TECHNICAL BULLETIN

Fire Regulations and Flame Retardant Usage Trends

Chemical Insights
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Introduction

The US Flammable Fabric Act was passed in 1953 to regulate the manufacture of highly flammable clothing in response to a series of deaths in the 1940s wearing rayon clothing.[1] However, this was not enough to stop fire casualty that in 1971, President Nixon appointed the US National Commission on Fire Prevention and Control. Its final report, America Burning, was submitted in 1973; it estimated back then that fires caused 12,000 deaths, 300,000 injuries, and $11.4 billion in property damage annually.[2] One outcome from the report was the formation of US fire administration in 1974.[2] Since, though never for US nationwide, fire regulations were adopted and adapted over time. In response, flame retardant usage, which was added to reduce the risk of fire, also shifted over time. Below lists the summary of historic events and trends of fire regulations and flame retardants in consumer products, specifically on interior furniture.

Early History - Pre 2000

1. Flammable Fabric Act was amended in 1967 to include products/interior furnishings in addition to apparels and textiles.[3]
2. Beginning in the 1970s, polybrominated diphenyl ethers (PBDEs) were added as flame retardants to consumer products.
3. In 1972, the state of California required the Bureau of Home Furnishing and Thermal Insulation (now known as Bureau of Household Goods and Services) to establish an upholstered furniture flammability standard. In 1975, as a result, Technical Bulletin 117 (TB 117) was introduced, requiring filling materials of upholstered furniture to pass open flame and cigarette smolder tests. The interior foam had to withstand 12-second open flame test.[4] Most foam was treated with flame retardants to pass this test.
4. The US Consumer Product Safety Commission (established in 1973) became the government agency responsible for administration of the Flammable Fabric Act and was given the authority to issue mandatory flammability standards (on basis of investigation and research).[3,5]
5. California issued Technical Bulletin 133 in 1984, requiring open flame flammability testing of completely assembled seating as used in public buildings.[6] TB 133 is similar to NFPA 266 and ASTM E-1537.
6. NFPA 261, Standard Method of Test for Determining Resistance of Mock-up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes, was first published in 1983.[3]
7. Boston adopted California TB 133 in 1995 which eliminated their previous "Boston Fire Test".[7]
8. NFPA 266, Standard method of Test for Fire Characteristics of Upholstered Furniture Exposed to Flaming Ignition Source, was published 1998.[8]

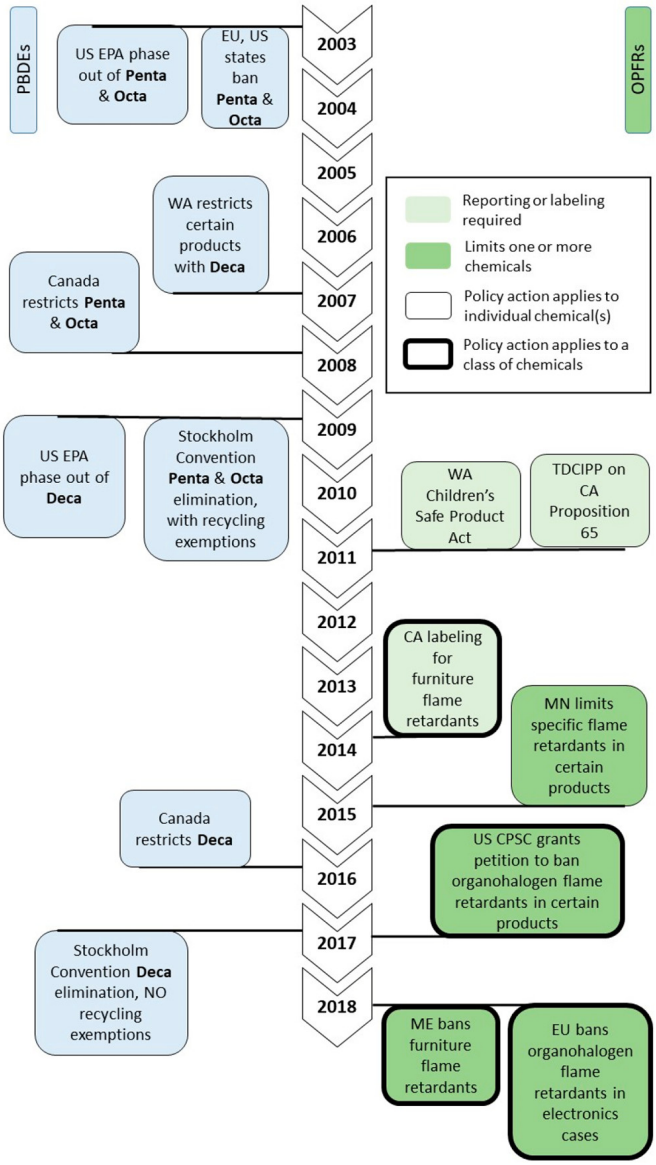

Figure 1. Timeline of regulations for PBDEs and other halogenated flame retardants[12]

a 2211 Newmarket Parkway, Suite 106, Marietta, Georgia 30067 w ulchemicalsafety.org e chemicalsafety@ul.org

Most Current - Post 2000

1. NFPA 266 was withdrawn in 2001.[8]
2. After extensive research showed that PBDEs were persistent, bioaccumulative, and toxic, in 2004 the European Commission and California banned the use of Penta- and OctaBDE, two commercial mixtures primarily used in North America.[9]
3. Since 2005, the use of PentaBDE has decreased and subsequently the exposure level of PentaBDE decreased. However, the use of alternate flame retardants increased.[10]
4. The 16 CFR 1633 is the US federal flammability standard for mattresses and mattress pads, which passed in 2006 and has been effective since 2007.[11]
5. Commercial flame retardant formulations that contain mainly organophosphate flame retardants (OPFRs) have replaced PentaBDE in residential furniture. OPFRs are organic esters of phosphoric acid-containing alkyl chains or aryl groups, and they can be halogenated (often bromine or chlorine) or nonhalogenated.
6. Research suggests that the entire class of organohalogen flame retardants may have hazardous properties.[12]
7. In the US, state specific bills are prohibiting or requiring reporting/labeling if (especially children's) products contain halogenated flame retardants.[12]
8. In 2008, Washington's Children's Safe Products Act was passed. Since then, specific flame retardants including bromine and chlorine (for example, tris(1,3-dichloro-2-propyl) phosphate (TDCPP), tris(2-chloroethyl) phosphate (TCEP), hexabromocyclododecane (HBCD), and 2,2-bis(chloromethyl)-propane-1,3-diyltetrakis(2-chloroethyl) bisphosphate (known as V6)) have been added to the Chemicals of high concern to children reporting list.[13]
9. In 2008, the US Consumer Product Safety Commission (CPSC) issued a Notice of Proposed Rulemaking, a flammability standard for residential upholstered furniture under the Flammable Fabrics Act (FFA), with the goal of reducing the risk of smoldering ignition fires, or those typically caused by a burning cigarette.[14]
10. In 2009, the US EPA negotiated the phase-out of DecaBDE production in addition to Penta- and OctaBDE.[9] Penta- and OctaBDE were added to the Stockholm Convention.[15]
11. In 2011, TDCPP was added to California Proposition 65 list.[16]
12. In March 2012, the Chicago Tribune published a series of articles outlining the health hazards of flame retardants.[17]
13. In 2012, the California governor directed state agencies to revise home furniture flammability standards so that fire safety could be achieved without added flame retardants.[18]
14. California requires labeling of upholstered furniture for the presence or absence of flame retardants according to SB 1019, 2014.[19]
15. California Technical Bulletin 117 or TB 117 was updated to TB 117-2013 to a smolder only test, a rule designed to make upholstered furniture safer from the hazard of a smoldering fire, such as a burning cigarette, and without the need for flame retardant use. TB 117-2013 outlines how to test individual components - cover fabric, barrier material, resilient filling material and decking material - of upholstered furniture. Manufacturers began using materials that passed the updated testing methods as of January 1, 2014, and had to meet the new standard on January 1, 2015 in California.[20] Additional test references include NFPA 260 and ASTM 1353.
16. NFPA initiated development of a new standard NFPA 277, test method for evaluating fire and ignition resistance of upholstered furniture from an open flame ignition source, in 2014. However the NFPA Standards Council has voted to not move forward for processing of the standard.[21]
17. Starting in 2015, Maine started to restrict the use of flame retardants in new furniture, especially for residential furniture.[22,23]
18. In 2016, Massachusetts Fire Code was changed to say that in sprinklered spaces, California TB 133 is not required and just needs to comply with California TB 117-2013. If the space is not sprinkler protected, compliance with TB 133 is still required.[24]
19. DecaBDE was added to the Stockholm Convention in 2017 and similarly phased out of use in most countries.
20. In 2017, CPSC accepted a petition to ban furniture, children's products, electronic enclosures, and mattresses containing any member of the class of organohalogen flame retardants.[25]
21. As the class of organohalogen flame retardants is declining due to regulatory action and manufacturers' voluntary actions, the use of non-halogenated OPFRs is increasing.[12]
22. Though not in furniture, EU prohibited the use of halogenated flame retardants in enclosures and stands of electronics in 2018; use of flame retardants must be identified on a label.[26]
23. In 2019, California published TB 116, Testing the Flame Retardance of Upholstered Furniture, which is a holistic smoldering testing rather than by components.[27] This is similar to NFPA 261.
24. The California furniture flammability standard for furniture in public facilities, TB 133, was repealed in 2019.[28]
25. As of 2019, a new upholstered residential furniture sold in Maine cannot contain any chemical flame retardant in an amount greater than 0.1% or 0.1% of a mixture.[22,23]
26. As of January 2020, California bans the sale of upholstered/reupholstered furniture, mattresses, and juvenile products that contain chemical flame retardant at levels above 1000 ppm.[29]
27. The furniture industry and state regulators estimate that as of January 2020, the vast majority of residential and business furniture manufactured in the US is made without flame retardants in the foam.[30] Alternative flammability reduction technologies are not implemented most of the time.
28. Today, EN1021-1 (smoldering test on cover fabric and foam) and -2 (match equivalent open flame test) are valid

throughout the European Union.[31] Some countries have their own national tests; for example DIN 54342 : 1/2 in Germany, NFP 92- 503 through 505 in France, and BS 5852 : 1990, BS 7176:1995, and BS 476:Part 7 in the United Kingdom.[7]

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