



Green Science Policy Institute

Flame Retardants & Six Classes of Harmful Chemicals How Science Can Impact Policy & Purchasing

Arlene Blum PhD

University of California, Berkeley

Green Science Policy Institute

U.S. Toxic Substances Control Act (1976)

- 62,000 previous chemicals “grandfathered”
- 20,000 new chemicals
 - 85% have no health data
 - 67% have no data at all



Chronic Long Term Health Impacts

PROTECT YOUR CHILDREN Against Disease-Carrying Insects!



TRIMZ DDT
REG. U. S. PAT. OFF.
CHILDREN'S ROOM
WALLPAPER and Ceiling Paper

KILLS FLIES, MOSQUITOS, ANTS

... as well as moths, bedbugs, silverfish and other household pests after contact!

MEDICAL SCIENCE KNOWS many common insects breed in filth, live in filth and carry disease. Science also recognizes the dangers that are present when these disease-carrying insects invade the home. Actual tests have proved that *one* fly can carry as many as 6,600,000 bacteria! Imagine the health hazard—especially to children—from flies seriously suspected of transmitting such diseases as scarlet fever, measles, typhoid, diarrhea . . . even dread polio! Some types of mosquitos carry malaria and yellow fever. And *any* mosquito bite is painful and easily infected when scratched.

NON-HAZARDOUS to children or adults, to pets or clothes. *Certified* to be absolutely safe for home use. Tested and commended by *Parents' Magazine*.

GUARANTEED effective against disease-carrying insects for 1 year. Actual tests have proven the insect-killing properties still effective after 2 years of use.

NO SPRAYS! NO LIQUIDS! NO POWDERS! So convenient, so safe because the DDT is fixed to the paper. It can't rub off!

BEAUTIFUL! "Jack and Jill" or "Disney Favorites"—gay new patterns that *protect* as they *beautify* a child's room.

DDT CEILING PAPERS, TOO! Extra protection for your children's room—for every other room in the house. Choice of two tints.

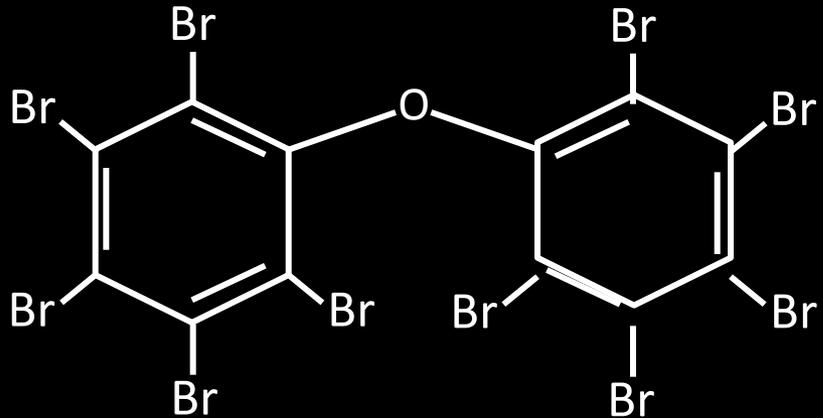


Human Toxicological Trial?

“We are conducting a massive clinical toxicological trial, and our children and our children's children are the experimental subjects.”

-Herbert Needleman & Philip Landrigan

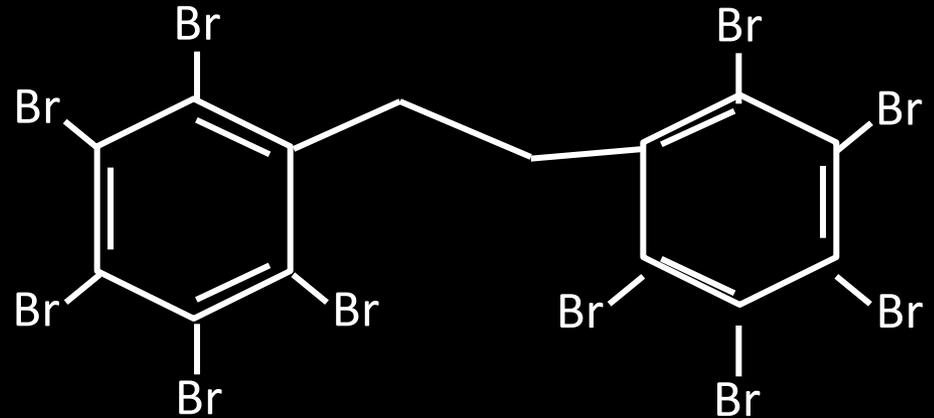
Regrettable Substitution



Decabromodiphenyl
ether

Concerns:

- Persistence
- Bioaccumulation
- Toxicity



Decabromodiphenyl
ethane

Concerns:

- Persistence
- Bioaccumulation
- Toxicity

One Solution: SixClasses.org



1. **Fluorinated chemicals**

stain and water repellants

2. **Chlorinated antimicrobials**

triclosan and triclocarban

3. **Flame retardants**

brominated, chlorinated, phosphate

4. **Bisphenols and phthalates**

BPA, phthalates, etc.

5. **Some organic solvents**

benzene, methylene chloride, xylene, etc.

6. **Some metals**

lead, mercury, chromium, cadmium, arsenic,

Is it necessary?

Is it worth it?

Is there a safer alternative?

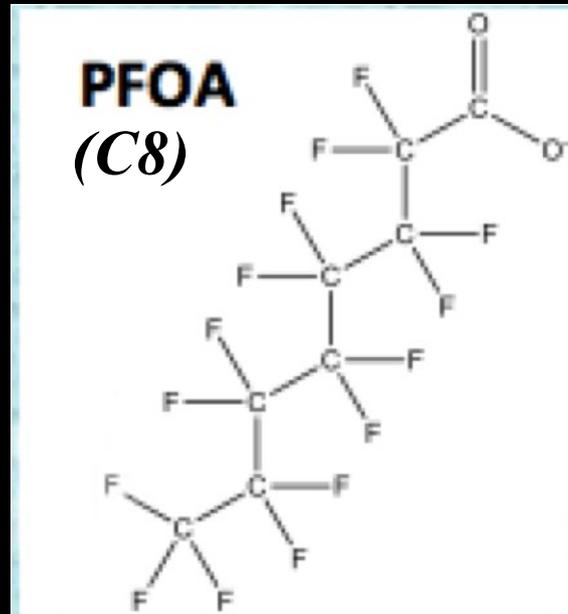
Green Chemistry



Green chemistry is the design of chemical products that reduces the use of hazardous substances.

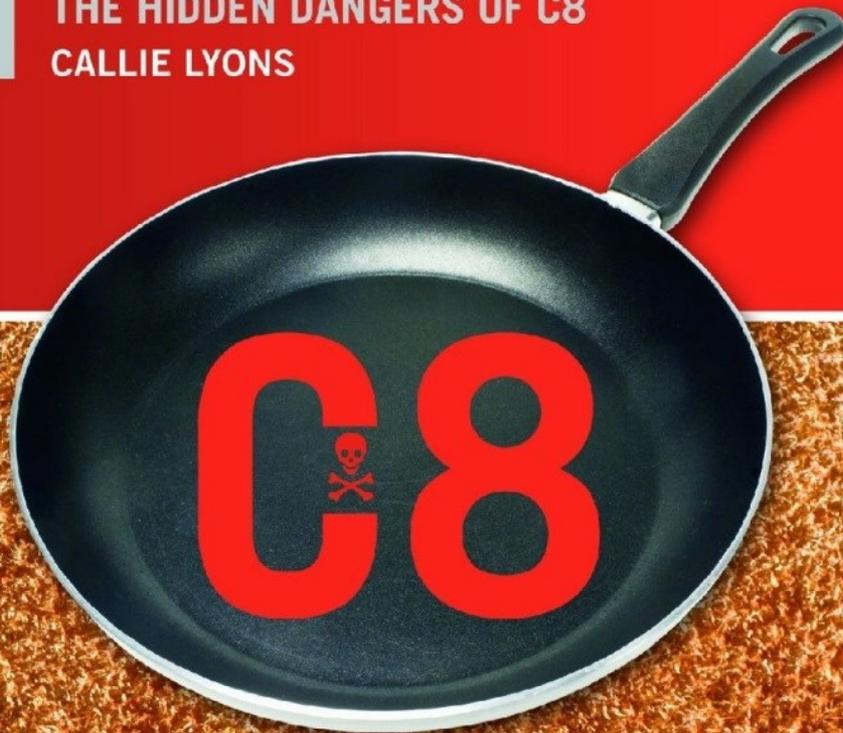
Class 1: Fluorinated Chemicals (PFAS)

- Carbon-Fluorine is the strongest bonds in nature
- This results in unique properties:
 - Oil and water repellency
 - Does not break down



**STAIN-RESISTANT,
NONSTICK, WATERPROOF,
AND LETHAL**

**THE HIDDEN DANGERS OF C8
CALLIE LYONS**



Fluorochemicals are used in:



Human Toxicology

- PFOS and PFOA persist in the body for years
- Health effects linked to exposure to PFOA:
 - Kidney, prostate, ovarian, and testicular cancer
 - Thyroid disease
 - Delayed puberty, decreased fertility (women) and early menopause
 - Reduced testosterone levels
 - Reduced immune response in children
 - Elevated cholesterol

C8 replaced with thirty forms of C6



- Persistent, a family trait
- In groundwater, wastewater, & seawater
- Limited toxicology data
- Increasing C6 levels in human blood
- Can causes cell changes associated with tumors

The Madrid Statement

Documents the scientific consensus regarding the persistence and potential for harm of poly- and perfluoroalkyl substances (PFAS), and lays out a roadmap to gather needed information and prevent further harm.



Photo credit: Flickr @ Turismo Madrid

Brands can eliminate all PFASs from products



MANGO

As of July 2013



As of August 2014



As of October 2014



As of January 2015

As of January 2013



By July 2015



By July 2015



By December 2015



By December 2015



By December 2015



By December 2015



By July 2016



By July 2016



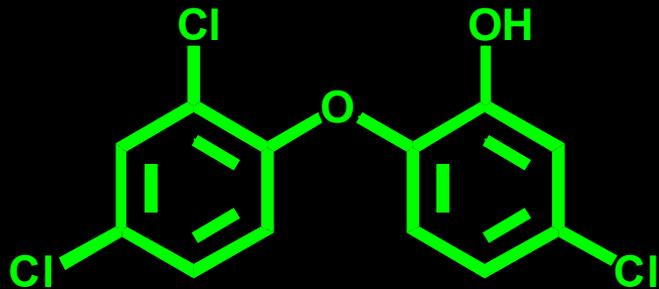
By December 2017



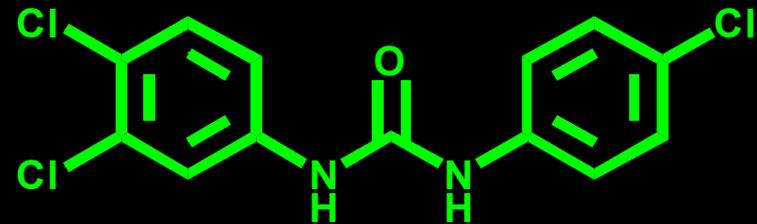
99% PFAS-free by December 2017

Class 2: Antimicrobials

Triclosan



Triclocarban



Antimicrobials are used in...

- Disinfectants
- soap, mouthwash, detergent, shampoo
- Deodorant/clothing
- Toothpaste
- Cosmetics
- Kitchen supplies, furniture
- Toys, school supplies, sports equipment



Do we need them?

- Might be helpful in toothpaste for gum disease
- No proven benefit over soap & water
- Ineffective in flooring and plastic

NO EVIDENCE ANTIMICROBIALS REDUCE INFECTIONS



Class 3 Flame retardants

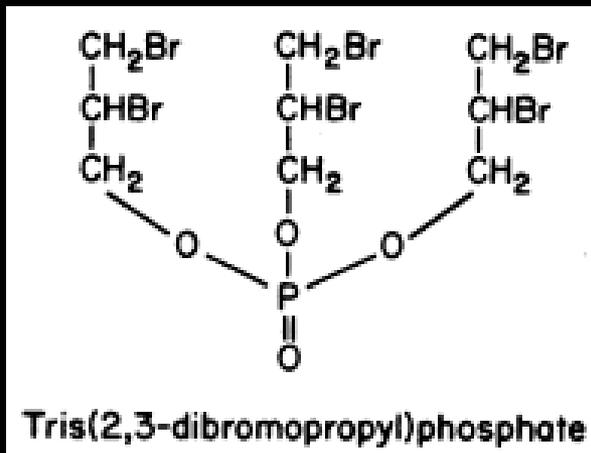
1970s Flammability Standards

- Children's sleepwear
- Furniture
- Foam plastic building insulation

Brominated Tris Flame Retardant

Tris (2,3-dibromopropyl) phosphate

- In children's sleepwear 1975 to 1977
- Up to 10% of the weight of fabric
- In children's urine
- Mutagen and possible carcinogen



Flame-Retardant Additives as Possible Cancer Hazards

**The main flame retardant in children's pajamas is a
mutagen and should not be used.**

Arlene Blum and Bruce N. Ames



**U.S. Consumer Product
Safety Commission**

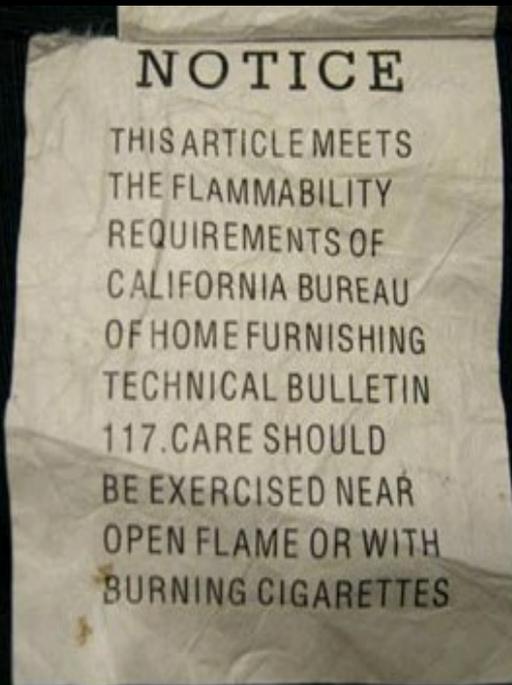
TRIS-Treated Children's Garments Banned

April , 1977

Chlorinated Tris replaced Brominated Tris

- Removed from pajamas in 1978
- Used in furniture until 2012

Technical Bulletin 117



- Required furniture foam to withstand a small open flame for 12 seconds
- No significant fire safety benefit (fires start in exterior fabric not filling)

Animal health effects

- **Chronic toxicity: long term impacts**
 - **Endocrine disruption:** Interference with thyroid hormone action
 - **Neurodevelopment:** Decreased memory, learning deficits, altered motor behavior, hyperactivity
 - **Reproductive system effects:** Abnormal gonadal development, reduced ovarian follicles, reduced sperm count
 - **Immune suppression**
 - **Cancer**

Human Health

Higher pentaBDE

associated with

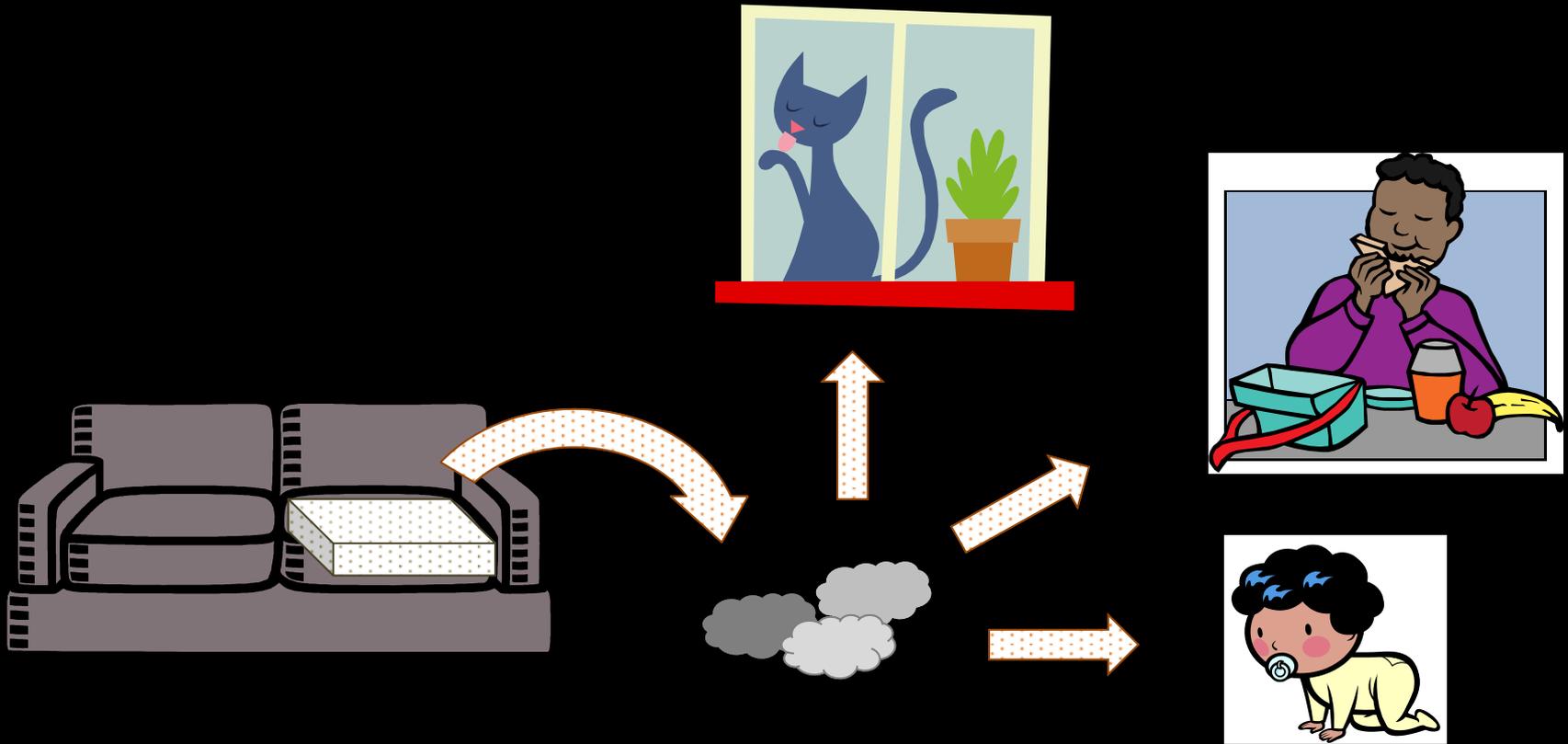
lower birth weight
impaired attention
poorer coordination
lowered IQ



longer time to get pregnant
altered thyroid hormones

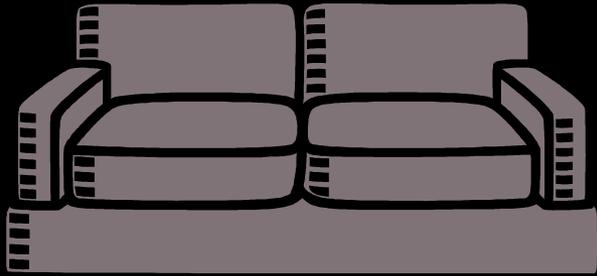


From Products to People



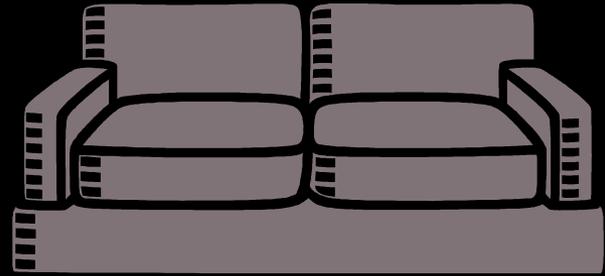
TB117 Fire Safety Benefit?

TB117 foam



~

Non - TB117 foam



“No significant, consistent difference...”

Increased fire safety without flame retardants



Assembly Bill 706, Senate Bill 772, Senate Bill 1291, Senate Bill 147

A DEADLY MISTAKE

Help stop the bill that will ban material used to make flame resistant products.

CALL YOUR STATE SENATOR TODAY AND TELL THEM TO **VOTE NO ON AB 706**

Call State Senator **Tom Torlakson** at **916-651-4007** and tell him to **VOTE NO** on AB 706.

P-15 P25 *****ECRLOT**C018

Richmond, CA 94804-5339

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DON'T LET THE SACRAMENTO POLITICIANS BAN THE USE OF PROVEN FLAME RETARDANTS-IT COULD BE A DEADLY MISTAKE

Paid for by Californians for Fire Safety:

- Albemarle
- Chemtura
- Israel Chemicals LTD (ICL)

ES&T Top Science Paper of 2011

Environmental Science & Technology | 3b2 | vez9 | 4/5/011 | 16:11 | Mec: es-2011-007462 | TEID: sls00 | BATID: 00000 | Pages: 8.52

ENVIRONMENTAL
Science & Technology

ARTICLE

pubs.acs.org/est

1 Identification of Flame Retardants in Polyurethane Foam Collected 2 from Baby Products

3 Heather M. Stapleton,^{*,†} Susan Klosterhaus,[‡] Alex Keller,[†] P. Lee Ferguson,[†] Saskia van Bergen,[§]
4 Ellen Cooper,[†] Thomas F. Webster,^{||} and Arlene Blum[⊥]

5 [†]Nicholas School of the Environment, Duke University, Durham, North Carolina, United States

6 [‡]San Francisco Estuary Institute, Oakland, California, United States

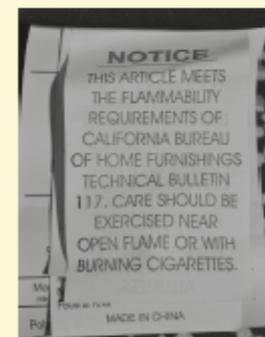
7 [§]East Bay Municipal Utility District, Oakland, California, United States

8 ^{||}Department of Environmental Health, Boston University School of Public Health, Boston, Massachusetts, United States

9 [⊥]Department of Chemistry, University of California, and Green Science Policy Institute, Berkeley, California, United States

10 **S** Supporting Information

11 **ABSTRACT:** With the phase-out of PentaBDE in 2004, alternative flame retardants are being used in
12 polyurethane foam to meet flammability standards. However, insufficient information is available on
13 the identity of the flame retardants currently in use. Baby products containing polyurethane foam
14 must meet California state furniture flammability standards, which likely affects the use of flame
15 retardants in baby products throughout the U.S. However, it is unclear which products contain flame
16 retardants and at what concentrations. In this study we surveyed baby products containing
17 polyurethane foam to investigate how often flame retardants were used in these products.
18 Information on when the products were purchased and whether they contained a label indicating
19 that the product meets requirements for a California flammability standard were recorded. When
20 possible, we identified the flame retardants being used and their concentrations in the foam. Foam
21 samples collected from 101 commonly used baby products were analyzed. Eighty samples contained
22 an identifiable flame retardant additive, and all but one of these was either chlorinated or brominated.
23 The most common flame retardant detected was tris(1,3-dichloroisopropyl) phosphate (TDCPP;
24 detection frequency 36%), followed by components typically found in the Firemaster550 commercial mixture (detection frequency
25 17%). Five samples contained PBDE congeners commonly associated with PentaBDE, suggesting products with PentaBDE are still
26 in-use. Two chlorinated organophosphate flame retardants not previously documented in the environment were also identified, one



California Flammability Standard

- Pillows
- Comforters,
- Mattress pads **Suspended**



NOTICE OF SUSPENSION

Technical Bulletin 604 Proposed Flammability Test Method for Bedclothing Products

The Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation (Bureau) has suspended its effort to begin the formal rulemaking process to implement Technical Bulletin 604, the proposed flammability standard for filled bedclothing products.



TRIBUNE WATCHDOG

Playing with fire

A deceptive campaign by industry brought toxic flame retardants into our homes and into our bodies. And the chemicals don't even work as promised.

BY PATRICIA CALLAHAN AND SAM ROE
Tribune reporters

Dr. David Heimbach knows how to tell a story. Before California lawmakers last year, the noted burn surgeon drew gasps from the crowd as he described a 7-week-old baby girl who was burned in a fire started by a candle while she lay on a pillow that lacked flame retardant chemicals.

"Now this is a tiny little person, no bigger than my Italian greyhound at home," said Heimbach, gesturing to approximate the baby's size. "Half of her body was severely burned. She ultimately died after about three weeks of pain and misery in the hospital."

Heimbach's passionate testimony about the baby's death made the long-term health concerns about flame retardants voiced by doctors, environmentalists and even firefighters sound abstract and petty.

But there was a problem with his testimony: It wasn't true. Records show there was no dangerous pillow or candle fire. The baby he described didn't exist.

Neither did the 9-week-old patient who Heimbach told California legislators died in a candle fire in 2009. Nor did the 6-week-old patient who he told Alaska lawmakers was fatally burned in her crib in 2010.

Heimbach is not just a prominent burn doctor. He is a star witness for the manufacturers of flame retardants.

His testimony, the Tribune found, is part of a decades-long campaign of deception that has loaded the furniture and electronics in American homes with pounds of toxic chemicals linked to cancer, neurological deficits, developmental problems and impaired fertility.

The tactics started with Big Tobacco, which wanted to shift focus away from cigarettes as the cause of fire deaths, and continued as chemical companies worked to preserve a lucrative market for their products, according to a Tribune review of thousands of government, scientific and internal industry

stoked the public's fear of fire and helped organize and steer an association of top fire officials that spent more than a decade campaigning for their cause.

Today, scientists know that some flame retardants escape from household products and settle in dust. That's why toddlers, who play on the floor and put things in their mouths, generally have far higher levels of these chemicals in their bodies than their parents.

Blood levels of certain widely used flame retardants doubled in adults every two to five years between 1970 and 2004. More recent studies show levels haven't declined in the U.S. even though some of the chemicals have been pulled from the market. A typical American baby is born with the highest recorded concentrations of flame retardants among infants in the world.

People might be willing to accept the health risks if the



Pulitzer Prize

Finalist

Goldsmith Prize

Investigative Reporting

Environmental

Journalists Society

Environmental Reporting

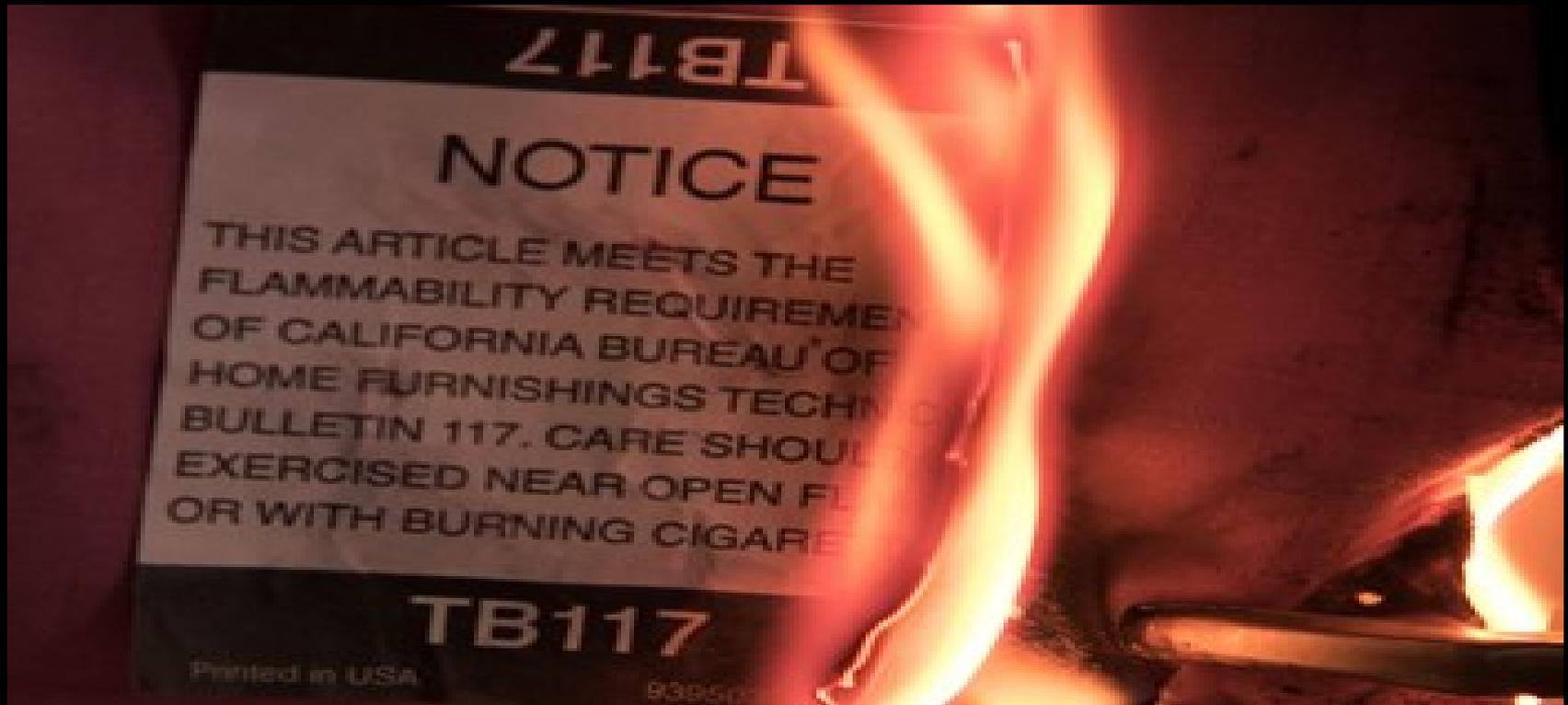
Gerald Loeb Award

Business and Financial Journalism

National Press Club

Consumer Award

Toxic Hot Seat



A film about stopping the use of the harmful and ineffective flame retardants in furniture and baby products

Rent it at <http://vimeo.com/ondemand/toxichotseat>



Office of Governor

Edmund G. Brown Jr.



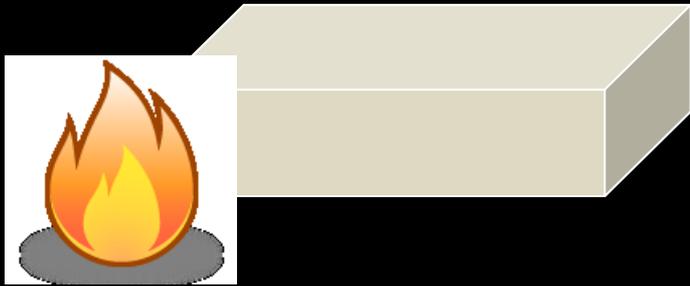
June 18, 2012

Governor Brown Directs State Agencies to Revise Flammability Standards

'We must find better ways to meet fire safety standards by reducing and eliminating - wherever possible - dangerous chemicals.'

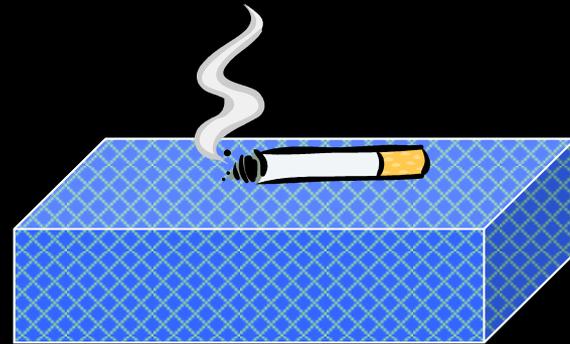
Open flame versus smolder?

TB117 regulates
furniture filling



- Flame retardants used to meet this open flame standard

Fires start on fabric



- Most start with smoldering:
- Cigarettes
 - Electrical sources

California Flammability Standard TB117-2013

- Mandatory January 1, 2015
- Flame retardants not needed, but can still be used

Senate Bill 1019

- Effective January 1, 2015
for products that meet
TB117-2013

NOTICE

THIS ARTICLE MEETS THE FLAMMABILITY REQUIREMENTS OF CALIFORNIA BUREAU OF ELECTRONIC AND APPLIANCE REPAIR, HOME FURNISHINGS AND THERMAL INSULATION TECHNICAL BULLETIN 117-2013. CARE SHOULD BE EXERCISED NEAR OPEN FLAME OR WITH BURNING CIGARETTES.

The upholstery materials in this product:

contain added flame retardant chemicals
 contain NO added flame retardant chemicals

The State of California has updated the flammability standard and determined the fire safety requirements for this product can be met without adding flame retardant chemicals. The State has identified many flame retardant chemicals as being known to, or strongly suspected of, adversely impacting human health or development.

TB117 and baby products

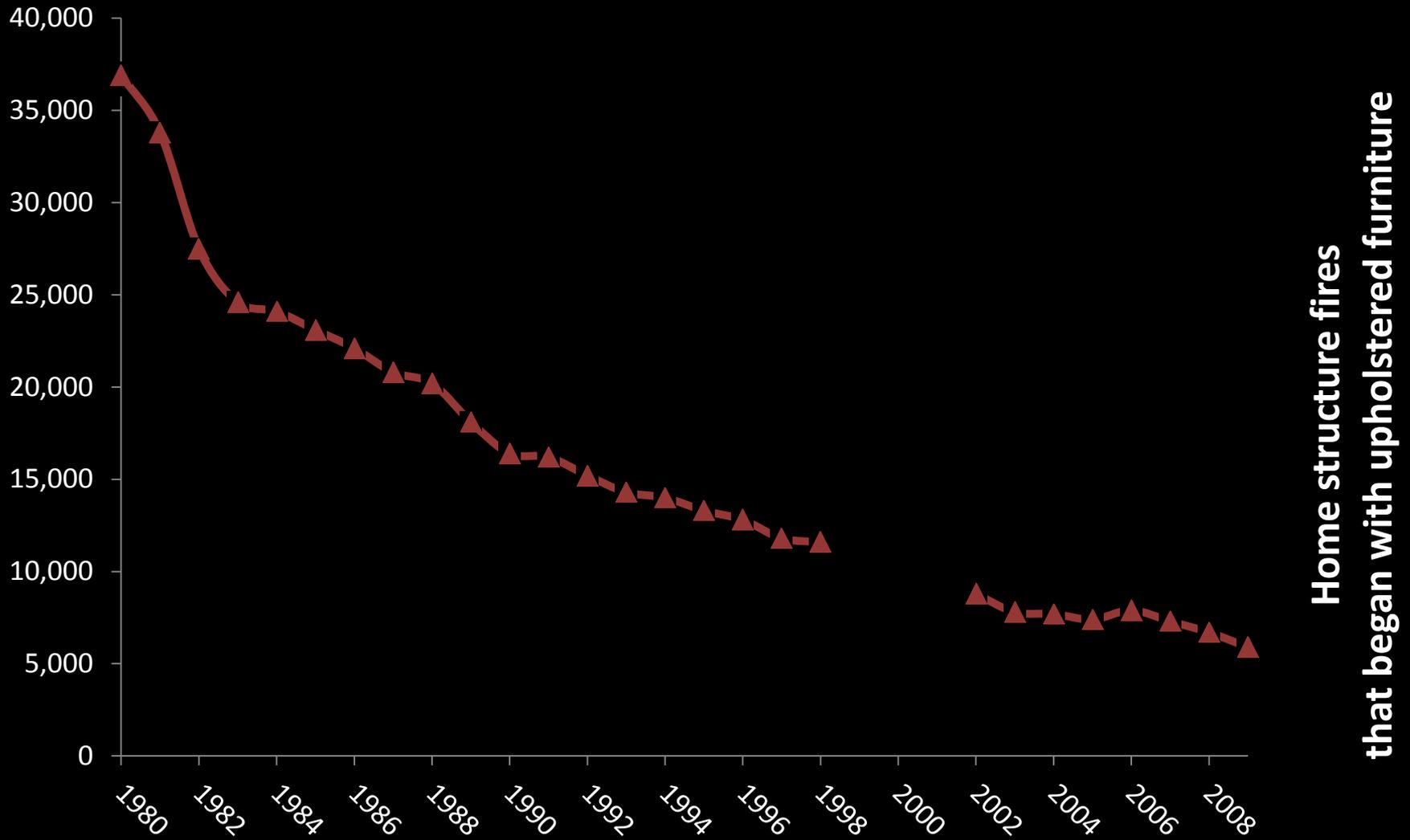
– December 2010: three exempted



– January 1, 2014: 15 more exempted



Fires that start in furniture are decreasing



Home structure fires
that began with upholstered furniture

Fire safety tools

- Decrease in smoking/ fire-safe cigarettes
 - Fire-safe candles, child-safe lighters
 - Smoke detectors/ alarms
 - Sprinklers
 - Work of fire service
 - Fire codes
 - Fire safety education
 - Furniture regulations
 - Smolder standard: TB117-2013
 - Open flame: TB117
- (Open flame standards have potential for harm)



When Product Safety and the Environment Appear to Collide:
**The Defeat of the Candle
Flame Ignition Requirement**

by Michael Kirschner, Design Chain Associates, and
Arlene Blum, Ph.D., Green Science Policy Institute

Conformity, January 2009

Electronic Housings Candle Ignition Requirements



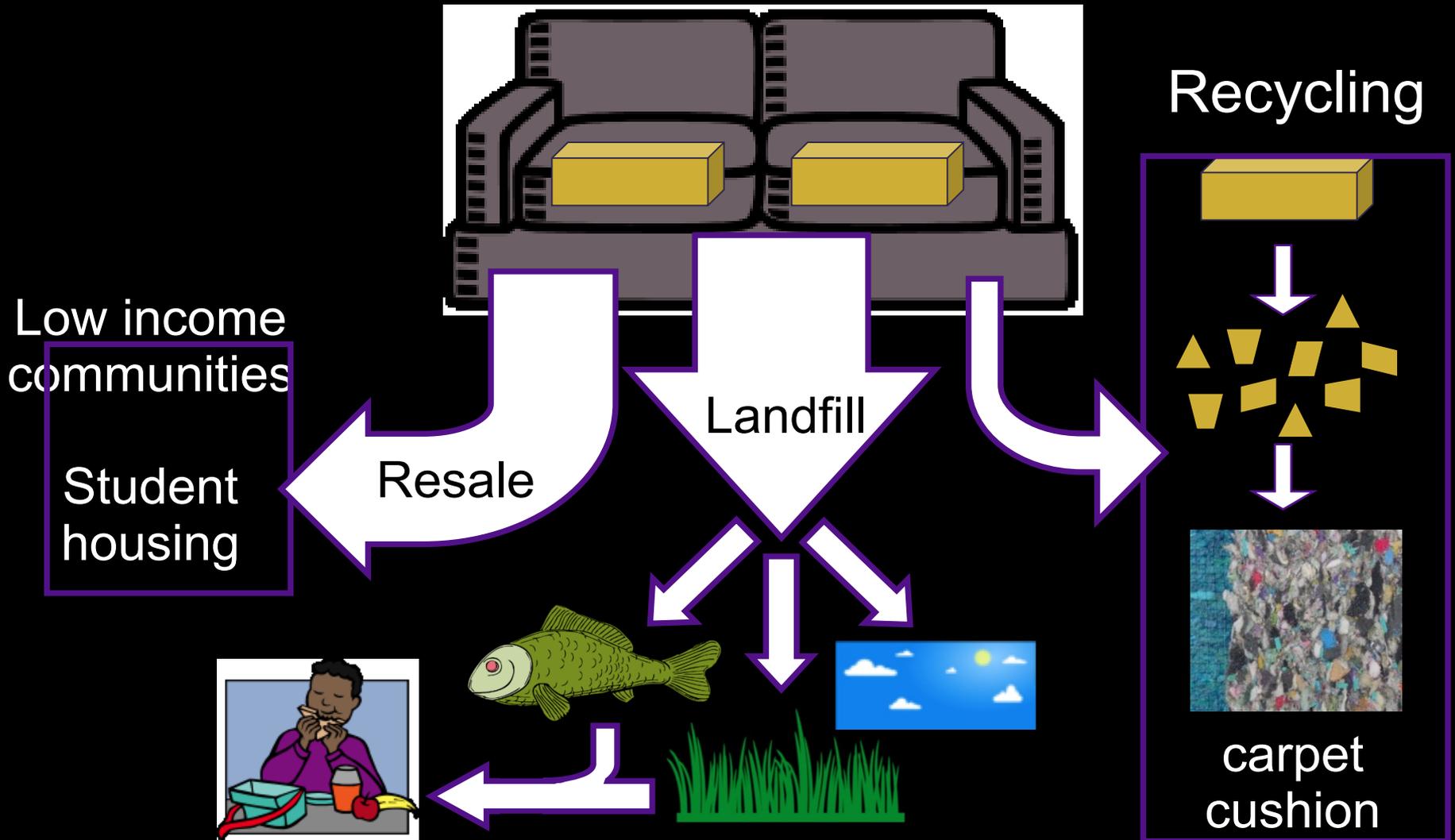
International Electrotechnical Commission

- 2002 IEC candle standard process initiated
- 2008 Two IEC, one EU electronics standard prevented
- 2008 One U.S. and one Canadian standard prevented
- 2008 EU Candle standard for TVs passed
- 2012 IEC candle standards for TVs prevented
- 2013 EU candle standards for TVs rolled back
- 2014 EU Common modification prevented
- 2015 EU, IEC candle standard prevented
- 2015 Two new EU, IEC candle standards in May

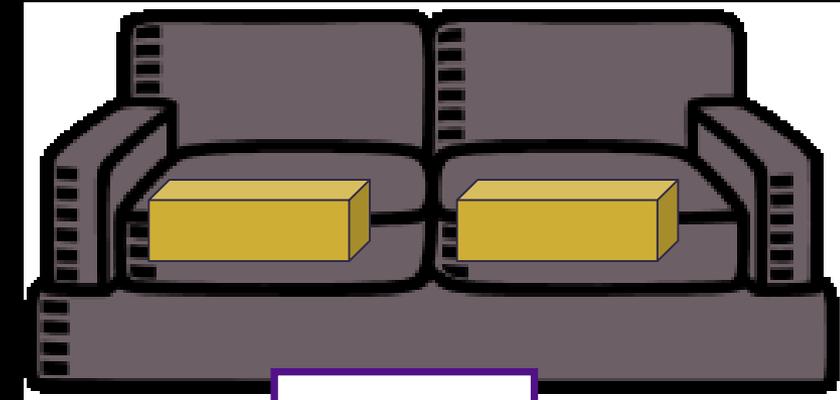


97 ppm to 3 ppm

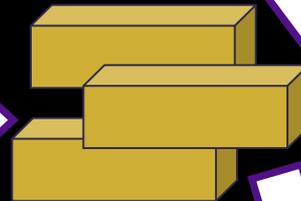
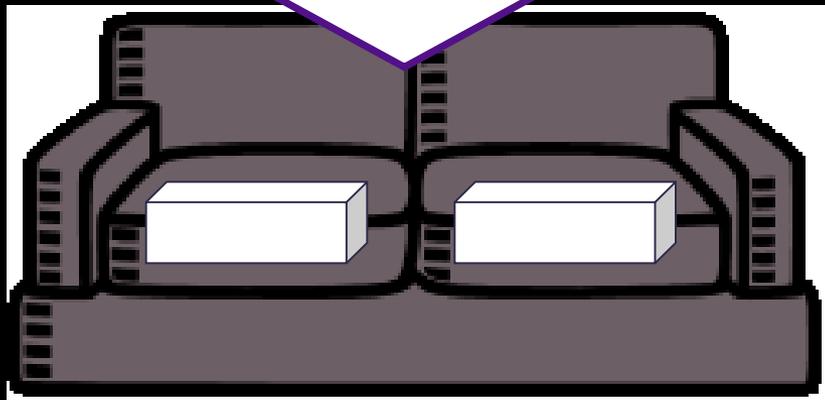
Where does flame retarded foam end up?



Better Solutions

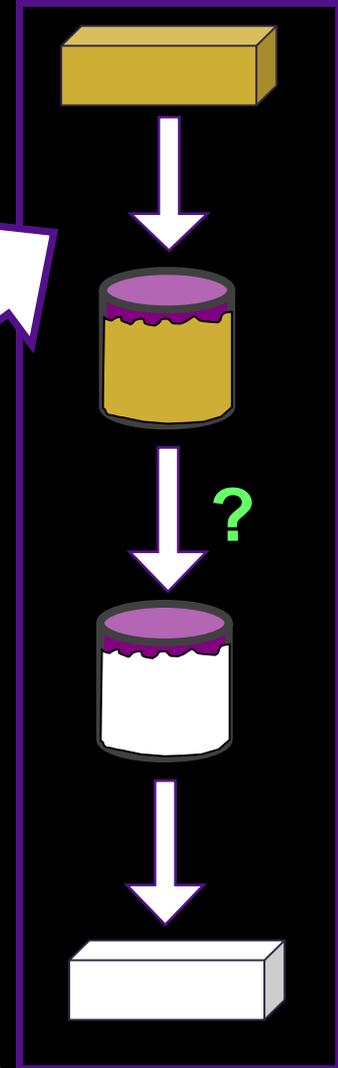


Foam Exchange



High Temp Combustion??

Chemical Recycling?



What to do with millions of foam and plastic items with harmful flame retardants?

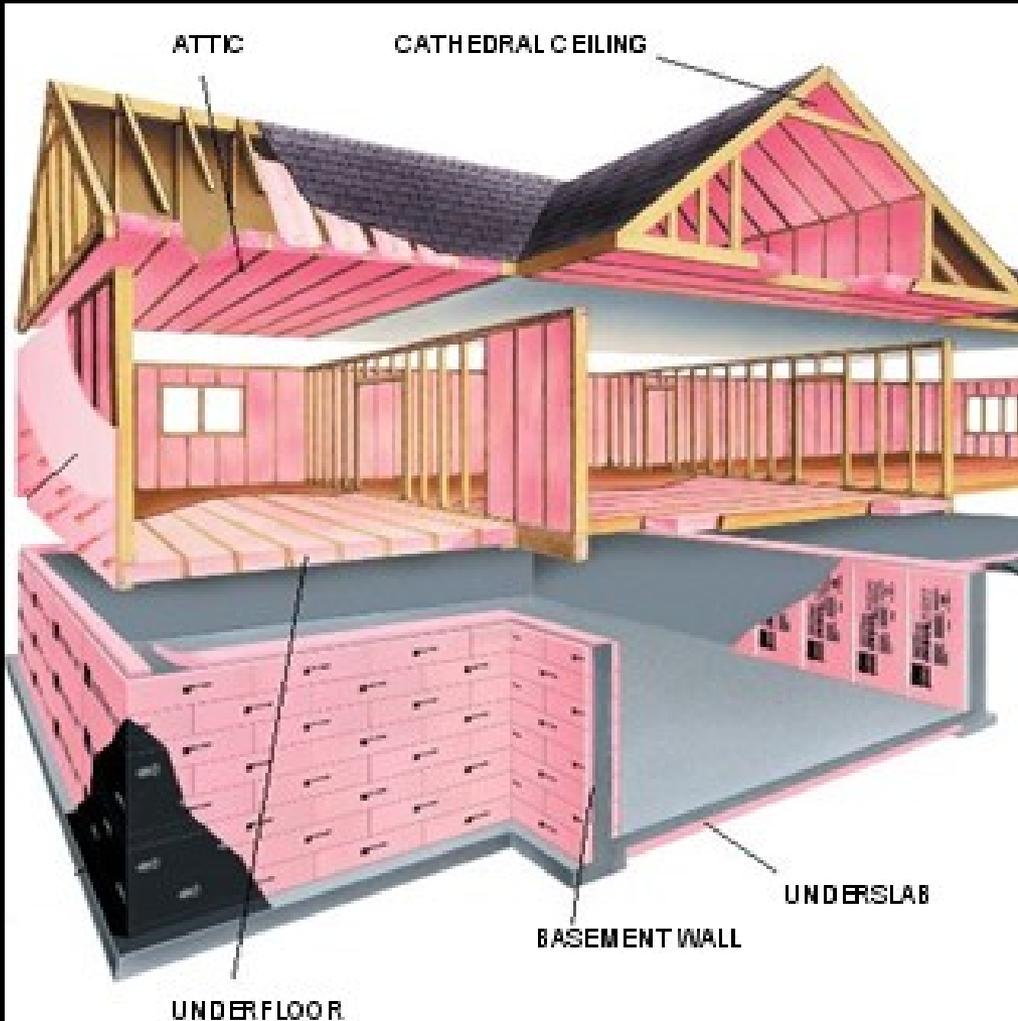
2 day workshop hosted by UC Berkeley and GSP
November, 2015
Washington, DC

For more information, contact:
Donald Lucas
D_lucas@lbl.gov
510-316-6764



Foam Plastic Insulation

(polystyrene, polyurethane, polyiso, etc.)



Used increasingly for energy efficiency

Can be used:

- inside walls
- below grade
- attics, etc.

INFORMATION PAPER

Flame retardants in building insulation: a case for re-evaluating building codes

Vytenis Babrauskas¹, Donald Lucas², David Eisenberg³, Veena Singla⁴,
Michel Dedeo⁴ and Arlene Blum^{4,5}

Download at:
saferinsulation.greensciencepolicy.org

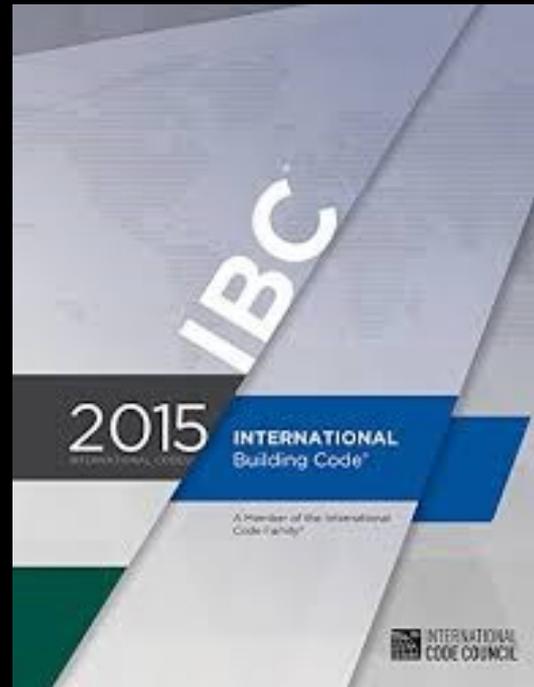
California AB 127 (2013)

Review of insulation flammability standards

- State fire marshal may propose updates that:
 - Maintain overall fire safety
 - Provide flexibility in meeting fire safety standards with or without chemical flame retardants
- Possible proposal to the CA Building Standards Commission:
 - Insulation below grade may be used without FRs

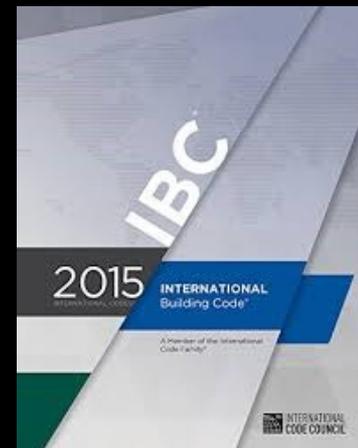
2018 International Building Code (IBC)

- Allow foam plastic insulation without FRs when fully protected below grade



2018 International Building Code (IBC)

- We are seeking support:
 - At ICC hearings:
 - April 19 – 30, 2015 Memphis, TN
 - Sept 30 – Oct 7, 2015 Long Beach, CA
 - Letters IBC Fire Safety Committee
- Contact:
avery@GreenSciencePolicy.org



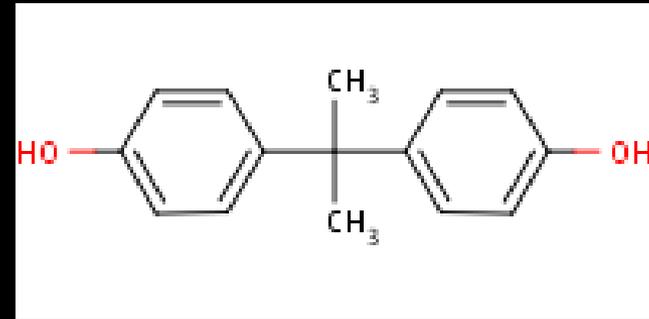
What to do?

- Replace the foam in your furniture.
- Buy furniture with a TB117-2013 label
 - Look for products without added flame retardants
- Vacuum, wet mop, hand wash

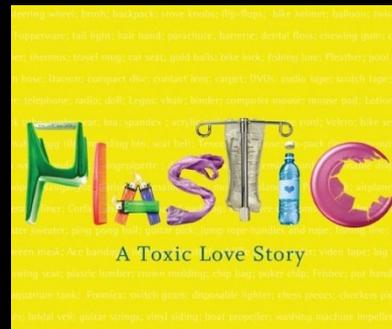


<http://greensciencepolicy.org/consumers>

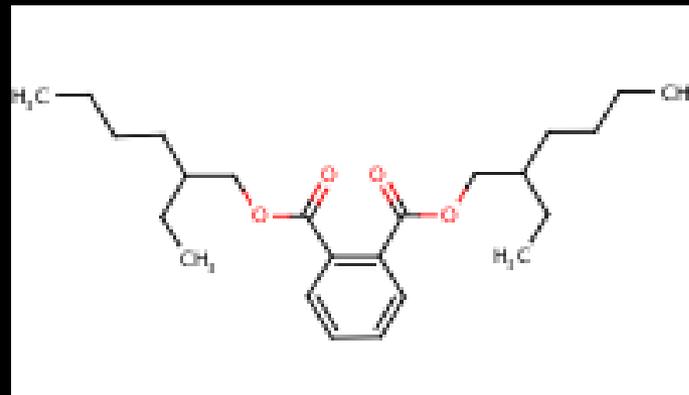
Class 4a Bisphenols



- Polycarbonate resins (hard plastics)
- Epoxy resins (linings)
- Thermal cash register receipt paper and in other products



Class 4b Phthalates



- Uses
 - Makes plastics softer and more flexible
 - Makes fragrances last longer



Class 5: Certain Solvents

(aliphatic, aromatic, halogenated, oxygenated)

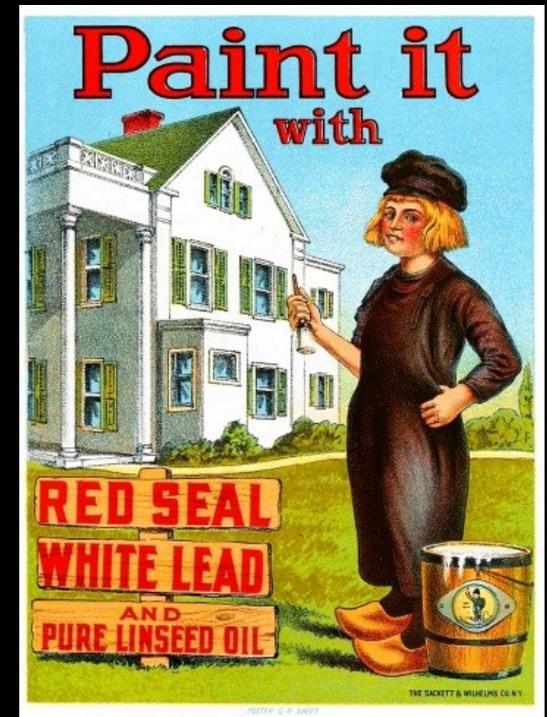
- Hydrocarbon solvents
 - Aliphatic organic solvents (petroleum-based)
 - Aromatic organic solvents (toluene, xylene, benzene)
- Chlorinated solvents
 - E.g., Methylene chloride, perc, TCE
- Oxygenated solvents
 - Acetone, glycol ethers, alcohols



Class 6: Certain Metals

(arsenic, cadmium, chromium, lead, mercury etc.)

- Can display toxicity at extremely low doses



Benefits of the Class Approach

- Minimize regrettable substitutions
- Simple tool for decision makers
- Facilitate better choices for manufacturers, retailers, large purchasers.

Effective at reducing harmful chemicals in products

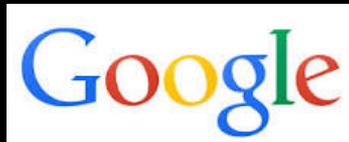


s i x c l a s s e s . o r g

SixClasses.org

15-minute webinars on Six Classes
containing harmful chemicals in consumer products.

“Buyers’ Club” for Healthier Building Materials



- Require transparency from manufacturers about chemicals in products and building materials
- Utilize collective purchasing power to create a demand for healthy products and materials

China

The largest user of flame retardants

Flame-retarding textile, fiber, decoration material, carpet, blankets, and fabric

Flame-retarding; lumber, decoration board, soft foam/hard foam of polyurethane

Flame-retarding/fire proof coating, plastic of flame-retarding engineering,

Flame-retarding wire cable and insulation material,



International Flame-retarding Exhibitions:

The Fire Bureau of the Ministry of Public Security requirement on products in public places will bring a bright prospect to China's flame-retarding industry.

<http://www.flameexpo.com/en/>



For more information
www.greensciencepolicy.org
to join our e-list

**Please give Arlene your card
Or sign our e-list**

WITH THANKS TO:

The New York Community Trust,

The Green Science Policy Institute Team:

Avery Lindeman

Simona Yi-Balan

Caroline Clarke

Veronica Chin

Don Lucas

Eileen Kramer

Anna Soehl

Gretta Goldenman

By reducing use of Harmful Chemical Classes

We can have a healthier world.

**For more information
Google: Green Science Policy
www.greensciencepolicy.org**

