

? Ask the Expert

By Roger V. Morrison, P.E., R.R.C.

Evaluation Reports, Acceptance Criteria, and the Building Code

The Problem

You've just sprayed five inches of closed-cell spray foam onto the underside of a residential roof deck, coated it with an approved ignition barrier coating, and ensured that the ceiling – or attic floor – was a gypsum board thermal barrier. After all that, the building inspector tells you that the foam is not allowed in this community and that you must tear it out. Now what do you do?

With the surging growth of spray polyurethane foam (SPF) insulation in the residential market, spray foam professionals are running into building code issues more and more frequently. Many building inspectors are seeing SPF for the first time. Others are seeing SPF applied more often and in greater thicknesses and in different places – such as unvented attics – than they're used to. Questions are bound to arise, and those of you who don't have the right answers may be forced to proceed at your own peril.

The building code – a series of complicated documents, sometimes contradictory, and always open to interpretation – may create conflicts between SPF contractors and building officials due to ignorance, misunderstandings, or misinterpretations. Understandably, building officials' primary concern is life safety, but when it comes to SPF, many are simply unfamiliar with the nuances of the building code.

In the case of the spray foam in the attic, the building inspector must determine if the materials and the method of installation comply with the requirements of the building code. To do this, the building inspector may have to reference multiple sections or multiple codes. For a product like spray foam, which may be a complete novelty to him, this can be a daunting task.

You're in luck! There is an easier way: An Evaluation Report.

ICC, ICC-ES, and Evaluation Reports

An Evaluation Report is a document prepared by building code experts that states how construction products, materials, components, and methods can be used and installed in a manner consistent with the building code. An Evaluation Report is of high value to building officials and designers; it saves those individuals the time and effort they would normally expend to verify code compliance.

The International Code Council (ICC) writes the most commonly used set of model building codes, often referred to collectively as the "I Codes." The codes most referenced by the spray foam industry are the International Building Code (IBC), which governs commercial construction; the International



Residential Code (IRC), which governs residential construction; and the International Energy Conservation Code (IECC), which governs energy conservation. When the I Codes are adopted by a local municipality or other jurisdiction, they acquire the force of law.

Operating as an independent subsidiary corporation to ICC is the ICC Evaluation Service (ICC-ES), which supplies the Evaluation Report. On its Web site – www.icc-es.org – the organization describes itself as “a non-profit, public-benefit corporation that does technical evaluation of building products, components, methods, and materials. The evaluation process culminates with the issuance of technical reports that, because they directly address the issue of code compliance, are extremely useful to both regulatory agencies and building-product manufacturers.”

With its own Board of Directors and procedures, ICC-ES operates independently from ICC. Its technical staff of highly trained evaluation specialists – most of whom are architects or engineers – is key to the operation of ICC-ES.

Evaluation Reports typically provide the following information specific to the SPF industry:

- 1. Code Compliance:** Each report is based on compliance with specific editions of building codes. For example, if a product's evaluation has been based on the 2003 IBC and the 2003 IRC, this report makes no representations regarding the 2006 codes.
- 2. Maximum SPF Thickness:** Evaluation Reports will state the maximum thickness at which a spray foam may be applied. This thickness will depend on the results found in accordance to ASTM E 84 and other appropriate testing.
- 3. Thermal Resistance (R-Values):** Older Evaluation Reports state the R-value at one-inch thickness and, perhaps, at other thicknesses. Newer Evaluation Reports require listing R-values at one-inch, at the maximum thicknesses listed in the report, and at representative thicknesses in between.
- 4. Thermal Barriers:** Reports will reiterate the requirements for thermal barriers (most commonly a 1/2-inch-thick gypsum wallboard) as required by the building codes.
- 5. Vapor Retarder:** If the SPF qualifies as a vapor retarder, the report will so state and under what conditions – thickness and density. If the SPF does not qualify as a vapor retarder, the report will state that a vapor retarder shall be installed as required by the applicable code.
- 6. Alternative Constructions:** Constructions and application techniques that may not be clearly spelled out in the building code can be described in Evaluation Reports. Examples include unvented attics, alternate thermal and ignition barriers, and fire-resistance-rated constructions.
- 7. Conditions of Use:** Evaluation Reports require that SPF systems be installed by contractors certified by the report owner. Other conditions might include use of thermal barriers, weather protection, job-site labeling, and types of construction.
- 8. Quality Assurance:** ICC-ES requires that Evaluation Report owners develop and follow a Quality Control Program. This involves witnessing sample preparations and conducting periodic inspections of production. The QC Program assures that the product being manufactured is the same as what was evaluated in the report.

To obtain an Evaluation Report, the manufacturer usually applies to the ICC-ES. He or she submits appropriate fees and supporting technical information for the application. The ICC-ES staff evaluates the application and supporting information. They compare the information submitted with the requirements of the building codes and/or the appropriate Acceptance Criteria. ICC-ES then issues an Evaluation Report describing the manufacturer's product – which may

include the methods, components, and materials – and how this may be used in a manner consistent with the intent of the building code. These reports are available free of charge from ICC-ES on its Web site: www.icc-es.org.

Acceptance Criteria

The building codes – as comprehensive as they try to make them – cannot possibly include all of the details needed to evaluate a product as complex as SPF. To provide guidance and consistency, ICC-ES developed Acceptance Criteria (AC) for specific products. For SPF, ICC-ES has developed AC 377 Acceptance Criteria for Spray-Applied Foam Plastic Insulation. You can see it at www.icc-es.org/criteria/pdf_files/ac377.pdf.

AC 377 was approved by the ICC-ES Committee in October 2007 with an effective date of March 1, 2008. Prior to the development of AC 377, spray polyurethane foam was included in AC 12 Acceptance Criteria for Foam Plastic Insulation. Many recognized that AC 12, which included all types of foam plastic insulation, was confusing and cumbersome to use. It was difficult to determine which elements in AC 12 governed all foam plastic insulation and which governed only board or spray insulation. The development of AC 377 represented a major simplification and a major step forward for the SPF industry.

AC 377 recognizes different types and uses of SPF and categorizes them accordingly. The physical properties that AC 377 requires are listed in Table 1 on the opposite page.

Acceptance Criteria were developed by ICC-ES for use during the evaluation process. These criteria help ensure that Evaluation Reports within the same industry maintain consistency. This, in turn, simplifies the task of local building officials and designers when they compare Evaluation Reports from different manufacturers.

Occasionally, a particular evaluation may require the review of more than one AC. For example, if a manufacturer is producing structural insulated panels (SIPs) using a spray foam as the insulation material, ICC-ES may require that he or she meet the requirements of AC 377 and Acceptance Criteria for Sandwich Panels (AC 04).

The ICC-ES staff and committee have been very receptive to the spray foam industry when updates to the AC were needed to accommodate new technologies, such as blowing agent changes. Having AC 377 – specifically for SPF – will further simplify this process.

The Solution

After the building inspector has told you to tear the SPF out of the attic, offer him an Evaluation Report. Hopefully, his tone will soften, and your credibility will increase a notch or two. **SF**

- **Evaluation Reports**, which have been issued by ICC-ES, are labeled as "ES Reports" and are designated by the letters "ESR" followed by a number (for example, ESR-0000).
- **Legacy Reports** are reports that were issued under one of the three model building code evaluation services that merged into ICC-ES in 2003. Legacy Reports are identified as "ES Legacy Reports" and are designated by letters indicating the evaluation service that originated the report (for example, NER-0000).
- Evaluation Reports have **issue dates** and may have an expiration date or a re-examination date. The only way to be sure a report is current is to check ICC-ES's Web site. If the report is posted there, it is current.

TABLE 1: AC 377 PHYSICAL PROPERTY REQUIREMENTS

APPLICATION	TESTS REQUIRED	VALUE	
Low-density insulation (nominal core density 0.5 - 1.0 pcf)	Thermal Resistance at 75°F mean temperature. One of the three test methods listed below shall be used: ASTM C 177 ASTM C 236 ASTM C 518	As reported	
	Core Density: ASTM D 1622	As reported	
	Tensile Strength: ASTM D 1623 Note: Closed cell content shall be determined in accordance with ASTM D 2856	Minimum closed cell content of 90%	5 lbf/in ² , minimum
		Closed cell content less than 90%	3 lbf/in ² , minimum
	Dimensional Stability: ASTM D 2126		15% maximum total change
	Surface Burning Characteristics: IBC—ASTM E 84 or UL 723 UBC Standard 8-1		75 flame-spread index or less, 450 smoke-developed index or less
Medium density insulation (nominal core density 1.5 - 3.0 pcf)	Thermal Resistance at 75°F (24°C) mean temperature. One of the three test methods listed below shall be used: ASTM C 177 ASTM C 236 ASTM C 518	As reported	
	Core Density: ASTM D 1622	As reported	
	Tensile Strength: ASTM D 1623		15 lbf/in ² , minimum
	Dimensional Stability: ASTM D 2126		15% maximum total change
	Surface Burning Characteristics: IBC—ASTM E 84 or UL 723 UBC Standard 8-1		75 flame-spread index or less, 450 smoke-developed index or less
	Compressive Strength: ASTM D 1621		15 lbf/in ² , minimum
Roofing (nominal core density 2.5 - 3.0 pcf)	Core Density: ASTM D 1622	As reported	
	Tensile Strength: ASTM D 1623		40 lbf/in ² , minimum
	Dimensional Stability: ASTM D 2126		15% maximum total change
	Surface Burning Characteristics: ASTM E 84 or UL 723 UBC Standard 8-1		75 flame-spread index or less
	Compressive Strength: ASTM D 1621		40 lbf/in ² , minimum
Sealant (nominal core density 0.5 - 1.0 pcf)	Core Density: ASTM D 1622	As reported	
	Surface Burning Characteristics: IBC—ASTM E 84 or UL 723 UBC Standard 8-1		75 flame-spread index or less, 450 smoke-developed index or less
	Adhesion: ASTM D 1623		5 lbf/in ² , minimum