRI ≤ 75; SDI ≤ 450
- Class A (optional): SRI ≤ 25; SDI ≤ 450

Code requires foam plastics to qualify as Class B materials, as validated by ASTM E84 (UL 723); Class A rating is optional. This means that the material has been tested against reference materials and found to have a flame spread index (SRI) of no more than 75 and a smoke developed index (SDI) of no more than 450 (the SRI for Class A materials is 25 or less.) Consult the third-party evaluation service report for the spray foam product to determine its surface burning characteristics; most have a Class A rating.

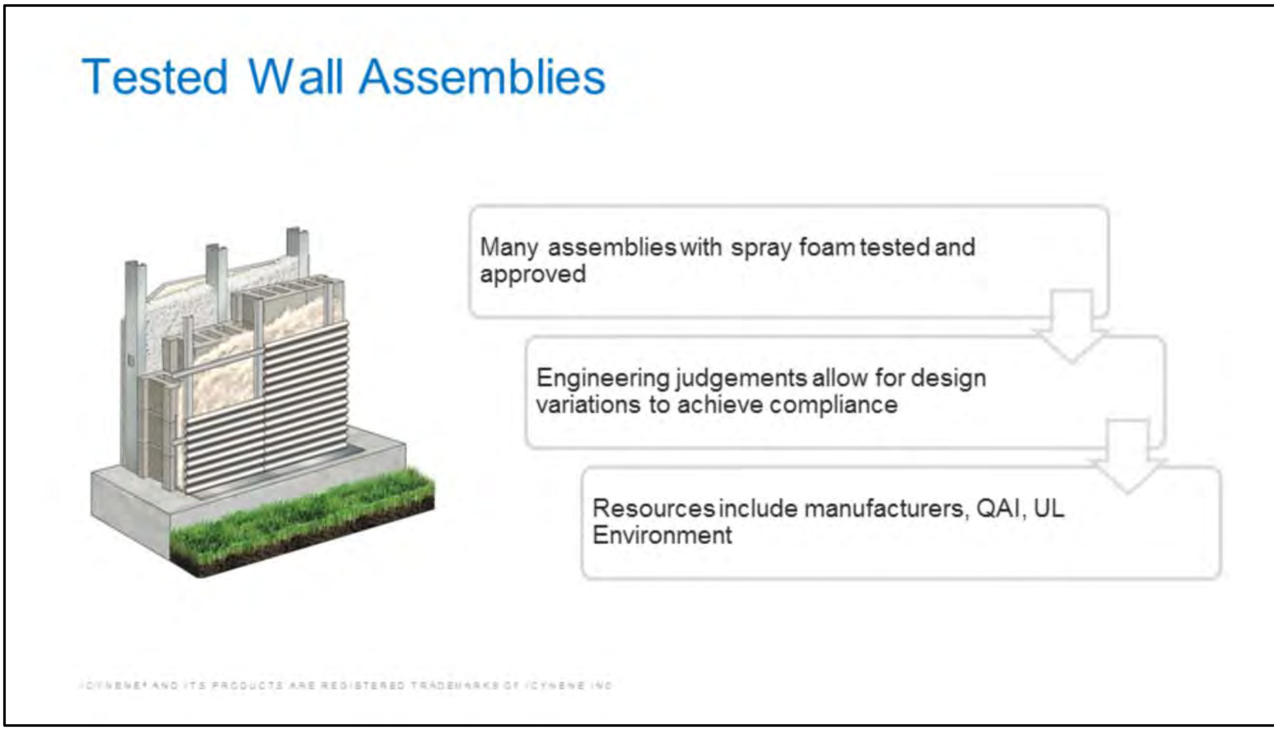


NFPA 285 is a standardized fire test procedure used to evaluate the suitability of exterior, non-load bearing wall assemblies that are constructed with combustible materials. Assemblies that must be tested include buildings of any height that incorporate foam insulation (spray foam and rigid board), except for Type V constructions and buildings taller than 40 feet above grade, which include air and water barriers and combustible claddings, such as exterior insulation finish systems (EIFS), metal composite materials (MCM), fiber-reinforced plastic (FRP), and high-pressure laminates (HPL).

NFPA 285 Test

- Whole wall assembly is tested
- Passing criteria
  - Flames should not propagate to second story
  - Temperatures should not exceed 1, 000 degrees Fahrenheit

The NFPA 285 test evaluates how well exterior assemblies, as opposed to individual components, propagate fire. For the test, a mockup of a two-story building is constructed. One burner is placed in the first-floor room; a second is placed in a first-floor window opening. To pass, the wall assembly cannot allow flames to propagate to the second-story room, and none of the thermocouples placed throughout the assembly can exceed 1, 000 degrees Fahrenheit for the full 35 minutes of the test. Testing is evaluated through both observations and temperature readings.



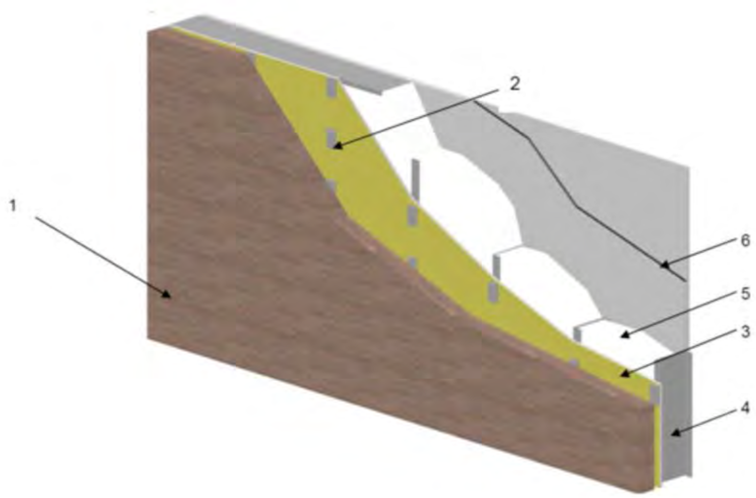
Several manufacturers have tested and evaluated many fire resistant assemblies that include closed- and open-cell spray foam. Some examples of NFPA 285-compliant walls include spray foam used as exterior continuous insulation, spray foam used as interior continuous insulation, and spray foam used as exterior continuous insulation with spray foam within stud cavities. Code-acceptable engineering judgments based on the NFPA 285 test results allow for design variations to achieve compliance, otherwise compliant options would be very limited. Resources for tested assemblies include spray foam manufacturers and organizations such as Quality Assurance International, or QAI, and UL Environment.

ASTM E 119 Test

- Measures fire resistance of an assembly
- Specimen subjected to controlled flame until failure occurs

ASTM E 119: Standard Test Method for Fire Tests of Building Construction and Materials evaluates how long building elements can contain a fire and/or retain their structural integrity. An assembly or structural member is placed in a flat furnace in either the horizontal or vertical position. If the specimen is a load-bearing element, a specific load is imposed on it. The specimen is then subjected to a controlled flame introduced from one side of the assembly, simulating exposure conditions in the field. The temperature of the controlled flame is increased to a maximum along a specific time-temperature relationship that simulates a flashover condition.

ASTM E 119 Test



- Assemblies classified based on time expired before failure
- Several spray foam manufacturers have tested their products in fire-resistance assemblies

The assembly is classified based on time expired before failure. For example, a 1-hour fire-resistant wall assembly will withstand fire exposure for 1 hour before the structural integrity of the wall fails. Several spray foam manufacturers have tested their products in such fire-resistance assemblies, thereby allowing them to be used in a variety of assembly designs. Engineering judgements based on test results allow for design variations to achieve compliance.

Conclusion

ICYNENE®
The Evolution of Insulation

Thank you for your interest in the benefits of open- and closed-cell spray foam insulation.

This concludes the American Institute of Architects Continuing Education Systems Course.

Please visit www.icynene.com if you have any questions about the material presented here.

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