New Fire-Resistance Standard for Attic and Crawl Space Foam

For nearly a decade, builders and manufacturers have grappled with confusing and sometimes contradictory code interpretations concerning the conditions under which spray polyurethane foam can be installed in attics and crawl spaces (see "Using Intumescent Coatings As Ignition Barriers," *EDU*, November 2007). However, over the past 18 months, the spray foam industry has completed an ambitious program to establish a rigorous and clear-cut testing procedure, while phasing out a questionable earlier test method. That phase-out date will arrive on December 31, 2009, after which all foams seeking approval for attic and crawl space use will be required to pass the new test.

Prescriptive Ignition Barriers and Intumescent Coatings

Under the International Residential Code (IRC), polyurethane foam insulation must ordinarily be covered with an approved 15-minute thermal barrier in occupied spaces, which typically consists of ½-inch gypsum board. However, in attics and crawl spaces accessed only for repairs or maintenance, the thermal barrier requirement is replaced with a less-demanding "ignition barrier" that is intended simply to prevent a flame source from directly contacting the foam. The IRC lists six prescriptive ignition barrier materials: 1 ½-inch mineral fiber insulation; ¼-inch wood structural panels, such as plywood; ⅜-inch particle board; ¼-inch hardboard; ⅜-inch gypsum board; and corrosion-resistant steel with a base metal thickness of at least 0.016 inch.

Although all six of the prescriptive ignition barriers offer good protection, none is particularly easy to install in the cramped confines of an attic or crawl space. As a result, some foam suppliers have championed the use of intumescent coatings – which can be applied to cured spray foam much like paint – as a less labor-intensive alternative. On exposure to high heat, an intumescent coating bubbles up to form a flame-resistant barrier layer.

When such a product is used in place of a prescribed ignition barrier, the IRC requires specific approval based on one of several test procedures listed in the code. But, under a controversial 2000 ruling by the ICBO Evaluation Service (the predecessor to the current International Code Council Evaluation Service, or ICC-ES), an additional test, known as SwRI 99-02, that is not listed in the code also gained acceptance as a method of qualifying ignition barriers for attics and crawl spaces

A "Remarkably Low" Bar

The SwRI 99-02 test was based on a crawl space mockup in which a wood fire is ignited, and the time from ignition to the appearance of flame out the front and through the overhead floor is recorded (see Figure 3). If the elapsed flame-out-the-front and through-the-floor times of the foam-insulated mockup were found to exceed that of mockup insulated with 3 ½-inch fiberglass batts faced with flammable kraft paper, the foam system was approved for use.

Although an estimated eight to ten different foam products protected by intumescent coatings – and at least four unprotected foams – were approved on the basis of SwRI 99-02, many in the spray foam industry came to regard the test with alarm. As *EDU* noted in the November 2007 article referenced above, "[a]ny testing procedure that determines how fast a product ignites compared to exposed kraft facing has chosen to set the bar remarkably low."

The Industry Responds

In January 2008, a task force organized through the Spray Polyurethane Foam Alliance (SPFA) met to develop a new ignition barrier test protocol. As a first step, the SPFA group and ICC-ES established a new interim criteria based on SwRI 99-02, setting a minimum threshold of 3 minutes for flame-out-the-front and 12 minutes for flame-through-the-floor. That new interim criteria, known as 3/12, was set to take effect June 1, 2008 and remain in place through June 2009, leaving a one-year window to develop its replacement.

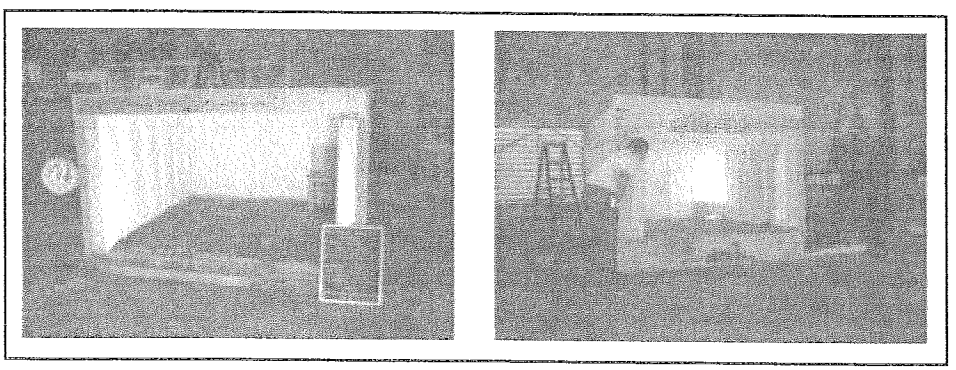

Figure 3. To gain approval for attic and crawl space use under the soon-to-be phased out SwRI 99-02 test, shown here, unprotected foams or foams with intumescent coatings had only to exhibit greater resistance to ignition than a baseline of kraft-faced fiberglass.

Figure 4. In the recently developed "modified NFPA 286 test," the new baseline is the average amount of time required for a gas-fired flame (a) to climb the wall and across the ceiling of a test module covered with ¼-inch plywood (b), and flash out a door-sized opening at the opposite end of the assembly (c).

By summer, the task force had agreed that the new ignition barrier test would be based on the established NFPA 286 "corner burn" test, which is ordinarily used as a pass/fail test to evaluate 15-minute thermal barrier systems. In cooperation with fire consultant Jesse Beitel of the Baltimore-based engineering firm Hughes Associates, a series of tests were performed on room-sized test assemblies designed to represent foam-filled, wood-framed walls and ceilings covered with a code-approved ignition barrier of ¼-inch plywood. A gas-fired burner is placed in the front corner of the assembly and ignited, allowing the flame to move up the wall, across the ceiling, and eventually out a door-size opening in the rear of the test unit (see Figure 4).

4 Minutes and 18 Seconds

The task force conducted more than a dozen burn tests, using randomly selected commercially available spray foams behind a ¼-inch plywood prescriptive ignition barrier. Both open-cell low density and closed-cell medium density foams were tested. The researchers noted the time at which key stages in each burn cycle occurred, including the ignition of crumpled newspaper "targets" on the floor, the measurement of a 600°C average temperature at the ceiling, and the "flash out" of flames through the door opening (see Table 1). The average of the times taken to attain five of the six fire stages (the time to ignition of the newspaper targets was ultimately deemed too variable to be useful) came to 4:18, and that figure was chosen as the new ignition-barrier benchmark.

Test No.	Foam Type	Time to Attain						Avg. of All 6	Avg. w/o Paper Targets
		Flames Out Door	1 MW HRR	20 Kw-Floor	600C	Ignition Paper - back	Ignition Paper front		
G	LD	4:01	4:17	4:12	3:52	4:03	4:10	4:05	4:05
AAA	LD	4:15	4:23	4:48	3:57	4:29	4:50	4:27	4:20
H	MD	4:25	4:23	4:23	3:58	4:33	5:03	4:27	4:17
DDD	MD	4:35	4:37	4:42	4:17	4:51	5:00	4:40	4:32
Avg.		**4:19**	**4:25**	**4:31**	**4:01**	**4:29**	**4:45**	**4:25**	**4:19**
DD	MD	5:03	5:02	5:02	4:32	6:13	6:10		4:54
A	LD	3:46	3:45	3:40	3:18	N/A	N/A	--	3:37
Avg.		**4:24**	**4:23**	**4:21**	**3:55**				**4:16**
1/4 plywood AVERAGE		**4:20**	**4:24**	**4:27**	**3:59**				**4:18**

Table 1. In the modified NFPA 286 baseline fire tests with randomly selected plywood-sheathed foams, the elapsed time to key events was timed and recorded as shown here. With the exception of the time to ignite paper targets, measured times were very consistent. The new 4 minute and 18 second threshold represents the overall average time for the first four events: flames out the door, heat release rate, floor exposure, and ceiling temperature.

In June 2009, the new protocol – dubbed "modified NFPA 286" – was accepted by the ICC-ES committee, and took effect the same month. Both the SwRI 99-02 test based on the controversial kraft-faced baseline and the 3/12 interim version remained in effect as well, but were scheduled to sunset on January 1, 2010. After that date, all foams seeking ICC-ES approval for attic and crawl space use must take the modified NFPA 286 test, and exceed the 4 minute and 18 second baseline established for plywood-covered foam in order to earn approval.

Bare Foams Pass, Too

The modified NFPA 286 test permits foam manufacturers to test their products with an intumescent coating of their choice, or with no protective coating at all. However, according to spray foam industry consultant Mason Knowles, it had been widely assumed that bare foams would be unable to meet the 4:18 benchmark.

So, like others in the industry, Knowles was surprised when the Houston-based foam manufacturer LaPolla Industries announced, in late September 2009, that two of its medium-density foams had passed the new test without the protection of an intumescent coating. More noteworthy still, the specific products tested (marketed under the separate brand names AirTight and Foam-Lok, although they are chemically almost identical) are standard off-the-shelf foams with no added fire retardant or other enhancements.

"I really didn't expect that," Knowles says. "I looked at the data in the test report, then sent it to Jesse [Beitel] to see if it said what I thought it did. He told me 'yes, it looks like it really did pass.' They're the only ones to pass with a bare foam so far, but if they can do it I presume that others will be able to as well."

LaPolla Industries president Doug Kramer expresses a somewhat different attitude. "We weren't sure we were going to pass, but we weren't necessarily surprised," he says. "We have a very low flame spread." He also notes that the company expects to subject other products to the new test, and that it has already seen "some very positive test results" for its half-pound foam.

As to whether standard foams from other manufacturers might also meet the 4:18 threshold without protection, Kramer is noncommittal. "I don't know for sure," he says. "Foam is not a commodity. There's a difference in performance and formulation. But I do believe that everyone is trying to stay ahead of the curve and that people are getting close to testing."

For more information, see "New Fire Test Method for Ignition Barrier Alternatives in Attics and Crawlspaces," available from the Spray Polyurethane Foam Alliance.

Rocky Start for Ontario Feed-In Tariff Program

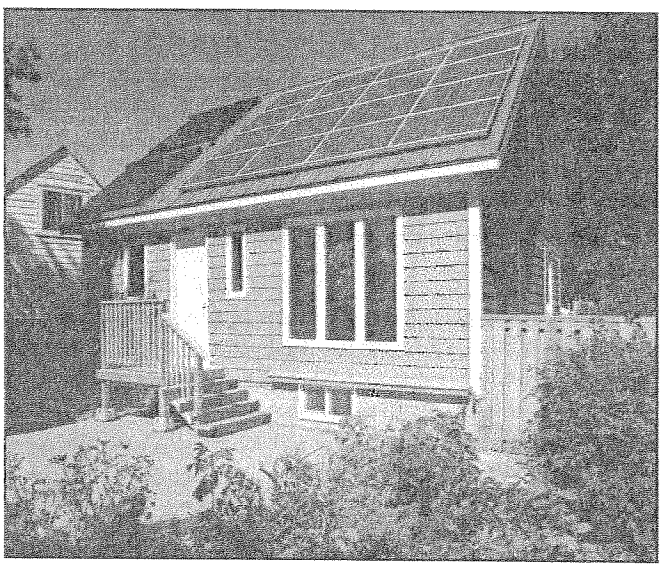

Figure 5. Grid-connected residential PV systems in the Canadian province of Ontario, like this 2-kW installation in Toronto, can now benefit from a new feed-in tariff that pays homeowners 80 cents per kWh for power they provide to the grid, while charging them a much lower rate for the power they use.

A recent decision by the provincial government of Ontario appears to have ended a short-lived impasse between early adopters of a residential alternative energy feed-in tariff program and the Ontario Power Authority (OPA). By retroactively adjusting the eligibility requirements for its newly launched FIT and MicroFIT programs, the agency cleared the way for an estimated several dozen Ontario homeowners to sell power from small grid-connected PV systems to their local utilities at a very favorable rate (see Figure 5).

From RESOP to FIT

In May 2009, OPA announced a new feed-in tariff program, which would replace the existing Renewable Energy Standard Offer Program (RESOP), which was to be phased out on October 1. One component of the new program, called FIT, was aimed at solar, wind, hydro, and biomass projects over 10 kW. A second program, called MicroFIT, was designed to cover residential-scale projects of 10 kW and less.

Under RESOP, which was launched in 2006, residential participants were paid 42 cents per kWh for power they