EXTRUDED POLYSTYRENE FOAM ASSOCIATION

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XPSA White Paper – Safety of FRs in Energy-Efficient XPS Foam Insulation

According to the U.S. Environmental Protection Agency (U.S. EPA), buildings account for an estimated 36 percent of total energy use, and 30 percent of all greenhouse gas emissions. When designing modern buildings for energy efficiency, temperature control and the minimization of environmental impact, the use of energy efficient foam insulation such as extruded polystyrene (XPS) is a critical component that helps architects, builders and specifiers meet stringent energy efficiency requirements for new construction and/or renovation to existing buildings.

New structures or structures undergoing renovation must meet stringent building codes and standards for fire safety. These international fire codes and standards are based on years of careful analysis, extensive testing and a robust and inclusive public development process. In order to meet these standards, XPS foam insulation is manufactured with flame retardants, critical components of insulation's overall fire performance.

Flame retardants are incorporated into building insulation to raise ignition temperatures, decrease the rate of burning, reduce flame spread or reduce smoke generation. While flame retardants do not make materials fireproof, they provide firefighters a larger window for response and control of a fire, and give building occupants crucial additional moments to escape a burning building.

Hexabromocyclododecane, or HBCD, is the flame retardant most commonly used in XPS foam insulation. HBCD has been used safely for decades for foam insulation in walls, ceilings and other building structures. While the use of flame retardants in many consumer and other products has recently come under the microscope, potential exposures to HBCD in foam building insulation—which is typically encapsulated behind drywall or other structures –are not comparable to other products.

For scientists, toxicologists and risk assessors, a substance's *risk* is determined by a scientific assessment of *hazard* and *exposure*. HBCD has been thoroughly studied by government agencies and risk assessors across the globe, and all have agreed that exposures from foam insulation are considered extremely low, and therefore of low risk to building occupants. Regulatory bodies making this determination include:

- The European Commission (2008): "There is at present no need for…risk reduction measures [for HBCD]." This "conclusion applies to all scenarios for consumers and humans exposed via the environment."
- Environment Canada (2011): "Based on the available information, it is concluded that HBCD is not entering the environment in a quantity or concentration or under conditions that constitute…a danger in Canada to human life or health."

- Government of Australia (2010): “Exposure to HBCD from all sources appears to be low and hence low risk is expected;” and “Public exposure to HBCD…resulting from the release of HBCD into household dust is not of concern due to the estimated low-level exposure.”

In making these determinations, risk assessors use a tool called a “margin of exposure” (MOE) to determine whether a chemical’s exposure puts people at risk. In risk assessment, an MOE greater than one demonstrates low risk and low concern. For HBCD, regulators across the globe have determined that MOEs for HBCD among the general population are far higher than one, again demonstrating very low risk to building occupants from HBCD.

Despite the low risks in relation to polystyrene foam, the flame retardant HBCD has been marked for eventual phase-out in favor of environmentally safer materials. It is critical to note, however, that although HBCD was added to the Stockholm Convention on Persistent Organic Pollutants in May 2013, signatories to this treaty were allowed to apply for a five-year exemption for continued use of HBCD in energy-efficient foam insulation only. This exemption is based on several factors, including the essential contribution of foam insulation to energy efficiency standards and measures, and because HBCD alternatives are not yet globally available in sufficient quantities.

Still, companies manufacturing XPS foam insulation recognized the need to develop and deploy next-generation flame retardants that are environmentally safe and sustainable. New polymeric flame retardants for use with foam insulation have recently been assessed by U.S. EPA’s Design for the Environment (DfE) program, which evaluates environmentally innovative, cost-effective and safe chemicals. Because the flame retardants are polymeric, they are not bioavailable (they are too large to enter cells) or toxic, do not bioaccumulate in the environment, and cannot be classified as a PBT (persistent, bioaccumulative, toxic) chemical. One of the newer flame retardants has even won several green chemistry awards.

A transition to these new flame retardants is expected to occur over the next four to five years, as global production capacity ramps up and as the companies that manufacture XPS foam insulation work with testing labs and evaluation services to ensure the reformulated product continues to meet the physical property performance and fire safety characteristics expected of foam insulation.

In the interim, architects, building engineers and occupants can be confident that XPS foam insulation providing temperature and energy control in existing structures, whether commercial, industrial or residential, continue to be effective and safe.