



## What Is EPA's Design for the Environment Program?

EPA's Design for the Environment (DfE) Program works in partnership with a broad range of stakeholders to reduce risk to people and the environment by preventing pollution. Partnerships focus on industries that combine the potential for chemical risk reduction with a strong motivation to make lasting, positive changes. DfE convenes partners, including industry representatives and environmental groups, who develop goals and guide the work of the partnership.

As incentives for participation and driving change, DfE offers unique technical tools, methodologies, and expertise. Partnerships evaluate the human health and environmental risks, performance, and cost of traditional and alternative technologies, materials, and processes.

DfE has formed partnerships with a range of industries including:

- Auto refinishing
- Chemical product formulators
- Electronics
  - Printed wiring board manufacturing
  - Lead-free solder
  - Computer displays
- Furniture
- Garment and textile care
- Industrial and institutional laundry
- Printing
- Wire and cable



## Flame-Retardant Alternatives for Furniture Foam

### What is the Furniture Flame Retardancy Partnership?

The Furniture Flame Retardancy Partnership is a multi-stakeholder effort to investigate and disseminate information on alternative flame-retardant technologies for achieving furniture fire safety standards. Partners include the American Fire Safety Council (AFSC), the American Home Furnishings Alliance (AHFA), the Business and Institutional Furniture Manufacturers Association (BIFMA), the Consumer Product Safety Commission (CPSC), GreenBlue Institute (GreenBlue), and EPA's Design for the Environment (DfE) Program.



Pentabromodiphenyl ether (pentaBDE) has been the primary flame retardant in the manufacture of low-density, flexible polyurethane foam for furniture. PentaBDE, with its ability to delay ignition of materials, has saved lives, but there are concerns over its use. Studies worldwide have found pentaBDE to be widespread in the environment and in human tissues. Because pentaBDE was voluntarily phased out at the end of 2004, it is important to find environmentally preferable ways to achieve fire safety.

The partnership was formed with the belief that enhanced fire safety is critical and that it should be achieved in a way that minimizes risk to human health and the environment

### What Work Has Been Conducted by the Partnership?

The first product of the partnership is the report: "Environmental Profiles of Chemical Flame-Retardant Alternatives for Low-Density Polyurethane Foam," which evaluates the leading chemical alternatives to pentaBDE for flame retarding low-density foam. Note, however, that the report does not include an assessment of other flame-retardant technologies, such as barriers or fabric backcoatings, which may be used in the future to meet a planned CPSC national flammability standard for residential upholstered furniture.

### How Did the Partnership Evaluate Chemicals?

Leading U.S. flame-retardant chemical manufacturers identified 14 chemical formulations that are potentially viable substitutes for large-scale production of low-density flexible polyurethane foam.

EPA assessed the hazards, potential exposures and tendency to bioaccumulate and persist in the environment for the chemicals in each formulation. EPA presented hazard concern levels for key toxicological and environmental endpoints based on experimental data where available, or estimated data. EPA also provided information on potential routes of exposure, based on physical and chemical properties.

The screening-level hazard and exposure information is presented in the report at three levels to meet the needs of a range of audiences and maximize transparency:

- A table showing a qualitative summary of each formulation that assigns a high, moderate, or low hazard concern level for each chemical according to the key human health and environmental endpoints.
- Quantitative summaries of the toxicity and exposure data from publicly available literature, EPA's confidential databases, chemical companies, EPA's New Chemicals Program, as well as the professional judgment of EPA staff.
- Detailed hazard data reviews with a summary of the availability and adequacy of data and a full data review by endpoint. References are included for chemicals that are not proprietary.

## Which Flame Retardant Chemical Should I Select?

The report does not rank flame-retardant formulations; the Partnership agreed that no single alternative is expected to provide an ideal solution to address every situation. While not providing full risk assessments, the report does provide screening-level information on the hazard concerns and potential routes of exposure associated with chemical components of flame-retardant formulation.

Concerns over pentaBDE center on its persistence in the environment and its tendency to bioaccumulate. The flame retardants evaluated in the report, however, do not appear to have concerns for persistence and bioaccumulation.

The report contains the following goals for developers and users of flame-retardant chemicals to minimize risk to human health and the environment. Risk is composed of two parts – hazard and exposure. These goals are based on minimizing the potential for hazard and exposure.

- Low persistence and bioaccumulation
- Low toxicity –less potential for harm, even if some exposure occurs
- Low exposure (e.g., some flame-retardant chemicals may be more stable in the foam matrix, reducing the potential for release into the environment)
- Low potential for persistence, bioaccumulation, and toxicity for breakdown products

Other considerations include:

- Aesthetic and performance considerations: appearance, durability, and fire safety
- Process, equipment and cost considerations
- Alternative technologies and design (e.g., the use of barriers and inherently flame-retardant materials)

The report is available on the DfE website at <http://www.epa.gov/dfe/pubs/index.htm#ffr>

## What Are Next Steps for the Partnership?

The partnership plans to develop and implement a process to identify additional toxicological data needed for adequately assessing the flame-retardant alternatives reviewed in this report. In the future, the partnership intends to evaluate additional chemical flame retardants and other materials that may be necessary to meet planned national fire safety standards.

### How Can I Get More Information?

To learn more about the DfE Program or the Furniture Flame Retardancy Partnership, or to obtain an electronic version of this fact sheet (document #EPA 742-F-05-001), visit the Office of Pollution Prevention and Toxics' DfE Program Web site: [www.epa.gov/dfe](http://www.epa.gov/dfe).

To obtain hard copies of DfE Program technical reports, pollution prevention case studies, and project summaries, contact:

National Service Center for Environmental Publications  
U.S. Environmental Protection Agency  
P.O. Box 42419  
Cincinnati, OH 45242  
Phone: (513) 489-8190, (800) 490-9198  
Fax: (513) 489-8695  
E-mail: [ncepimal@one.net](mailto:ncepimal@one.net)