

Technical Bulletin

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No. 34: Spray Foam Insulation

In all cases, consult with the spray foam manufacturer, project architect, engineer, and building code official. ICAA Technical Bulletins are provided for informational purposes only. ICAA and its members are not responsible for loss or damage caused by errors or omissions or any other cause.

SCOPE

This bulletin provides an overview of spray foam insulation, industry standards, typical characteristics, and product applications.

INTRODUCTION

Spray foam insulation is designed for use in residential, commercial, and industrial applications to insulate and air seal the building envelope. Other benefits include control of moisture and reduction of noise. See graphics Wall Assembly For ASTM E90 - STC Testing.

There are two main types of spray foam insulation:

- Low-density (1/2 lb.) spray foam
- Medium-density (2 lb.) spray foam

The common systems offered today comprise an "A" side consisting of a mixture of methylene diphenyl diisocyanate (MDI) and polymeric MDI (PMDI) and a "B" side consisting of a blend of a polyol, a catalyst, blowing agent, flame retardant, and surfactant.

The chemicals are heated and pressurized prior to and during application. When the chemicals are discharged from the spray gun, they become a reacting mixture of the A- and B-side components.

Low-Density Spray Foam Insulation

This material expands up to 100 times or more its original volume to form a semi-rigid non-structural foam plastic. R-values range from 3.5 to 4.5 per inch but most are within 3.5 to 3.7 per inch.

Medium-Density Spray Foam Insulation

This material expands about 35 - 50 times its original volume to form a rigid foam plastic. Initial R-values may be more than R 7.2 per inch for HFC-blown foams and R 5 per inch for water-blown foams. All manufacturers report aged R-values which are more representative of the long-term thermal performance. These range from R 6.2 to R 6.8 per inch for HFC-blown foams.

APPLICATION OF SPRAY FOAM

Spray foam insulation can be applied to a variety of substrates including wood, concrete, foam sheathing, and metal. The substrate should be sufficiently clean

and dry per manufacturer specifications and within a given temperature range for proper application. Check with manufacturer to determine proper application requirements. Also check with manufacturer specifications to determine the maximum thickness permitted.

Moisture-Laden Substrates

Generally, spray foam manufacturers recommend that the product be applied to a relatively dry substrate free of excessive dust and dirt. Check with manufacturer.

Cold Substrates

Spray foam insulation manufacturers have indicated that it can take 20% - 40% more foam material to cover the same area when the surface area of the substrate is cold. Adhesion limitations may also exist within certain foam systems at colder ambient and substrate temperatures. Check with the manufacturer to determine application temperature limits.

Underside of Roof Decks

Spray foam insulation may be applied to the underside of a roof deck in an unvented attic, cathedral ceiling or to a flat roof area, when qualified as an air-impermeable insulation. This application is now approved by the 2006 International Code Council (International Residential Code, Section R806.4). See graphics Cathedralized Attic Detail and Cathedralized Roof Detail. Spray foam insulation has been applied to the underside of roof decks for more than forty years.

New Construction: When insulating the underside of the roof deck, insulation is not permitted on the attic floor (ceiling).

Retrofit: In retrofits, floor (ceiling) insulation should be removed for optimal performance.

Codes require removal of vapor retarder on ceiling below for unvented attics.

When heat-producing appliances are present, combustion air must be provided according to the International Mechanical Code, Section 701 and 703.

Masking & Trimming

Insulators should have an overspray plan for each job that includes masking or moving items in the immediate vicinity of the application that might get oversprayed.

High Altitudes

Consult with manufacturer for high altitude application recommendations.

SAFETY & HEALTH

There is no evidence that installed spray foam insulation contributes to poor indoor air quality.

Follow the manufacturers' MSDSs and implement a respiratory protection program.

CODES & STANDARDS

Ask for test data and code body approvals, listings, or other written indications of acceptability under the code to be sure that the products selected offer the fire protection that the code demands.

Spray foam insulation is formulated with flame retardants and tested pursuant to *ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials* and *ASTM C 1029 Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation*.

Evaluation Service Reports

The ICC-ES (International Code Council Evaluation Service) evaluates test data from an approved laboratory to determine code compliance. Many spray foam insulation manufacturers have an Evaluation Service Report for their products.

Ignition Barrier in Attics and Crawlspaces

International Residential Code (IRC) 2006, Section R314, Paragraph R314.5.3 Attics and Crawlspaces states "Within attics and crawlspaces where entry is made only for service of utilities, foam plastics shall be protected against ignition by 1.5-inch-thick (38mm) mineral fiber insulation, 0.25-inch-thick (6.4mm) wood structural panels, 0.375 inch (9.5mm) particleboard, 0.25 inch (6.4mm) hardboard, 0.375 inch (9.5mm) gypsum board, or corrosion-resistant steel having a base metal thickness of 0.016 inch (0.406mm)."

"The (prescriptive) ignition barrier is not required where the foam insulation (and/or protective coating) has been tested in accordance with the requirements of ICC-ES AC 377 Acceptance Criteria for Spray-Applied Foam Plastic Insulation, or as identified by IRC Section R314.6."

Check with your spray foam insulation manufacturer to determine if there is an exception to the ignition barrier requirement for attics and crawlspaces in which entry is made only for the service of utilities.

Thermal Barrier in Attics and Crawlspaces

When attic and crawlspaces have uses other than just for access to utilities (i.e. storage), the 15-minute thermal barrier is required to protect all spray foam insulation unless testing has been identified by IRC Section R314.6.

Clearance from Hot Surfaces

Keep spray foam insulation at least three inches away from hot surfaces, such as chimneys, recessed light fixtures (including IC-rated fixtures), and heated flue pipes. Follow material manufacturers' recommendations for application to recessed light fixtures.

VAPOR RETARDER REQUIREMENTS

Low-density spray foam insulation has a perm rating of approximately 6 - 16 perms per 3" thickness of material. Because it does not meet the code-required vapor retarder in some climate zones, an additional material should be utilized. See graphic Vapor Retarder Location, In the Wall Assemblies Where Required.

Medium-density spray foam insulation has a perm rating of approximately 1.0 or less based on a minimum thickness of 2" which will meet the code-defined vapor retarder requirement. Check manufacturer's data sheets for vapor retarder performance by specific product.

No vapor retarders are allowed on the attic floor (ceiling) in an unvented attic assembly.

Climate Zones 5, 6, 7, 8

The 2007 Supplement to the 2006 IRC requires the use of a vapor retarder on the underside of the insulation or the spray foam must inherently perform as a vapor retarder. A vapor retarder paint can be sprayed on the underside of the spray foam insulation to meet the code requirements in unvented attic applications.

In walls with open-cell foams, a vapor retarder paint can be applied to the gypsum board, or a film-type vapor retarder can be used behind the gypsum board. Most closed-cell foams meet the code-prescribed

vapor retarder requirement when sprayed to a thickness of 2" or more (depending on the manufacturers' specifications) and do not need a separate vapor retarder.

Check with the spray foam manufacturer for required minimum thickness of the spray foam insulation layer to ensure condensation control.

Climate Zones 1, 2, 3, 4

In hot humid climates, vapor should be prevented from entering the sheathing and the insulation below.

In all cases, check with local code and your spray foam manufacturer to determine air barrier/vapor retarder requirements for the specific product you are spraying.