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ASSEMBLY COMMITTEE ON
ENVIRONMENTAL SAFETY AND TOXIC MATERIALS

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To: Members of the Assembly Committee on Environmental Safety & Toxic Materials

From: Assemblymember Bob Wieckowski, Chair

Subject: Oversight Hearing on State Furniture Flammability Standards and the Safety of Flame Retardant Chemicals

The Assembly Environmental Safety and Toxic Materials Committee (ESTM) will be holding an oversight hearing on Tuesday June 26, 2012, to review the status of State Furniture Flammability Standards and the Safety of Flame Retardant Chemicals. The Committee will be reviewing actions of State agencies, including the Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation (Bureau), a government body under the California Department of Consumer Affairs. The Bureau enforces the Home Furnishings and Thermal Insulation Act, which is designed to protect consumers of upholstered furniture, bedding, and thermal insulation.

On June 18, 2012, Governor Edmund G. Brown Jr. announced his administration's effort to protect public safety by reducing the use of toxic flame retardants in upholstered furniture sold in the state. The Governor asked the Bureau to review and revise the state's furniture flammability standards and to recommend changes to reduce toxic flame retardant chemicals while continuing to ensure fire safety.

This ESTM hearing will gather information and take testimony on a range of policy issues related to the development of, potential changes to, and the operation of furniture flammability standards including:

- Do flammability standards adequately consider the public health and environmental consequences of compliance?
- Do current flammability standards and procedures reflect the most current scientific evidence of fire safety?

- In adopting flammability standards, does the Bureau consider the potential of regrettable substitutions of hazardous flame retardant chemicals?
- Can flammability standards be developed by the Bureau in concert with public health and environmental agencies?
- Should the state of California encourage a flammability policy that relies on, or results in, the presence of flame retardant chemicals?
- Should California revise its furniture flammability requirements to reflect the need to reduce or eliminate the exposure to toxic chemicals and does this need require statutory modifications or directions?
- How does the current regulatory process consider the life cycle of consumer products, like furniture, that contain toxics and what is the long term environmental impact associated with exposure from recycling and end of life management?

California Flammability Standards: Laws, Regulations and Technical Bulletins

California state law includes the provision of the Home Furnishings and Thermal Insulation Act[1], which establishes the Bureau and provides it with the authority to establish and enforce flammability standards for a range of home furnishing products, including mattresses and mattress sets; bedding products; flexible polyurethane foam; and seating furniture including upholstered furniture.

According to the Bureau, manufacturers are required to make upholstered furniture and bedding products sold in California flame-retardant. In the event of a residential fire, these products act as a significant fuel source and are difficult to extinguish once ignited. The Bureau measures flame retardance in accordance with flammability standards developed by the Bureau or the United States Consumer Products Safety Commission (CPSC).[2]

The California Business and Profession (B&P) Code provides specific actions on flammability requirements for furniture. Specifically B&P Code §§ 19161(c) and 19161.3 provides direction on furniture and polyurethane foam:

> *§19161. (c) All seating furniture sold or offered for sale by an importer, manufacturer, or wholesaler for use in this state, including any seating furniture sold to or offered for sale for use in a hotel, motel, or other place of public accommodation in this state, and reupholstered furniture to which filling materials are added, shall be fire retardant and shall be labeled in a manner specified by The Bureau. This does not include furniture used exclusively for the purpose of physical fitness and exercise.*

[1] California Business and Profession Code § 19000 et seq.

[2] http://www.bhfti.ca.gov/industry/bulletin.shtml

§19161.3. All flexible polyurethane foam in the form of slabs, blocks, or sheets, or which is shredded (loose or packaged), except polyurethane foam sold for use as carpet underlayment and polyurethane foam which cannot reasonably be expected to be used in or as an article of furniture or a mattress, that is offered for sale to the general public at retail outlets in this state for noncommercial or nonmanufacturing purposes, shall be fire retardant…"

The general provisions of the B&P Code are implemented by the Bureau through a combination of administrative regulations and more detailed Technical Bulletins (TBs) that augment the regulations.

Since 1975, the Bureau has developed several TBs to specify flammability standards. These performance-based standards do not prescribe the use of flame-retardant chemicals, manufacturing methods, or specific materials to meet the standards. Furniture manufacturers must strictly adhere to state and federal laws governing the manufacture and sale of upholstered furniture and bedding products.

The flammability regulations for furniture are contained within Division 3 of Title 4 of the California Code of Regulations (CCR). The regulations contain, among other requirements, the specific mandate that upholstered furniture comply with the testing requirement established in the Bureau's TBs. Section 1370 of Division 3 of Title 4 of the CCR provides:

> ***1370. Flame Resistant, Flame Retardant.*** *(a) Filling materials labeled as "flame resistant," "flame retardant" and words of similar import shall be tested in accordance with, and shall meet the requirements of, the State of California, Bureau of Home Furnishings Technical Bulletin No. 117, entitled "Requirements, Test Procedures and Apparatus for Testing the Flame Retardance of Filling Materials Used in Upholstered Furniture," dated March 2000.*

The following flammability standards pertain to upholstered furniture and bedding products sold in California:

Technical Bulletin 604 - Notice of Suspension of Flammability Test Method for Bedclothing Products

Technical Bulletin 116 - Requirements, Test Procedure and Apparatus for Testing the Flame Retardance of Upholstered Furniture

Technical Bulletin 117 - Requirements, Test Procedures and Apparatus for Testing the Flame Retardance of Resilient Filling Materials Used in Upholstered Furniture.

Technical Bulletin 133 - Flammability Test Procedure for Seating Furniture for Use in Public Occupancies

Technical Bulletins 117 and 116

California's Technical Bulletin 117 (TB 117), implemented in 1975, requires flexible polyurethane foam and other filling materials in furniture and juvenile products to withstand exposure to a small open flame for 12 seconds. This standard is most economically and conveniently met by adding flame retardant chemicals to the filling materials. Despite considerable research showing adverse health impacts from the chemicals commonly used to

meet TB 117, most national furniture manufacturers increasingly apply the standard for furniture sold across North America in order to comply with California's standard.

TB 117 is a collection of various small-scale component and mock-up tests for open flame and smolder resistance of upholstered furniture components. The TB 117 standard consists of requirements, test procedures and apparatuses for testing the flame retardance of resilient filling materials used in upholstered furniture. It also provides the specifications for conditioning samples, including size of specimens, equipment, and specific procedures on how to test different types of materials. The standard encompasses the testing process for various types of materials including:

- Resilient Cellular Materials
- Shredded Resilient Cellular Materials (i.e., shredded polyurethane foams)
- Expanded Polystyrene Beads
- Non-Man-Made Filling Materials
- Shredded and Loose Fill Materials/Feathers and Down
- Resilient Filling Materials
- Upholstery Fabrics

California's Technical Bulletin 116 (TB 116), the companion standard for fabric flammability, is a voluntary cigarette smolder test and rarely followed. In addition, TB 117 requires that fabrics pass the Federal flame-spread standard, a standard designed to remove the most dangerous flammable materials from the clothing market.

Federal Regulatory Action

On March 4, 2008, the CPSC published a notice of proposed rulemaking on upholstered furniture in the Federal Register ("Standard for the Flammability of Residential Upholstered Furniture"). The proposed rules would target smoldering ignition, which has been identified as the principal aspect of fire risk, and recognize that furniture with barriers provides open flame protection. One goal of the rules would be to minimize reliance on fire retardant chemical additives in fabrics and filling materials.[3] The CPSC has not taken action to adopt the proposed rules.

About Flame Retardants: Chemistry

Flame retardants are added to plastic, foam, textiles, electronics, and countless other products to reduce the likelihood that products will catch fire and to slow the rate at which they burn if they do catch fire. They can act to reduce the chances that something catches on fire, or slow the progression of the fire after it starts. Chemical flame retardants undergo a chemical reaction that

[3] http://www.cpsc.gov/library/foia/foia08/os/ahfa.pdf

quenches the fire, typically by reducing the amount of oxygen available to feed the fire. There are three main families of chemical flame retardants: inorganic compounds, non-halogenated organophosphorous compounds, and halogenated organophosphorous compounds (Fig. 1).

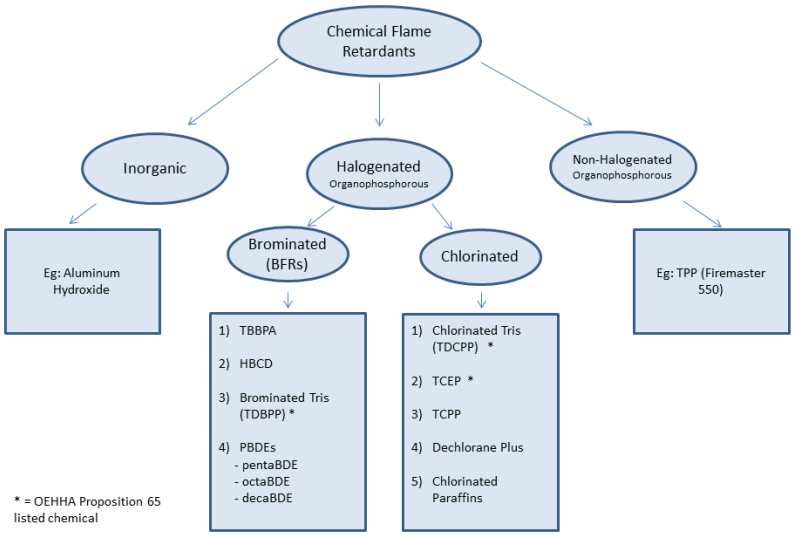

Figure 1: Types of Chemical Flame Retardants used in Furniture and other Consumer Products.

Halogenated Flame Retardants: Halogen-based flame retardants contain an element in the "halogen group:" bromine, chlorine, fluorine, or iodine. Bromine and chlorine are the halogens used in commercial products. When products containing halogenated flame retardants are exposed to a certain level of heat, the halogen atoms come off and quench the fire.

Brominated Flame Retardants (BFRs): Brominated flame retardants predominate in the marketplace due to low cost and high efficiency.[4] The main types of BFRs produced commercially are Tetrabromobisphenol A (TBBPA), Hexabromocyclododecane (HBCD), Brominated Tris (TDBPP), and polybrominated diphenyl ethers (PBDEs).

The highest volume flame retardant world-wide is Tetrabromobisphenol A (TBBPA), but it is primarily used in electronics rather than furniture foam. The electronics industry accounts for the greatest consumption of BFRs, where they are used in printed circuit boards, plastic covers, connectors, and cables.

Hexabromocycldoodecane (HBCD) is primarily used in flame retardant foams used in building construction, but is also sometimes used in furniture upholstery and automobile textiles. Summarizing available research, the US EPA determined in 2010 that HBCD presents potential human health concerns based on animal test results indicating potential

[4] Brown and Cordner, 2011. *Lessons Learned From Flame Retardant Use and Regulation Could Enhance Future Control of Potentially Hazardous Chemicals.* Health Affairs, v. 30(5).

reproductive, developmental and neurological effects. It is now included in the EPA's List of Chemicals of Concern and is initiating action to address manufacturing, processing, distribution in commerce and use of HBCD.[5]

TDBPP, or Brominated Tris, was banned from children's sleepwear by CPSC in 1977 when research indicated potential health risks to developing children. TDBPP is on California's list of chemicals known to the State to cause cancer for purposes of the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).

Growing Concern over PBDEs: Polybrominated diphenyl ethers (PBDEs) are commonly used in building materials, electronics, furnishings, motor vehicles, polyurethane foams and textiles. The family of PDBEs consists of hundreds of closely related compounds, or 'congeners', which are sold as trademarked mixtures in the United States. OEHHA found that prior to 2006, PBDEs were the primary additive flame retardants in furniture foam.[6] There are three major mixes available commercially, defined by how many bromine rings are in the chemical compound: pentaBDE, octaBDE, and decaBDE.

PentaBDE and OctaBDE: PentaBDE is used in polyurethane foam found in upholstery, carpet, mattresses, and pillows. It is also a component of rigid foam inside computers and television sets. OctaBDE is found in hard plastic (styrene) housings of computer and television monitors, and in circuit boards.

The European Union banned the use of penta- and octaBDE in 2003. In California, both penta- and octaBDE were banned from manufacture, distribution, and processing effective 2008 (AB 302, Chan, Chapter 205, Statutes of 2003.) Subsequently, they were listed under the Stockholm Convention on Persistent Organic Pollutants (POPs), a treaty to control and remove these chemicals from production around the world.[7] As of October 2011, there were 176 participating countries in the convention, but the United States is not one of them.

The Deca Debate: DecaBDE was used as a replacement for penta- and octaBDE in high impact polystyrene used in electronics, wires, cables, pipes and textile back coatings (upholstery and drapes). DecaBDE is the dominant form of PBDE found in electronic waste and autoshredder waste. DecaBDE was found to be practically non-toxic in laboratory conditions but it is known to break down into smaller forms which are more toxic than the parent compound. In 2009, in response to growing concerns, US EPA and the three major US manufacturers of decaBDE agreed to a voluntary phase out of this chemical within 3 years.[8]

Bromine is out, Chlorine is in: Because some BFRs are banned, being phased out, or no longer on the market, companies have looked for similar products as a replacement for

[5] US EPA Hexabromocyclododecane (HBCD) Action Plan, 8/18/2010.

[6] http://oehha.ca.gov/multimedia/biomon/pdf/120408flamedoc.pdf

[7] http://www.environment.gov.au/settlements/chemicals/international/pops-2010.html

[8] http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/deccadbe.html

those no longer available. Chlorinated Tris (TDCPP) was voluntarily removed from used in children's sleepwear in the United States in 1978 when research indicated the chemical to be a mutagen and probable carcinogen. Despite that, TDCPP is the main component currently used by furniture manufacturers in polyurethane foam to meet the requirements of California's Technical Bulletin (TB) 117.[9] TDCPP is considered a probable human carcinogen by CPSC and a 'moderate hazard for cancer and reproductive and developmental effects' by the US EPA. Effective October 28, 2011**,** the Office of Environmental Health Hazard Assessment (OEHHA) added TDCPP to the list of chemicals known to the State to cause cancer for purposes of the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).[10]

Other common chlorinated flame retardants in current use include tris(2-chloroethyl) phosphate (TCEP), Tris (1-chloro-2-propyl) phosphate (TCPP), and Dechlorane Plus. TCEP is a Prop 65 listed chemical and TCPP is a World Health Organization suspected carcinogen that is under study for genotoxicity and reproductive toxicity by the National Toxicology Program of the National Institute of Environmental Health Sciences. Dechlorane Plus has been identified in environmental samples globally but exposure bioaccumulation, degradation, and toxicological effects have not been thoroughly studied.[11]

Similarity to PCBs: The structure of PBDEs is very similar to persistent environmental contaminants such as polybrominated and polychlorinated biphenyls (PBBs and PCBs). Chemicals with similar structures often have similar effects on the body. Due to PCBs' toxicity and classification as a persistent organic pollutant, PCB production was banned by the United States Congress in 1979 and by the Stockholm Convention on Persistent Organic Pollutants in 2001. Because a wide number of health effects have been associated with PCB exposure, there is concern that PBDE exposure may result in similar health effects. The Department of Toxic Substance Control (DTSC) states that "in the limited toxicity testing to date, PBDEs have produced some of the toxic effects and physiologic changes typical of many persistent polyhalogenated organic pollutants, in particular the PBBs and PCBs. These effects include developmental and nervous system toxicity, as well as mimicry of estrogen and interference with the activity of thyroid hormone. In addition, there is the potential for brominated dioxins and related compound formation during combustion of plastics containing PBDEs. Neither pentaBDEs nor octaBDEs have been tested for carcinogenicity."

Non-halogenated Flame Retardants as a Replacement: This class of chemical has begun to replace traditional BFRs in furniture and is being touted as a more "green" alternative. Simply removing the halogen component of the flame retardant does not render the chemical non-controversial, however. Firemaster 550 is a proprietary blend of chemicals that has become the major replacement for pentaBDE in furniture foam and juvenile products.[12] One of the known

[9] Shaw, *et al.* 2010. *Halogenated Flame Retardants: Do the Fire Safety Benefits Justify the Risks?* Rev Env Health, v. 25(4).
[10] http://oehha.ca.gov/prop65/prop65_list/102811list.html
[11] Sverkot, *et al.* 2011. *Dechlorane Plus and Related Compounds in the Environment: A Review.* Environ. Sci. Technol., v. 45 (12)
[12] New Materials International. 2003. Great lakes to cease production of penta PBDE flame retardant by end 2004.

chemicals in the blend is triphenyl phosphate (TPP), which is also a component in hydraulic fluid, lubricants, roofing paper, lacquers, varnish, and many other commercial applications. US EPA's Design for the Environment program predicted reproductive, neurological, and developmental toxicity and persistent degradation products from a common flame retardant mixture that contains TPP.

Risks to Human Health and the Environment

In recent years PBDE flame retardants, the most thoroughly studied of the flame retardant chemicals, have been found in the environment, in foods and in people. There is a growing body of scientific evidence of negative effects on animal and human health.

Many flame retardant chemicals are often described as persistent chemicals that bioaccumulate and are passed up the food chain to larger organisms in a process known as biomagnification. PBDEs have been found in birds, fish, shellfish, amphibians, marine mammals, sewage sludge, sediments, air samples, meats, dairy products and even vegetables in numerous North American and European locations, as well as in Japan. Cal/EPA scientists have reported the highest tissue concentrations of PBDEs measured in the world in California wildlife (shorebird eggs and fish), and rapid accumulation of PBDEs in the tissues of San Francisco Bay harbor seals. There has been extensive animal research over the past decade, indicating PBDE exposure can lead to abnormalities in learning, memory, neurodevelopment, hyperactivity, endocrine disruption, and neurotoxic effects.

In humans, PBDEs have been found to accumulate in blood, fat and breast milk. According to the Department of Toxic Substance Control, the levels of PBDEs measured in humans in the United States and Canada are typically at least 10 times higher than those in Europe, and appear to be doubling every few years.[13] More recent research has shown that PBDE exposure in humans may lead to endocrine disruption, reproductive difficulty, neurodevelopment, reduced IQ, and elevated thyroid levels.

PBDEs are structurally similar to thyroid hormones, which are very important for normal growth of the brain and nervous system. One way that PBDE exposure may cause health problems is by changing thyroid hormone levels in the body. Thyroid hormones are responsible for regulating many essential metabolic functions, and are extremely important in promoting normal brain development in infants. Researchers from the University of California, Berkeley found statistically significant associations between flame retardant levels in the blood of California women and reduced fertility. The researchers believe this link may result from alterations in thyroid hormone levels after exposure to the chemicals.

Diet and Dust: Although PBDEs have been detected in everything from food to indoor air and dust, exactly how people are exposed to PBDEs is an area of ongoing study. There are two major routes by which humans are exposed to BFRs: dietary intake and household dust. About

[13] Hooper K, McDonald TA. 2000. The PBDEs: an emerging environmental challenge and another reason for breast-milk monitoring programs. Environ Health Perspect, v. 108(5).

20% of exposure is expected to come from dietary intake in Americans, primarily through butter, seafood, and meat.[14] The remaining 80% is assumed to derive from ingestion or inhalation of contaminated dust. Because they are merely additives mixed into products, and not chemically bonded to the foam or product, they have the ability to leave the product during normal use and as products age. Infants and children have higher exposure levels due to increased hand-to-mouth contact. Additionally, concentration of PBDEs in breast milk leads to a greater exposure for nursing babies.

Certain occupations face higher exposure than the average population, such as firefighters, workers in manufacturing and recycling plants, or airport workers. Numerous studies demonstrate that firefighters have significantly elevated rates of cancer, including non-Hodgkin's lymphoma and brain cancer. A study published in the Journal of Occupational and Environmental Medicine concluded that firefighters have a significantly elevated risk of cancer that may be attributed to toxic chemicals they inhale, including flame retardants.

Addressing Environmental Persistence: Flame retardants can migrate from furniture and other products into the surrounding environment, where they may remain for many years. PBDEs have been widely used in consumer products since the 1960s. Despite that fact that they are currently being phased-out of the market, they are in products with a relatively long life span. According to European Federation of Furniture Manufacturers (UEA) statistics, in the EU, furniture waste accounts annually for more than 4% of the total municipal solid waste (MSW), of which 80-90% is incinerated or dumped in landfills, and 10% is recycled. Policy makers must consider human exposure through direct contact and house dust during the lifespan of the product, as well as environmental exposure to chemicals during incineration and in landfills.

A recent document, the "San Antonio Statement of Brominated and Chlorinated Flame Retardants", voices the concerns of prominent scientists about widespread contamination of these compounds, particularly PBDEs.[15] Despite bans and discontinuation of production, landfill disposal and release of PBDEs into the air and wastewater continue to be a major, unresolved policy issue.

Legislative History of Furniture Flammability Standards

SB 769 (Moscone, Chapter 844, Statutes of 1970) required the then Bureau of Furniture and Bedding Inspection (BFBI), to set upholstered furniture flammability standards.

AB 302 (Chan, Chapter 205, Statutes of 2003), banned the use of penta- and octa- brominated diphenyl ethers (pentaBDE or octaBDE) after January 1, 2008.

AB 513 (Leiber, 2007), would have extended the prohibition on pentaBDE or octaBDE to

[14] Schecter *et al*, 2008. *Brominated flame retardants in US food.* Mol Nutr Food Res, v. 52.
[15] DiGangi, *et al*. 2010. *San Antonio Statement on Brominated and Chlorinated Flame Retardants.* Environ Health Perspect. v. 118(12).

include decaBDE, but only with regard to electronic products. This measure failed passage on the Assembly floor.

SB 509 (Simitian, Chapter 560, Statutes of 2008), "Green chemistry," required DTSC to establish a Toxics Information Clearinghouse for the collection, maintenance, and distribution of specified chemical information.

AB 1879 (Feuer, Chapter 559, Statutes of 2008), "Green Chemistry," required DTSC to develop, in regulation, processes by which chemicals of concern and their alternatives are identified and assessed, and methods of reducing exposure are established.

AB 706 (Leno, 2008), would have required bedding products to comply with certain requirements, including not containing a chemical that doesn't comply with alternatives assessment requirements. Would have required DTSC to develop and adopt methodology for an alternatives assessment to review the classes of chemicals used to meet the fire retardance standards set by the Bureau. This measure failed passage on the Senate floor.

SB 772 (Leno, 2009), would have exempted defined juvenile products from fire retardant requirements and regulations unless the then Bureau of Home Furnishings and Thermal Insulation (BHFTI) determines the product poses a serious fire hazard. This measure failed passage in the Assembly Appropriations Committee.

SB 1291 (Leno, 2010), would have required the Department of Toxic Substances Control to include, as a chemical under consideration in the Green Chemistry process, any chemical that is used, or is proposed to be used, as a flame retardant. That bill was placed on the inactive file on the Senate Floor and died on file.

SB 147 (Leno, 2011), would have required the Bureau, on or before March 1, 2013, to modify the requirements for flammability of residential upholstered furniture to include a smolder flammability test as an alternative method of compliance. This billed failed passage in the Senate Committee on Business, Professions, and Economic Development.

AB 2197 (Mitchell, 2012), would have required the Bureau to revise regulations to require all seating furniture sold or offered for sale to meet a smolder flammability test rather than an open flame-test. This bill was not heard in the Assembly ESTM committee, at the author's request.