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Getting Flame Retardants Out of Foam Insulation

CEUs available

By Alex Wilson

In 2009, when Siegel & Strain Architects began working on the design of the new Yosemite Environmental Education Center campus for the Yosemite Institute (now NatureBridge) in Yosemite National Park, principal Larry Strain, AIA, had an epiphany. Given the setting—one of America's greatest environmental treasures—and the firm's commitment to sustainability, it's no surprise that the project's objectives include net-zero-energy performance, 60% reduction of water use, and LEED Platinum certification.

The Yosemite Environmental Education Center is being designed by Siegel & Strain Architects to avoid the use of foam insulation due to concerns about flame retardants.

But the epiphany had to do with the insulation material that they were planning to specify. "We were working on the project when we heard Arlene [Blum] talk about flame retardants," Strain recalls, referring to a leader in the movement to address the health and environmental impacts of the chemicals used to make many everyday materials less flammable. "It was an eye opener." For Siegel & Strain, learning that the flame retardants used in most rigid insulation materials bioaccumulate—get into the environment and don't go away—put these materials into a whole different category of risk compared with other products their firm tries to avoid. (See "PBT Chemicals: Persistent, Bioaccumulative, Toxic," *EBN* Sept. 2011.)

"In the heating-dominated climate of Yosemite, we needed pretty robust exterior rigid insulation to eliminate thermal bridging," says Strain. Instead of using rigid foam insulation on the exterior, Siegel & Strain redesigned the envelope to use rigid mineral wool. However, achieving the necessary R-value meant a fairly thick, four-inch layer of mineral wool with furring. This increased the projected cost and complexity of the project, which initially was to be built off-site with a panelized system using steel studs. Despite the added cost, both Nature Bridge and the National Park Service have supported the design change to eliminate flame retardants. "It helps to have great clients with high standards," Strain notes. The design has been subsequently changed from panelized construction to site-built, and the steel studs will be replaced with deeper wood studs, allowing two-inch rather than four-inch mineral wool.

Foam Insulation and Alternatives

Product	Form	Typical Uses	Cost	R-value per inch	Raw Materials	Health Issues	Flame Retardant
FOAM INSULATION CONTAINING HALOGENATED FLAME RETARDANTS (HFRS)							
Extruded Polystyrene (XPS)	Boardstock	Below-grade (subslab and exterior frost wall); wall and roof sheathing	$$	5.0	Petrochemicals; blowing agent (HFC-134a); some recycled PS; flame retardant	CO, soot, smoke, benzene, HFR	2.5% HBCD
Expanded Polystyrene (EPS)	Boardstock	Below-grade (min. 1.5 pcf density); wall and roof sheathing	$$	3.5–4.0	Petrochemicals; blowing agent (pentane); some recycled PS; flame retardant	CO, soot, smoke, benzene, HFR	0.5%–0.7% HBCD
Polyisocyanurate	Boardstock	Above-grade wall and roof sheathing	$$	6.0–6.5	Petrochemicals; blowing agent (pentane); flame retardant	CO, soot, smoke, HFR	2.5%–5.5% TCPP
Spray Polyurethane Foam	Foam-in-place	Cavity insulation, interior basement and crawl space; especially for uneven surfaces	$$	3.6–6.0	Petrochemicals; HFC-245fa blowing agent in most closed-cell; flame retardant	Toxic during installation; CO, soot, smoke, HFR	12.5% TCPP in open-cell; 4% in closed-cell
ALTERNATIVES TO FOAM INSULATION CONTAINING HFRS							
Product	Form	Typical Uses	Cost	R-value per inch	Raw Materials	Health Issues	Flame Retardant
Perlite	Boardstock (also sold as loose fill)	Commercial roofs	$$	2.7	Perlite; cellulose binders; waterproofing agents	No known issues	None
Mineral Wool	Stiff batt and boardstock	Below-grade exterior frost walls; sheathing; rainscreen (potential subslab)	$$	3.7–4.2	Slag wool fiber and/or basaltic rock; phenolic resin	Can irritate and congest lungs during installation	None
Cellular Glass	Boardstock	Below-grade (subslab and exterior frost wall)	$$$	3.45	Alumino-silicate cellular glass	No known issues	None
Aerogel	Felt-like mat	Thin layer for roofing, tensile-fabric roof, walls, appliances	$$$	8–10	Silica aerogel; PET; fiberglass	Can irritate and congest during installation	None
Microporous Silica and Carbon Foam	Boardstock and panel	Specialized high-temp (buildings, industrial); substrate for vacuum panel	$$$$	6.9–10	Silica or calcined coke	No known issues	None
Expanded Cork	Boardstock	Wall or roof sheathing; floors for sound control	$$$	3.6	Natural cork bark	No known issues	None
Vacuum Panel	Boardstock or panel	Appliance insulation; buildings where very high R-value in thin layer required	$$$$	14–30	Silica or carbon substrate; foil facing	No known issues	None
Cementitious Foam	Foam	Cavity-fill walls, CMU/ICF	$$	3.9	Magnesium oxychloride cement	No known issues	None

"This is now our office standard—wood framing with cavity insulation and dense rockwool boards over the sheathing at the walls and roof," says Strain. The firm still uses foam when very high R-values are needed, though, and this has kept it busy on another front. At least three architects at Siegel & Strain are now actively engaged in an effort to change building codes so that toxic flame-retardant (FR) chemicals won't be needed for all foam insulation, and to encourage manufacturers to offer foam insulation without FR treatments.

Flame Retardants in Insulation

Halogenated flame retardants (those containing the chemicals bromine, chlorine, or fluorine) are used in virtually all foam-plastic insulation for building applications in North America. Extruded polystyrene (XPS) contains approximately 2.5% HBCD—a common brominated FR chemical—by weight, and expanded polystyrene (EPS) contains 0.5% to 0.7% HBCD by weight. Worldwide production of HBCD, according to the United Nations Environment Programme Persistent Organic Pollutants Review Committee, totaled about 62 million pounds (28,000 tonnes) in 2012. About 90% of HBCD is used for treating XPS and EPS building insulation.

TCPP (a chlorinated FR) is used in spray polyurethane foam (SPF) at a concentration of about 12.5% for open-cell and 4% for closed-cell products. In polyisocyanurate boardstock, TCPP is used at a concentration of 2.5% – 5.5% by weight (3.4% typical). Worldwide production of TCPP in 1997 totaled about 80 million pounds (36,000 tonnes), though by 2000, that amount was used in Europe alone.

To foam or not to foam

With the sheer volume of FR chemical production and the health problems associated with these chemicals (see table), some designers like Strain see a need to do what we can to avoid their use. However, green building professionals are caught between a rock and a hard place. Avoiding foam insulation can mean redesigning the envelope, and given the increased cost, they may be forgiven for asking if using such chemicals in an exterior application—where the chemicals aren't likely to affect indoor air quality—is such a bad thing.

As Mark Kalin, FAIA, an architectural specifications writer, argues, the protected location of below-grade insulation reduces health concerns. "If it's XPS and it's used as a foundation wall or under a slab, I guess I'd have no particular concern [about flame retardants in the foam]," Kalin told *EBN*. "You can't touch it, it can't impact people, and it can't get back into the building."

Not so fast, says Peter Syrett, AIA, of Perkins+Will, who helped develop that firm's well-received Precautionary List of chemicals. Flame-retardant chemicals in insulation are featured on that list, and Syrett says that while it's easy to see no evil in foam insulation buried under a slab, designers should be mindful of the life cycle. "It's important to recognize that building products are part of a long continuum of contact, from extraction to fabrication, installation, disposal, and ultimately the decay process," he says. The demand for these chemicals in buildings brings them into the world, and once they're here, they stick around in the environment and work their way up the food chain, he says. Syrett notes that the long lifespan of PBT chemicals is mismatched with the short lifespan of many new buildings today.

William Buchholz, AIA, of Specifications Consultants, comes down on the side of precaution: "We don't know how much of these halogenated flame retardants are offgassing into the occupied space," he says. "We don't know the health hazards. We know that they are hazardous and toxic, so let's get them out of our buildings."

The Case for Taking the Chemicals Out

Awareness about the environmental and health risks of halogenated flame retardants throughout their life cycle has been growing for years, and companies are responding with alternative chemicals they believe will alleviate some of the problems. Meanwhile, some of those concerned about flame retardants are asking if we need flame retardants in foam insulation at all—at least when that insulation is separated from the occupied space in a building by a suitable thermal barrier. Perhaps building codes should be changed to eliminate the requirement for fire-rated foams when there is a thermal barrier.

That's the argument made in a peer-reviewed paper, "Flame Retardants in Building Insulation: A Case for Re-Evaluating Building Codes," published in the journal *Building Research and Information* in November 2012. The lead author of the article is fire scientist Vytenis Babrauskas, Ph.D., of Fire Science & Technology, Inc. in Issaquah, Washington. Other authors include Arlene Blum, Ph.D., of the Green Science Policy Institute in Berkeley, California; Donald Lucas, Ph.D., of the Combustion Technologies Group at Lawrence Berkeley National Laboratory; and David Eisenberg of the Development Center for Appropriate Technology in Tucson.

Thermal barriers work

According to the article, thermal barriers provided by gypsum wallboard do a very good job of protecting against fire. Prior to flashover—the condition in a room fire in which the space becomes engulfed in flames—gypsum wallboard withstands fire exposure extremely well.

The author's home has 6" of Foamglas (a cellular glass insulation material) on the

Once flashover occurs, the wallboard effectively keeps materials on the other side, such as wall studs and foam insulation, from igniting for at least 15 minutes. This is referred to as the *finish rating*, and the goal is to provide time for occupants to escape. The finish rating test ensures that material on the other side of the thermal barrier does not exceed an average of 250°F (121°C) or a peak value of 325°F (163°C), based on standard National Fire Protection Association (NFPA) test methods. Building codes accept ½"-thick gypsum wallboard as a prescriptive standard for this 15-minute finish rating, and the efficacy of this standard is well established by decades of research and experience. Given the efficacy of drywall, the Babrauskas paper argues, there is negligible added benefit to treating foam insulation materials that are installed behind it.

frost walls, providing about R-22.

According to Eisenberg, “Fire safety research, when carefully examined, reveals that it is the code-mandated thermal or ignition barriers and fire blocking that provide the safety benefit in a fire, not the flame-retardant chemicals.” In Sweden and Norway, there is precedent for not using flame retardants in foam-plastic insulation, relying instead on the same thermal barriers required in U.S. codes.

Questioning the test methods

The paper also draws attention to the flawed method used to establish fire ratings for foam insulation. For decades, the Steiner Tunnel Test (referenced in ASTM E84, UL723, and NFPA 255 standards) has been used to provide a flame-spread index (FSI); it was developed in 1944 by Al Steiner of Underwriters Laboratories (UL) as a way to gauge how quickly wall and ceiling finish materials would propagate fire and how much smoke they would emit. For wood and engineered-wood products like plywood, the test is very effective, but for materials that either melt (thermoplastic foams) or delaminate (thermoset foams) in a fire, the test—until recently—did not account for material that dropped off the ceiling of the 24-foot-long (7.3 m) test chamber. In a real building fire, melting polystyrene drips and adds fuel to the fire—but in the test, polystyrene that dripped away from the test chamber wasn’t accounted for.

To address this concern, the UL version of the Steiner Tunnel Test was modified in 2010 so that any test material that drips or falls to the test chamber floor and burns contributes to a calculated total for flame spread and smoke development. Similar revisions to the ASTM E84 test method were approved in November 2012.

In the meantime, these flawed test methods have provided misleading information on how well (or poorly) foam insulation materials withstand fires. In extensive testing by UL in the 1970s in which foams with different FSI ratings were tested in room fires (without thermal barriers), some foam insulation materials with very low FSI ratings, as measured by the Steiner Tunnel Test, led to almost complete fire loss in corner and full-room fire tests, while other foams with far higher FSI ratings resulted in much less damage. In other words, the FSI ratings derived from the Steiner Tunnel Test were not indicative of actual fire performance—or, as the Babrauskas paper notes, “there was no correlation between the flame-spread index and the room fire hazard.”

Modifying Building Codes

Unfortunately, manufacturers couldn’t simply stop using flame retardant chemicals in foam insulation, even if they wanted to: building codes prevent it. Right now, the only alternative for designers, spec writers, and builders is to choose a non-plastic insulation, such as mineral wool or cellular glass (see table, page 11). Although there are many advantages to using these non-fossil-fuel based products, they can be more expensive, and their performance properties may not align with every project's requirements. Designers still want the option to use foam insulation but without the toxic flame retardants.

That's why a consortium of architects, environmentalists, and health advocates, dubbed the Safer Insulation group, have been working to modify the building codes. Their goal is to eliminate the requirement for fire ratings when foam insulation is separated from occupied space either by concrete or masonry or by a 15-minute thermal barrier. This group, consisting of the coauthors of the paper and several dozen others, has been working on code-modification language for several months and discussed its ideas at a November 2012 meeting in San Francisco coinciding with the Greenbuild conference. (Disclosure: BuildingGreen, publisher of *EBN*, organized the meeting along with the Green Science Policy Institute, and I have been part of that group.)

Because the International Residential Code (IRC) is the next of the International Code Council (ICC) codes to be up for renewal, this group is focusing for now on that code and hopes to propose revised code language in January 2013. If successful, the changes would be incorporated into the 2015 IRC.

Foam below grade

Avoidance of flame retardants was one of the primary reasons the author used Foamglas (4" layer) under the slab in his new house. Its high compressive strength makes this a good option, though it is more than twice the cost of XPS.

There are two proposals being discussed. The first change (to section R-316.3 of the IRC) would exempt foam insulation from having to carry a fire rating when that foam is installed either below grade on the outside of a foundation system or when otherwise separated from the living space by a minimum 1" (25 mm) thickness of masonry or concrete. "The blanket requirement for all foam plastic insulation to meet flame-spread and smoke-development standards shouldn't apply to foam insulation when that insulation is installed in places that will never be exposed to fire—between concrete or masonry and the ground, or when separated from the interior of the building by concrete," says Eisenberg. This "seems like a no-brainer," says Larry Strain.

Foam behind a thermal barrier

The second proposed change (also to section 316.3 of the IRC) would exempt foam insulation from having to carry a fire rating when that foam is separated from the living space by a 15-minute thermal barrier—even if that insulation is above grade and exposed to a wall or ceiling cavity. Although perhaps not as bulletproof, the idea is the same—that the efficacy of the 15-minute thermal barrier obviates the need for flame retardants in the foam.

Eisenberg emphasizes that this effort "is not attempting to ban or eliminate" foam insulation containing flame retardants. Rather, the goal is to stop requiring the addition of hazardous chemicals in applications where non-treated insulation can be used safely because of adequate thermal and ignition barriers—barriers that are already required by code in most situations.

Would Manufacturers Respond?

The building code changes being proposed by the Safer Insulation group would not force manufacturers to eliminate flame retardants from the foam or prevent the use of flame-retardant-treated foam. But by exempting foam insulation from carrying fire ratings when installed below grade or behind a thermal barrier, this change to the 2015 IRC would open up the option for insulation manufacturers to offer untreated foam for these applications. If manufacturers saw a market potential for such a product, they would be able to introduce it. The group hopes that manufacturers might even see an incentive to meet a new demand while reducing their manufacturing costs through the elimination of the flame retardant—which is a costly ingredient for them.

It may not be so easy, though. Greg Bergtold, the business advocacy director for Dow Building & Construction, the manufacturer of Styrofoam XPS, indicated that the cost-saving argument would not influence decision-making at Dow. "We believe the potential fire risk to property and life would far outweigh any potential savings for Dow," he told *EBN*.

Additionally, there would remain applications—both in commercial construction regulated by the International Building Code (IBC) and in portions of the IRC—where foam insulation may be installed without a thermal barrier, such as in certain ceiling and roof applications. There is no reason to believe that flame retardants wouldn't still be required for foam insulation used in such applications.

To make everyone happy, manufacturers would have to produce two versions of their products: one FR-free version for protected applications and another FR-treated version for all other applications. This may be a hard sell to the XPS insulation industry, in which three huge companies (Dow, Owens Corning, and Pactiv) dominate the market and, according to Bergtold, sell products "through highly fragmented building materials distribution channels to reach both the contractor and the consumer." With these resellers ranging in size from a few thousand dollars to multi-billion-dollar retailers like Home Depot, "manufacturers cannot control who or how builders and consumers ultimately choose to install our products," he said. "Therefore, we have chosen to provide standard fire protection in all of our products to ensure our products are safe no matter what installation is used."

Rick Duncan, technical director of the Spray Polyurethane Foam Alliance, told *EBN* that the SPF industry might get behind the idea of a non-FR-treated foam for below grade (a relatively common application in Canada). But above-grade applications, he suggested, might be too complex, increasing expectations in an industry where installers already have to follow stringent rules to ensure safe application and indoor air quality. This is because some above-grade uses (behind drywall) would be thermally protected, and others (like band joists) would not. "That would complicate the installation quite a bit, switching from one formulation to another," he cautions.

Frank O'Brien-Bernini, chief sustainability officer for Owens Corning, told *EBN* that there were additional complications to not treating some foam products: "There are fire protection considerations throughout the supply chain that must be considered," he said, "including transportation, warehousing and onsite storage."

Speaking for the Polyisocyanurate Insulation Manufacturers Association (PIMA), president Jared Blum expressed caution in moving forward. "Because the primary recommendation of the Babrauskas study involves a change in current building code fire-resistance criteria, PIMA and its members believe that this proposal should be fully vetted before any conclusions are made regarding the use of specific fire retardants in polyiso or any other foam insulation product," he told *EBN*. "A single research study, regardless of the expertise of the researchers, still requires extensive peer review and validation before its recommendations should be viewed as persuasive."

But manufacturers might soon be feeling pressure to address FR chemistry from another quarter. The international safety testing group UL concurs with Jared Blum on the issue of testing—"UL's motto is 'know by test,' and thus far, UL has not tested this scenario," Marilyn Black, Ph.D., vice president and senior technical advisor told *EBN*—but that doesn't mean business as usual either. "In general, UL's viewpoint is that solutions must live in the intersection of fire safety product needs and human and environmental health needs. Sacrificing one for the other will not be acceptable in our world today." Although UL currently "never prescribes a specific methodology to achieve compliance," she adds, they may be re-examining that position in the future and potentially working with manufacturers to eliminate certain chemicals from their products—even if those chemicals help products pass fire-safety tests. "UL is aware of the need for greater dialogue about the convergence of fire safety and toxicology and will be taking steps to bring key stakeholders together for discussion in 2013."

Replacement chemicals

As HBCD has come under increasing fire (see table on page 15) and manufacturers have recognized that they will need to cease using the compound, the search for safer alternatives has heated up. Dow Chemical, North America's leading manufacturer of XPS, developed and patented what it considers to be a safer alternative, and the company has licensed this compound to all three brominated flame retardant manufacturers (see "New Flame Retardant for Polystyrene—Too Much Like the Old?" *EBN* Apr. 2011). Chemtura Corporation was the first to license the new chemical and is marketing it as Emerald 3000.

Emerald 3000—along with other versions of the flame retardant, which will be produced by Bromine Compounds, Ltd. (part of ICL Industrial Products) and Albemarle Corporation—is a high-molecular-weight, brominated, polymeric flame retardant. Because the chemical is larger than HBCD and a polymer, Chemtura and Dow claim it will be more tightly bound to the polystyrene and non-bioaccumulating in organisms.

While the manufacturers are enthusiastic about this alternative to HBCD and are working quickly on the substitution, some experts remain skeptical about the long-term safety of this brominated flame retardant. Chemist Arlene Blum says that we don't have adequate information on the toxicity of Emerald 3000. "The life cycle is problematic," she told *EBN*. As a halogenated compound, Emerald 3000 "can produce soot, smoke, and toxic gases that contribute to the majority of fire deaths, as well as toxic dioxins," says Blum.

Halogenated Flame Retardants: A Progress Report

A 2006 study published in the *Journal of Occupational and*

Environmental Medicine, "Cancer Risk Among Firefighters: A Review and Meta-analysis of 32 Studies," shows a strong correlation between a firefighting profession and various cancers, with the strongest correlations for multiple myeloma, non-Hodgkin melanoma, and prostate cancer; dioxins are among the chemicals released during fires that could be a factor in these cancers, and halogenated flame retardants are one source of dioxins.

Flame retardant	Uses in buildings	Health and environmental concerns	Status in the market
Penta and Octa forms of PBDE	Has been used in flexible foams in furniture and carpet padding, along with textiles and rigid plastics. OctaBDE was also used in ABS plastic.	Known to be persistent, bioaccumulative and toxic, according to the U.S. EPA. These chemicals exhibit a wide range of health effects, including acting as endocrine disruptors and causing learning and memory impairment, behavioral changes, delayed puberty, decreased sperm count, fetal malformations, and possibly some cancers.	Banned in several states and Europe, pentaBDE and octaBDE were removed from the market in 2004, when the sole producer (Great Lakes Chemical Corporation, now Chemtura Corporation) ceased production. Using its authority under the Toxic Substances Control Act (TSCA), EPA restricted use of these chemicals in 2006.
DecaBDE	Widely used in textiles, electronic equipment and appliances, and certain building materials, including wire and cable, commercial carpeting, wallcoverings, EPDM roof membranes, acrylic roof coatings, ABS piping, high-impact plastics, and polycarbonate glazings.	A draft 800-page Alternatives Assessment for decaBDE published in June 2012 by EPA shows persistence to be very high, bioaccumulation to be high, neurological and developmental risks to be high, and carcinogenicity risk to be moderate.	Uses restricted in Europe through REACH. At least eight states have restricted its use in certain applications. In December 2009, following negotiations of EPA, the two U.S. manufacturers and the largest importer agreed to end all production, importation, and sales of decaBDE by the end of 2013, with most uses phased out by the end of 2012.
HBCD (Hexabromocyclododecane)	Approximately 90% of HBCD is used for treating polystyrene, including both extruded (XPS) and expanded (EPS) forms. Smaller quantities are used in the backcoating of textiles and upholstery fabrics, in certain rubber products, and in high-impact polystyrene for electronics and appliance housings, as well as in some wiring.	According to EPA, HBCD is persistent in the environment and highly bioaccumulative in the food chain. It is persistent and highly toxic to aquatic organisms. Relative to human health, HBCD carries reproductive, developmental, and neurological impacts.	In October 2008, HBCD was added to the "Substances of Very High Concern" list in the European REACH program. In August 2010, EPA added HBCD to its Chemicals of Concern list. And in October 2012, the Persistent Organic Pollutants Review Committee of the Stockholm Convention passed a resolution to add HBCD to Annex A of chemicals slated for worldwide phaseout.
TCPP (Tris (1-chloro-2-propyl) phosphate)	Commonly used in spray polyurethane foam, both closed-cell and open-cell, as well as in most polyisocyanurate foam insulation.	Relatively little is known about risks of TCPP. This chlorinated flame retardant is defined as a suspected carcinogen by the World Health Organization and is being investigated for genotoxicity and reproductive toxicity by the National Institute for Environmental Health Sciences.	TCPP is currently not regulated, though it is on several "red lists," including those of the Living Building Challenge and the Perkins+Will Precautionary List.

While much of the discussion about flame retardants over the years has focused on PBDE (polybrominated diphenyl ethers)—in penta, octa, or deca forms—today the active debate, at least in the building industry, is much more about HBCD and TCPP. Note that there are many other halogenated flame retardants that are not covered here but are used in a wide range of products.

Syrett, of Perkins+Will, says of manufacturer reassurances on Emerald 3000 that "I get nervous when people make chemical arguments to me rather than health arguments. I would like to turn that around and say, 'Do you believe your product gets rid of the health issues associated with flame retardants?'"

Interior designer and material safety expert Chris Youssef finds the new polymeric chemistry concerning: "From what I understand, it's not a natural process to make long-chained polymers. I would do more research," he says. On the other hand, most architects and designers have neither the time nor the expertise to research and judge claims like these from manufacturers, he explains. "They literally have two minutes to make a decision," Youssef said. Even for those with the best intentions, "The project still has to meet deadline."

Moving Forward

Concern remains strong over the millions of pounds of halogenated flame retardants that are added to foam insulation. Rather than pushing for safer versions of those flame retardants, advocates argue, why not recognize the fact that those flame retardants do very little to enhance the safety of foam, and allow foam that is fully protected by a code-mandated thermal barrier to be free of flame retardants?

Changing building codes is a difficult process, but due to the national attention recently given to flame retardants by a *Chicago Tribune* exposé (see "Flame Retardant Rules Result of Deception, Says Investigation," *EBN* May 2012), now may be the time to challenge established practice.

As the practices at Siegel & Strain Architects demonstrate, a failure to change building codes so that untreated foam insulation can be obtained may move environmentally concerned architects and specifiers away from foam insulation in favor of alternative materials that are inherently safe in fires without chemicals.

Tristan Roberts and Paula Melton contributed reporting.

For more information:

Green Science Policy Institute
www.greensciencepolicy.org

Siegel & Strain Architects
www.siegelstrain.com

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Learning Objectives

Upon completing this course, participants will be able to:

1. Summarize why and how flame retardants are used in foam insulation.
2. Elucidate the case for taking the chemicals out of foam insulation.
3. Describe the proposed building codes that reflect how non-treated insulation can be used safely.
4. Discuss potential advantages and challenges for manufacturers in offering untreated foam insulation.

To earn continuing education credit, make sure you are logged into your personal BuildingGreen account, then read this article and pass **this quiz**.

Discussion Questions

Use the following questions to inform class discussions or homework assignments.

1. A representative from the XPS insulation industry said, “Manufacturers cannot control who or how builders and consumers ultimately choose to install our products. Therefore, we have chosen to provide standard fire protection in all of our products to ensure our products are safe no matter what installation is used.” Can you think of other aspects of the green building industry in which manufacturers are controlling who and how builders and consumers ultimately install the products? If so, are there applicable lessons? Is there associated profit potential?
2. Imagine the particular FR-free foam insulation supply stream in which you might one day participate. How must it be modified from today’s foam-insulation supply stream?
3. What situations require such “very high R-values” that foam insulation is the only option considered? Are you able to solidly justify why none of the currently available FR-free alternatives are an option? How do you value FR-free insulation relative to very high R-values?
4. As mentioned in the article, there are certain applications where foam insulation may be

installed without a thermal barrier... but *must* they be installed without a thermal barrier? Are there other reasons besides "code doesn't require it" to not use a thermal barrier? How does your answer relate to the non-eliminative language of the proposed building code changes?

5. UL's viewpoint is that solutions are at the "intersection of fire safety product needs and human and environmental health needs" and that "sacrificing one for the other will not be acceptable in our world today." How do you think that stance might interface with UL's potential shift towards prescribing specific methodology to achieve compliance?
6. Manufacturers like Dow still claim that insulation without fire retardants could potentiate fire risk to property and life (outweighing any potential savings in removing fire retardants from product). On the way to a building code evaluation meeting on foam insulation, you share an elevator with others who ask for your opinion on Dow's stance. Luckily, you prepared for this moment and are ready with a 30-second speech that elucidates the holes in their logic.

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