

Inside ICC

ICC Evaluation Service (ICC-ES)

ICC-ES Acceptance Criteria Drives Greater Building Code Acceptance for Spray-Applied Foam Plastic Insulations

By ICC-ES Staff



Application of SPF to the underside of sloped roof rafters.

Over the past decade, the use of spray-applied polyurethane foam insulation has mushroomed for new construction, renovations and weatherization projects. Scores of different manufacturers vie for recognition in an ever-expanding market category, demanding new and better products. New formula-

tions are being continually submitted to independent laboratories for testing in hopes of achieving a wide range of performance characteristics, such as easier application, improved flammability resistance, air and moisture barrier and thermal resistance (*R*-values).



AC377 – Primary Tool for Evaluation of SPFs

Spray-applied foam plastic insulations have become an indispensable tool for contractors and are being specified more than ever before in building plans. For officials across the country responsible for building code enforcement, the ICC Evaluation Service (ICC-ES) Acceptance Criteria for Spray-Applied Foam Plastic Insulation (AC377) has become an equally indispensable tool to verify that a new insulation complies with building code requirements. Essentially, AC377 contains all requirements to demonstrate the code compliance of spray-foam plastic insulation. The criteria also establish all physical property tests of low-density, medium-density, roofing and sealing foams.

Known in the trades as “SPF,” spray-applied polyurethane foam insulation is a two-component reactive system that is actually mixed at the spray nozzle. It goes on as a thin liquid that immediately expands to many times its original size and cures to a stable, solid state. Thoroughly trained installers are critical to achieving proper application of commercial-grade, high-pressure, two-component spray-foam polyure-

thanes, while most anyone can properly apply the low-pressure, aerosol can products after reading the directions.

SPFs are Used More and More in Buildings

In building applications, this versatile material can be adjusted to handle many residential, commercial and industrial jobs – to insulate attics, crawl spaces and the cavities of walls and ceilings. Additionally, higher-density SPF roofing insulations can be used in coated foam roofing applications. ICC-ES has also issued evaluation reports where SPF insulations are used for purposes not specifically addressed in AC377, such as filling cracks and voids in construction and maintaining the integrity of penetrations of wood fireblocking. Because it completely fills in gaps, SPF insulation can be used to seal the perimeter around window and doorframes, provide thermal resistance (*R*-values) and serve as an air-impermeable insulation when qualified for use in unvented attic assemblies.

Verification of Code Compliance Facilitated Through AC377

“AC377, and code-specified standards, provide a means for SPF insulations to be recognized in an ICC-ES evaluation report,” said Chris Allen, a licensed mechanical engineer and Senior Staff Engineer at ICC-ES.

Dr. Rick Duncan, Technical Director for the Spray Polyurethane Foam Alliance (SPFA), went further: “Evaluation Service Reports, written using the guidelines established in AC377, level the playing field for all SPF suppliers, by assuring that all products are uniformly evaluated using the same set of performance criteria. In comparison to product data sheets, test reports and marketing literature, the reports present the information in a more consistent manner. This allows design professionals to create data-driven specifications and enables code officials to assess easily each product for code compliance.

“The continued evolution of AC377 is achieved by a great working relationship between SPFA and ICC-ES staff,” Dr. Duncan added. “SPFA has a standing subcommittee consisting of SPF industry experts that meets regularly to develop proposed improvements

to AC377 based on industry consensus. These proposed changes are submitted to ICC-ES staff and are reviewed and approved by the ICC-ES Committee on a regular basis.”

Michael Beaton, Senior Vice President of ICC Evaluation Service, recently commented on the growing use of SPF without a traditional ignition barrier like plywood.

“AC377 has new test protocols that are based on the documented performance of code compliant assemblies and establish a credible standard for flammability performance of SPF installed in attic and crawl space applications,” Beaton said.

SPFs as Elements of Energy Conservation

A major factor spurring the growing use of SPF is increased attention to energy conservation, spurred by national policies to reduce dependence on imported oil and the general rise in electric costs from all forms of energy generation.

Today, energy conservation and building energy efficiency are hot-button topics with government officials, real estate developers, landlords, architects, the building trades and especially homeowners. The U.S. Department of Energy (DOE) has long recognized the value of conserving BTUs. For example, through its Weatherization Assistance Program (WAP), over 6.4 million low-income households have been able to reduce their energy bills by an annual average of approximately \$437. State governments working with electric and gas utilities have followed DOE’s lead and have mounted ambitious weatherization programs to conserve energy across the country. SPF, used as building envelope insulation and an air seal, has played a major role in these energy conservation initiatives.

That is why receiving an ICC-ES evaluation report under AC377 is a critical milestone in the development and commercialization of any new spray-foam insulation product. The ICC-ES evaluation report is a valuable source of information for code officials who must enforce building regulations.

“By having all this information condensed into an ICC-ES evaluation report, code officials can verify compliance with applicable requirements without having to review lengthy test reports and quality control documentation,” said Allen. “That’s important because resolving questions and concerns of code officials takes time and causes delays in building projects where multiple trades must coordinate schedules to ensure on time completion dates.”

Since 2007, over 40 individual products from a number of manufacturers have met the AC377 acceptance criteria, and each was issued an ICC-ES evaluation report (see sidebar, page 5). Other new products are currently undergoing evaluation. “I have been evaluating polyurethane foam products for over five years and have been using AC377 for the last three. I believe that the ICC-ES code review is the most comprehensive and consistent in the building products industry today for spray-foam polyurethane,” said Si Farvardin, ICC-ES Senior Evaluation Specialist. “We continue to improve AC377, with the most recent hearings occurring in October 2010.”

Development History of AC377

The first version of AC377 was issued in October 2007 to address issues specific to spray-applied polyurethane foam plastic insulations. "The time had come where SPF needed to separate itself from board type insulations and deal with issues that were particular to that industry segment," said Allen. "Particular emphasis was placed on ensuring that performance requirements were consistent for the two product types. ICC-ES has been issuing reports for foam plastic insulation products since April 1980. The newest version of AC377 was approved in October 2010."

An AC377 evaluation reflects a thorough review process confirming that a product meets, or is equivalent to, the requirements of the code. The procedure for obtaining an ICC-ES evaluation report under AC377 is a detailed one that should begin during the manufacturer's product development phase.

AC377 compliance is one of the benchmarks used for all new SPF product testing. During the testing phase, care must be taken to establish traceability to the formulation, so subsequent production can be compared. Sampling of products must be done by

the testing laboratory, and all tests used to qualify the products must be performed by, or under the supervision of, an accredited testing laboratory, such as those accredited by the International Accreditation Service, a subsidiary of the International Code Council (ICC).

Research and Testing for Code Compliance

Typically, research and development testing is done on a new product to see if it can meet AC377 requirements *before* the product is submitted to an accredited test laboratory. However, even before the product goes to the laboratory for testing, a representative of an independent testing or inspection agency must visit the manufacturer to witness the formulation of the polyurethane components and sample test specimens. The list of ingredients in the initial formulation is maintained throughout the testing phase and during the AC377 evaluation, and is thereafter reviewed quarterly to assure product quality.

"We don't need to review the SPF manufacturer's proprietary formula," said Allen, "but we do need veri-

fication from the testing or inspection agency that the test specimens were sampled at the factory and that they are representative of current and future production. Future production of the SPF insulation is then verified through a quality assurance program with follow-up inspections conducted by an accredited inspection agency."

The ICC-ES technical staff, in cooperation with report applicants and other interested parties, including the SPFA, originally developed acceptance criteria for SPFs. The ICC-ES Evaluation Committee, an appointed body comprised of code officials, normally develops Acceptance Criteria through open public hearings. Acceptance Criteria are living documents with regular reviews and revisions to keep up with changing technology, better science and changes in the model building codes.

Code Officials, Building Industry Derive Benefits from ICC-ES Reports

The benefit to manufacturers is that, after reading a few pages of an ICC-ES report, everyone – code officials, contract installers and property owners – will



know exactly how a particular product complies with the requirements of building codes. Of course, the manufacturer could provide a multiplicity of inspection documents and test reports to individual jurisdictions. But this would be a cumbersome and confusing process, especially to those without the time or expertise to evaluate the various, complex test standards that apply to spray-applied foam plastics.

While a structure is being designed and planned, architects, builders and contractors can easily refer to an ICC-ES evaluation report to determine if ICC-ES recognizes a specific spray-applied polyurethane as complying with code for the intended use.

You can easily reference or download the ICC-ES Acceptance Criteria for Spray-Applied Foam Plastic Insulation by [clicking here](#). Currently, you can access 44 ICC-ES evaluation reports for spray-applied foam plastic products at the [ICC Evaluation Service website](#). Just go to the site and type in the manufacturer's name, the product brand name or the evaluation report number, in the applicable search box, to access an individual PDF file.

An ICC-ES evaluation report contains a wealth of product information – from the manufacturer's contact information to the scope of evaluation for code compliance, and from surface-burning characteristics to *R*-values.

ICC-ES evaluation reports provide confidence that a product has been thoroughly evaluated for code compliance. Also, if a code official or installer has a question about AC377, they can always consult with ICC-ES for expert clarification. **bsj**

Free Download of Energy Code Available

ICC has been awarded federal funding to provide the 2009 International Energy Conservation Code as part of an initiative to meet nationwide energy-efficiency goals through the Building Technologies Program and the American Recovery and Reinvestment Act. Get yours today – [click here!](#)

This article is intended to provide information about the ICC Evaluation Service's Acceptance Criteria on Spray-Applied Foam Plastic Insulation (AC377). It should not be construed as an endorsement or procedural recommendation by ICC-ES.

[Click here](#) for ICC-ES Products Evaluated In Accordance with Acceptance Criteria for Spray-Applied Plastic Foam Insulation (AC377).