AC12-0508-R1 5

Polyisocyanurate Insulation Manufacturers Association

May 14, 2008

Mr. Michael Beaton
ICC Evaluation Services Inc.
5360 Workman Mill Road
Whittier, CA 90601

RE: Proposed Revisions to the Acceptance Criteria for Foam Plastic Insulation, Subject AC12-0508-R1 (MB/MO)

Dear Mike,

On behalf of the Polyisocyanurate Insulation Manufacturers Association (PIMA), I would like to thank you and the ICC ES Committee for the opportunity to provide these comments on the proposed revisions to AC 12.

I have listed below the proposed revisions with the PIMA position for each:

1. Delete requirements, including Table 1, for spray-applied polyurethane foam plastic insulation, which is now covered in AC 377.
   PIMA Position: While PIMA continues to object to the establishment of a separate Acceptance Criteria for Spray-Applied Foam Plastic Insulation (AC 377), we agree with the deletion of Table 1. We would also point out that Section 6.3 of AC 12 should also be deleted as it applies only to spray-applied insulation. With this deletion the rest of the section will need to be re-numbered.

2. Delete Section 3.3.2, which is now covered in ICC ES AC for Stay-in-Place, Foam Plastic Insulating Concrete Form Systems for Solid Concrete Walls (AC 353).
   PIMA Position: PIMA agrees with this deletion as long as there is a pointer to AC 12 for the general foam plastic insulation requirements, especially those pertaining to fire test properties such as flame spread, smoke developed indices and tests for elimination of ignition barrier or thermal barrier as applicable.

3. Revise Section 4.5.11.5, Attics and Crawl Spaces
   a. For attics, Section 4.5.11.5.1 requires compliance with either the room corner tests of NFPA286, UL 1715, or UBC Standard 26-3 or with a comparative room corner test using the same three methodologies. The limitations of use are dependent on the method used.

      PIMA Position: PIMA agrees with the separation of fire test requirements for the attic and crawl space. For a more detailed discussion on the background of attic and crawl space fire tests for elimination of the ignition barrier, please refer to Attachment A of this submittal.

However, we disagree with the limitations of use as shown in the proposed revision to AC 12.

If a room corner test is conducted as described in proposed Section 4.11.5.1.2.1, then the limitations of 4.5.11.5.1.2.3.2 are applied. PIMA believes that no limitations, beyond those in applicable section of the IRC and the IBC and the room corner test report (maximum foam thickness and density), should be required. Our position is based on the fact that the room corner test, which is the most rigorous fire exposure, is used to allow exposed foam without a *thermal* barrier in many applications. Using the corner test to qualify elimination of the ignition barrier in an attic space should not have any limitations such as those proposed in Section 4.5.11.5.1.2.3.2. This section should be eliminated.

However, use of the comparative room corner to eliminate the ignition barrier in an attic space should continue to have limitations. We agree with the proposed limitations in 4.5.11.5.1.2.2.

b. For crawl spaces, Section 4.5.11.5.2 requires compliance with either the room corner tests of NFPA 286, UL 1715 or UBC Standard 26-3, or with a comparative crawl space test which is described in Appendix A. The test method is used with permission from Southwest Research Institute and is based on their Test Procedure 05-01. The limitations of use are dependent on the method used.

   PIMA Position: PIMA agrees with the separation of fire test requirements for the attic and crawl space. For a more detailed discussion on the background of attic and crawl space fire tests for elimination of the ignition barrier, please refer to Attachment A of this submittal. However, we disagree with the limitations of use as shown in the proposed revision to AC 12.

   Similar to the position stated above regarding attic spaces, if a room corner test is conducted as described in proposed Section 4.11.5.2.2.1, then the limitations of 4.5.11.5.2.2.3.2 are applied. PIMA believes, however, that no limitations, beyond those in applicable section of the IRC and the IBC and the room corner test report (maximum foam thickness and density), should be required. Our position is based on the fact that the room corner test, which is the most rigorous fire exposure, is used to allow exposed foam without a *thermal* barrier in many applications, such as basements. Using the corner test to qualify elimination of the ignition barrier in a crawl space should not have any limitations such as those proposed in Section 4.5.11.5.2.2.3.2. This section should be eliminated.

   However, we have two comments on the use of the comparative room corner to eliminate the ignition barrier in a crawl space:
   1. The test procedure itself should be part of both AC 12 and AC 377. Although it is noted in the ICC ES cover letter on this topic as Attachment A, it is not shown in AC 12 or AC 377. If it is left as is, there will continue to be confusion as to the construction of the baseline test and the test assembly. PIMA strongly suggests that the SWRI Test Procedure 05-01 should be incorporated in both AC 12 and AC 377. We are encouraged to see that the baseline assembly has been restored to a code-complying construction.
   2. Limitations as described in proposed section 4.5.11.5.2.2.2 should remain.

c. For attics, if any of the stated methods is followed, the proposal will allow recognition of exposed foam plastic insulation on floors for the same thickness of foam plastic insulation tested on the walls. [The tested assembly does not include foam plastic applied on the floor during the test.]
PIMA Position: PIMA agrees with this item.

d. For attics, comment is requested as to whether the room corner tests can be considered representative of attics with sloped roofs where the wall is less than 8 feet.
PIMA Position: Fire test science tells us that geometry of the test configuration has an effect on test results. However, because there is no data currently available, we agree that, as an interim solution, room corner tests should be used to qualify foam in attics without an ignition barrier, even if the application will be to a sloped ceiling. Industry should be working toward a better understanding of the issue, hopefully resulting in a modified room corner or a different fire test altogether.

   The qualification of test type to anticipated wall height is not practical. The foam manufacturer does not know, in advance, the height of the attic walls. Conversely, placing the responsibility on the contractor or building enforcement organization to determine what test is necessary for a product is to be used where is not acceptable. Attics often have more than one wall height – knee walls versus gable ends for example. Accepting the room corner test to qualify exposed foam in attics is the best solution at this time.

e. For both the attics and crawl spaces, the proposal does not include the following limitations of use that have typically been included in evaluation reports when the room corner test method is followed:
   i. There are no interconnected attic areas
   ii. Air in the attic is not circulated to other parts of the building

   Both conditions of use still apply when the comparative test method is followed.
PIMA Position: These two concepts are poorly understood. Definitions for each situation are necessary from the fire safety perspective. PIMA would welcome the opportunity to explore this item more fully at the ICC ES Committee meeting and with Staff.

We appreciate your kind consideration of these comments. Please contact me at Intech@tampabay.rr.com if you need additional information or have any questions.

Sincerely,

Lorraine Ross
Intech Consulting Inc.
For PIMA

Attachment A

Overview and History of Foam Plastic Insulation Fire Tests for Attics and Crawl Spaces

This briefing is intended to provide an overview of fire testing requirements for the use of foam plastic insulation use in attics and crawl spaces, along with qualifying fire tests that may be used to eliminate the thermal barrier, the ignition barrier or to test various foam plastic insulations with coatings.

Background

One of the first uses of foam insulation in the residential market was foam plastic boardstock, both PUR/PIR and polystyrene, used as exterior sheathing. In this application, the foam insulation, typically ½" – 1" thickness, replaced plywood or fiberboard. Many of the benefits included insulation of the wood framing, which could be up to 25% of the walls in the home.

Over time, a series of fires and the resulting FTC action[1] against the foam plastic industry led to the building code regulation of foam plastics in buildings. One of the first of these requirements was the separation of foam plastic from the interior of the building by the use of a thermal barrier such as ½" gypsum board. Investigation into the archives of FTC findings and ASTM Symposia on this subject highlighted that the thermal barrier idea was selected to protect the foam from ignition. Additionally, deficiencies of small scale tests to predict the "real world" fire experience prompted intense research into the development of large scale fire tests that could be used to evaluate foam plastic assemblies, or even exposed foam plastic applications, where the thermal barrier could be eliminated.

When foam insulating sheathing was used, the building codes in place at that time required a thermal barrier, usually ½" gypsum wall board on the inside of the framing. A concern about fire risk, where the foam insulation was exposed in the gable end[2] walls portion of the attic, soon emerged. A similar situation existed where the foam was installed as crawl space[3] insulation – on the underside of the floor joists. At that time foam insulation was not usually installed on the crawl space walls. Of course, neither of these areas was considered to be habitable, so the need for a thermal barrier was questioned.

The code community then turned to an assessment of the potential hazard of foam plastics in attics and crawl spaces and determined that ignition of the foam plastic could come from equipment in the attic in the form of heat generating appliances, small ignition sources, wiring, recessed lighting fixtures or maintenance activities. The codes then agreed that a thermal barrier was not necessary in cases where the entry into the attic was made *only* for service of utilities (since interpreted to mean no storage use of the attic), but an ignition barrier – a protective covering - would provide enough protection from ignition of the foam plastic. Later codes prescriptively described the materials that could be used as an ignition barrier:

[1] Federal Trade Commission, "Cellular Plastic Products, Disclosure of Combustion Characteristics in Marketing and Certification," Federal Register, Vol. 4, No.142, July 23, 1975, p.30842.
[2] Gable End Wall – the triangular end of an exterior wall above the eaves formed under a gable roof.
[3] Crawl Space – the space between the ground and the first floor of a home, usually no higher than 4 feet.

- 1-1/2” Mineral Fiber Insulation (not fiberglass insulation – mineral fiber has a much higher melting point ~ 2700 F)
- ¼” wood structural panel (plywood or OSB)
- 3/8” particleboard
- ¼” hardboard
- 3/8” gypsum wallboard
- 0.016 in corrosion resistant steel

It is important to remember that construction at the time for foam plastic insulation use in attics was basically limited to the gable end wall, representing a small percentage of the combined area of the attic walls, floors and underside of the roof deck AND the thickness of the foam insulation boardstock was generally ½” to 1”.

The same approach was applied to the crawl space where the foam insulation was applied to the underside of the floor joists. Once again, the foam boardstock was usually applied to the underside of the floor joists, or sometimes the crawl space walls, but not typically both.

It is also important to note that the neither the International Building Code (IBC) nor the International Residential Code (IRC) regulates type or form of foam insulation. IBC Chapter 26 and IRC Section R314 apply to *all* foam insulation products.

Although room corner tests were available, eventually, Southwest Research Institute (SWRI) developed a Crawl Space Evaluation Protocol (SWRI 99).

> “1.0 Scope
>
> The objective of this test is to evaluate the fire performance of insulation board materials when tested in a simulated crawl space module to determine if the insulation can be considered for use in attic or crawl space areas without a thermal barrier. The test provides a comparison of fire performance characteristics between un-insulated and insulated wood sub-floor assemblies.”

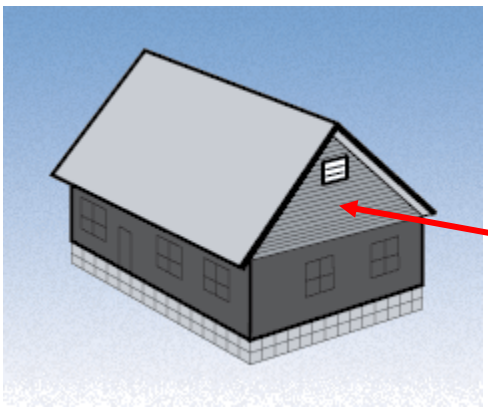
This comparative testing was accepted by ICBO Evaluation Services (ICC ES) and used by most of the foam plastic insulation board stock manufacturers to gain Evaluation Reports (ERs) allowing exposed foam insulation in gable end walls of attics and under floor areas of crawl spaces. Acceptance was based on comparative testing: i.e., two tests were required, an uninsulated test and then an insulated test.

Introduction of Spray-applied Foam Plastic Insulation

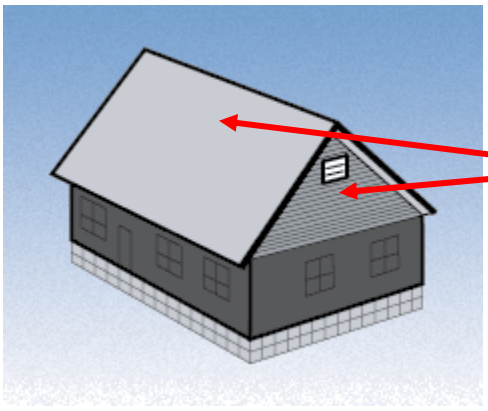
For years, spray foam insulation in the market was composed of closed cell, nominal 2 lb/ft^3 foam applied to the exterior of buildings, mostly roofs, but also tanks and other similar structures or equipment. However, the emergence of low density, open cell polyurethane foam opened the residential market by developing methods of applying the foam in wall cavities and advocated the use on non-ventilated attic spaces where the spray foam was applied to the underside of the roof deck and/or the attic walls and/or floors. Use was also extended to unvented crawl spaces where the foam is installed on crawl space walls as well as on the underside of the sub floor joist cavities. The current situation is that both types of spray-applied polyurethane foams, the closed cell 2 lb/ft^3 and the open cell low density foams, are now being used in these configurations.

"Foam Loading[4]" as an Important Consideration in the risk of Fire in Attics and Crawl Spaces

Where the use of foam boardstock in attics was limited to the gable end walls, with board thickness of ½" to ¾", the spray applied products are often used on 100% of the under roof deck areas in thicknesses up to 10". 100% of the wall area in attics may also be covered by spray foam in thicknesses up to 6". A combination system is where 100% of the under deck roof area and 100% of the wall area in the attic may be covered completely by spray polyurethane.



Gable End Wall – typical area for rigid foam insulation exposed in attic



Entire attic space – underside of roof deck, gable end wall and sometimes floor – typical areas for spray foam exposed in attic

A similar situation exists in crawl spaces. Foam insulation boardstock in thicknesses of ½" to maybe 1" was applied to the underside of the sub floor joists with the cavities filled with fiberglass insulation. In contrast, spray applied polyurethane can be applied to fill the cavities formed by the sub floor joists or may also cover the walls or both.

Like the foam insulation boardstock industry earlier, the SPF industry has also found the need to qualify exposed foam insulation. The SWRI 99 test was once again brought into use, with some modifications (SWRI 99-02 Draft).

The original SW -99 test was modified to address spray-applied foam insulation. Testing was taken to ICC Evaluation Services (ICC ES) for review and acceptance to allow evaluation of exposed spray-applied foam in attics and crawl spaces.

[4] Refers to the total amount of foam insulation exposed to the interior surface of the attic or crawl space, taking into account thickness and density.

Today's Situation

A combination of events in the market and in building code circles has led to confusion regarding the acceptable use of foam plastic insulation of all types and forms in attics and crawl spaces. The topic of attic and crawl space fire testing of foam plastics was an issue discussed at the "Cracker Barrel" portion of ICC Annual Meeting in Reno in 2007. Today, users of foam insulation as well as the code enforcement community are thoroughly perplexed about foam plastics in attics and crawl spaces as well as foam plastic use in general. The effect of ventilation or non-ventilation in attics and crawl spaces on fire performance should be separately explored.

Next Steps:

Largely because of confusion in the market and code community, several industry trade associations have begun to look at current test methods used to qualify the proper code complying use of foam insulation in attics and crawl spaces.

A number of differences between the two versions of the test should to be explored in order to determine if the current test should be refined or is there is a need for separate tests for attic and crawl space applications of foam plastic insulation. Test details, including test configuration, base-line assembly, test assembly and test criteria should all be examined for their compliance with current code requirements (for the baseline assemblies) and for the test assemblies, their replication to current application techniques. A few examples:

	SWRI 99-02	**SWRI 05-01**
Test Configuration	Block walls (representative of typical crawl space construction)	2 x 4 lumber with 2 layers of ½" gypsum wallboard (not representative of crawls space construction)
Test Criteria	One or both: Time to flames emerging from front of the crawl space Time to burn through the floor/deck systems	Two "pre-baseline" tests are run to determine times to ceiling burn through. AND Time to burn out the front of the crawl space May be more stringent? Depends on the baseline and test assembly construction.
Baseline tests and test assembles	Comparison in performance between un-insulated and insulated assemblies	Both baseline and test assemblies contain spray applied foam insulation (SPF), which means there is not an insulated and un-insulated comparison. The baseline test has SPF covered by fiberglass batt – which is not accepted as an ignition barrier by the IRC, whether the kraft facing is exposed or not. The code required mineral fiber batt which has a much higher melting temperature than fiberglass. The test assembly contains just the SPF alone, or SPF with coatings.

Another point raised is the suitability of using a test structure that is only 4 ft high to assess the fire performance of foam insulation in an attic space where there will be higher wall heights and thicker foam coverage. The sloped ceiling of a typical attic is another confounding issue because of known impacts of fire test geometry, i.e., the SWRI test has a flat ceiling surface intended to replicate a typical floor in a crawl space. Does this test need to be adjusted to accommodate a sloped ceiling? Should this test be used for attics at all?

The combination of new foam insulation products, new applications that are increasing the attic and crawl space “foam loading” on 50 – 100% of the surface area with increased thicknesses of these spaces, unclear code language, and loss of “institutional history” in foam manufacturers and the code enforcement sectors has the potential to lead to improper use of foam insulation products.