Flame Retardants in Building Insulation

HEALTHY BUILDING NETWORK

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Our Mission

To advance human and environmental health by improving hazardous chemical transparency and inspiring product innovation.

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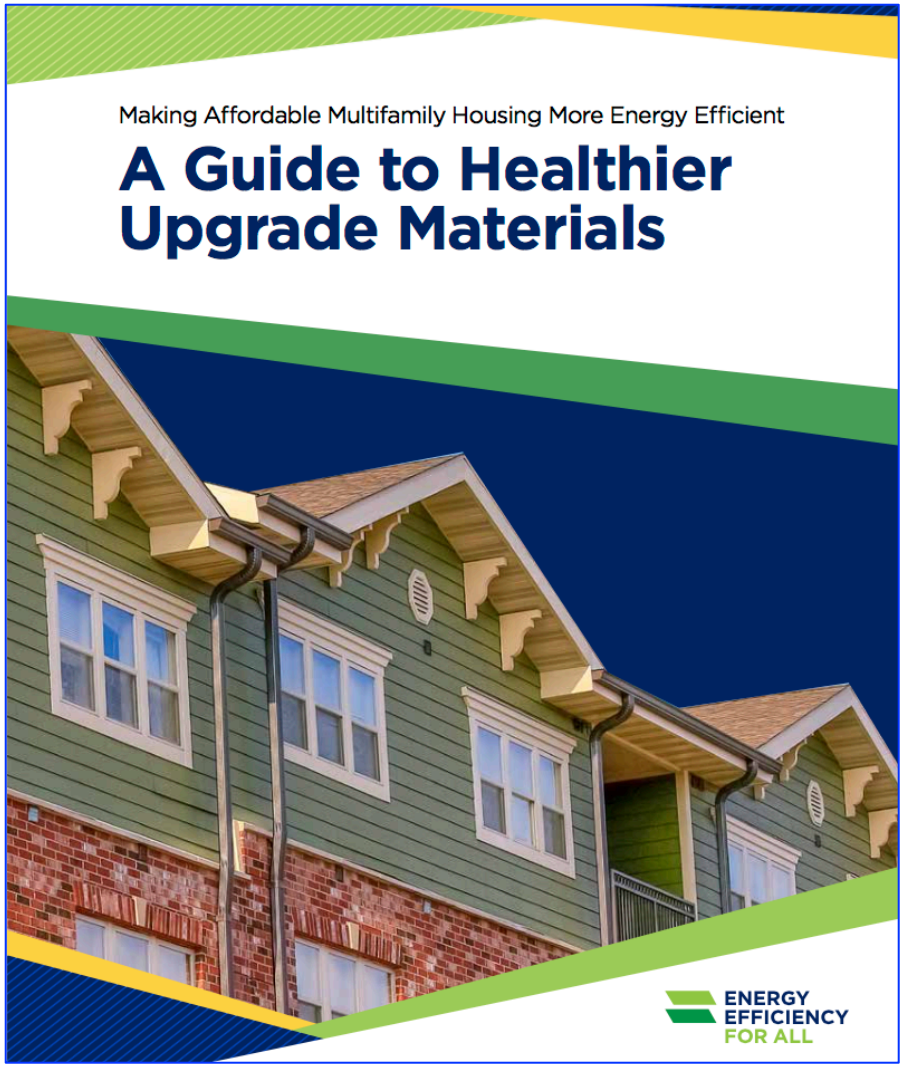

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Overview

- Where are additive FRs found in insulation?
- What preferable alternatives exist?
- What is the viability of these alternatives?

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Where are additive flame retardants found in insulation?

Insulation with additive FRs
Polyisocyanurate
Expanded Polystyrene (EPS)
Extruded Polystyrene (XPS)
Spray Polyurethane Foam (SPF)
Cellulose/Cotton
Fiber Glass (with certain facings and duct boards)

Insulation without additive FRs
Expanded Cork Board
Fiber Glass (blown, sprayed, unfaced and kraft-faced)
Mineral Wool

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Type of Insulation	Common Additive Flame Retardant(s)	Occasional Additive Flame Retardant(s)
Unfaced Cellulose/Cotton Batts	Boric acid, Ammonium sulfate	Ammonium phosphate salt
Blown-In Cellulose	Boric acid	
ASJ, PSK or FSK-Faced Fiber Glass Batts, Duct Wrap, or Pipe Insulation	Antimony trioxide	Undisclosed halogenated FR, HBCD, DecaBDE, Aluminum Trihydrate
Fiber Glass Duct Board	Antimony trioxide, Alumina trihydrate	DecaBDE
Polyisocyanurate	TCPP	
Expanded Polystyrene (EPS)	HBCD → Polymeric FR	
Extruded Polystyrene (XPS)	HBCD → Polymeric FR	
Spray Polyurethane Foam (SPF)	TCPP	TEP, undisclosed FR

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ASJ, PSK or FSK-Faced Fiber Glass Batts, Duct Wrap, or Pipe Insulation	**Antimony trioxide**	**Undisclosed halogenated FR, HBCD, DecaBDE,** Aluminum Trihydrate
Fiber Glass Duct Board	**Antimony trioxide**, Alumina trihydrate	**DecaBDE**
Polyisocyanurate	**TCPP**	
Expanded Polystyrene (EPS)	**HBCD → Polymeric FR**	
Extruded Polystyrene (XPS)	**HBCD → Polymeric FR**	
Spray Polyurethane Foam (SPF)	**TCPP**	TEP, undisclosed FR

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HB 2545 Listed Flame Retardants

- **TCPP**

Type of Insulation	% by weight
Polyisocyanurate	2 - 10%
Spray Polyurethane Foam (SPF)	4 - 45% (B-side)

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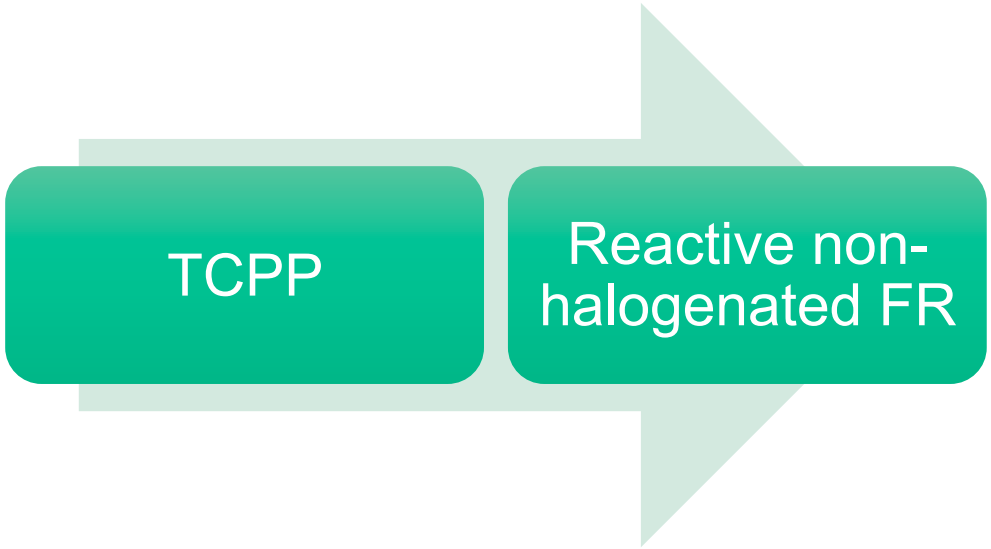
ALTERNATIVE CHEMISTRY

ALTERNATIVE PRODUCTS

Alternative FR Chemistry

Polyisocyanurate (Polyiso)



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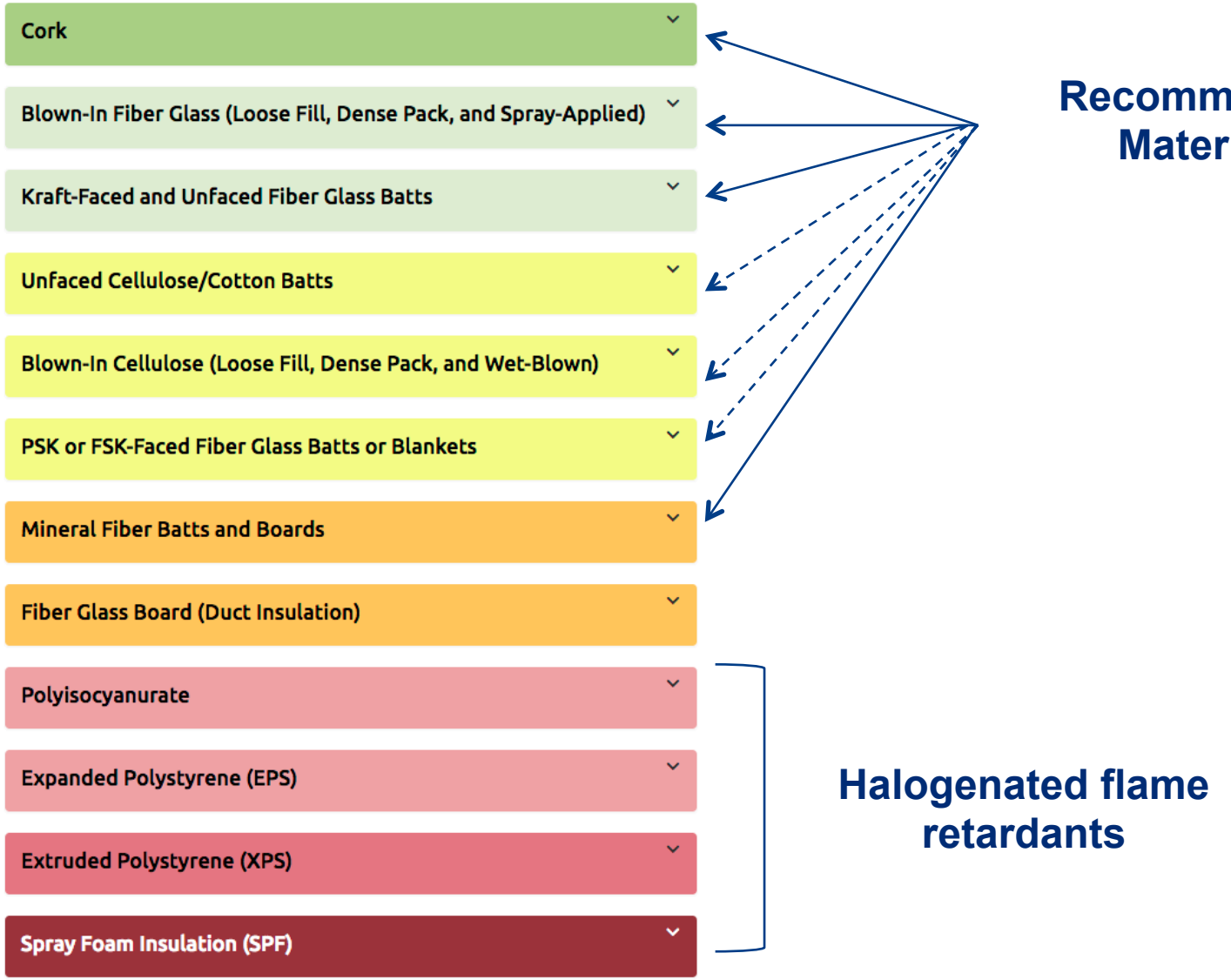
Alternative Materials



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Other Insulation - No Additive Flame Retardants:

- Foamed concrete insulation
- Mycelium insulation
- Cellular glass board insulation
- Phenolic foam board insulation

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Viability of Alternative Materials

- **Non-halogen polyiso**
  - Three manufacturers
  - GAF – across product line, competitively priced
- **Cork**
  - $$$$ and may have limited availability
- **Fiber glass/cellulose**
  - Readily available and commonly used
  - Lower cost per R-value than foam
  - Lower R-value per inch than most foam
- **Mineral wool boards**
  - Similar cost per R-value to foam boards
  - Lower R-value per inch than most foam

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Viability of Alternative Materials

TABLE 10. BASELINE INSULATION PRODUCTS BY APPLICATION		
Application	**Baseline Type(s)**	**Other Types Listed in Survey**
Attic ceiling	Blown-in fiber glass, SPF, fiber glass batt and roll	Blown-in cellulose, wet-applied cellulose
Attic floors (open cavity)	Blown-in cellulose, blown-in fiber glass	SPF, fiber glass batts, wet-applied cellulose
Attic floors (enclosed cavity)	Blown-in and dense-pack cellulose, blown-in and dense-pack fiber glass	
Attic hatch	XPS	Cellulose batt
Cathedral ceiling	Blown-in and dense-pack fiber glass, SPF	Blown-in and dense-pack cellulose
Enclosed walls	Blown-in and dense-pack fiber glass, blown-in and dense-pack cellulose	
Open wall cavities	Fiber glass batt	Dense-pack cellulose, wet-applied cellulose, SPF
Interior basement wall	*no baseline identified*	Fiber glass batt, cellulose batt, polyisocyanurate
Exterior basement wall	XPS, fiber glass batt and blanket	Polyisocyanurate
Basement ceiling	Fiber glass batt	SPF, wet-applied cellulose
Crawl space	Fiber glass batt, SPF	
HVAC ducts	Fiber glass duct wrap	
Water pipe insulation	Foam pipe insulation, fiber glass pipe insulation	

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Health-Based Ranking (Green is best; red is worst)	Insulation Type	R-Value per Inch*	Relative Installed Cost per R-Value**	Special Installation Equipment Required	Vapor Retarder^	Air Barrier Material^^	Level of Transparency on Chemical Content^^^ (More shading indicates less transparency within product type)
	Expanded Cork Board	3.6-4.2	$$$$	no	Class III	Information not available	
	Blown-In Fiber Glass						
	Loose-Fill Fiber Glass	2.2-3.1	$	yes	Vapor permeable	Not an air barrier	
	Dense-Pack Fiber Glass	3.7-4.6	$-$$	yes	Vapor permeable	Not an air barrier but does reduce airflow	
	Spray-Applied Fiber Glass	4.0-4.3	$-$$	yes	Vapor permeable	Not an air barrier but does reduce airflow	
	Fiber Glass Batts/ Blankets (Kraft-Faced and Unfaced)	2.9-4.3	$	no	Kraft-faced: Class II, Unfaced: Vapor permeable	Not an air barrier	
	Fiber Glass Batts/ Blankets (PSK or FSK-Faced, Basement Wall Insulation)	Duct wrap: 2.7-3.2#, Basement wall insulation: 3.0-3.5	$-$$	no	Class I (except basement wall insulation where facing is perforated to allow for moisture transfer)	Facing may be an air barrier material	
	Cellulose/Cotton Batts and Blankets	3.5-4.0	$$-$$$	no	Vapor permeable	Not an air	

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Coming Soon!

Guidance for Specifying Healthier Insulation and Air Sealing Materials

Board Insulation
1. Expanded cork board insulation
2. Mineral wool
3. Polyisocyanurate free of halogenated flame retardants

Batt/Blanket Insulation
1. Unfaced or kraft-faced fiber glass or formaldehyde-free mineral wool batt insulation
2. Cotton/cellulose batt insulation or PSK or FSK faced fiber glass batt insulation free of halogenated flame retardants

Loose-Fill/Blown Insulation
1. Blown-in fiber glass insulation
2. Blown-in cellulose insulation

Spray-applied Insulation
1. Spray-applied fiber glass insulation
2. Spray-applied cellulose insulation

Pipe Insulation
1. Unfaced formaldehyde-free fiber glass pipe insulation
2. Faced formaldehyde-free fiber glass pipe insulation, free of halogenated flame retardants

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