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CPSC MEETING LOG
UPHOLSTERED FURNITURE / MATTRESSES

Meeting Between: CPSC staff and attendees at the American Fire Safety Council Annual International Fire Safety Conference

Date of Meeting: September 27-28, 2004

Meeting Site: Flamingo Hotel, Las Vegas, NV

Log Entry By: Dale R. Ray, Project Mgr., EC, (301) 504-0962 x1323

Participants:
Mark Buczek, Ripplewood Phosphorus, AFSC Chairman
Clive Davies, U.S. Environmental Protection Agency
Kathleen Vokes, U.S. Environmental Protection Agency
David Buszard, Great Lakes Chemical Corp.
Gordon Damant, Inter-City Testing & Consulting
Shigero Matsumi, Great Lakes Chemical Corp.
Matthew Bundy, NIST
Marcelo Hirschler, GBH International
Glade Squires, Ameribrom Corp.
Sander Kroon, Ripplewood Phosphorus
Raymond Dawson, Albemarle Corp.
Ken Moss, U.S. Environmental Protection Agency
Dale Ray, CPSC
+ about 50 attendees representing chemical manufacturers and related organizations

Summary:

This annual fire safety conference was the first one held by the American Fire Safety Council, formerly the Fire Retardant Chemicals Association. AFSC's members include four major chemical manufacturers and various related industry suppliers. AFSC (and, previously, FRCA) provided comments and recommendations to CPSC on the upholstered furniture project. Representatives of industry, fire services and world regulatory bodies participated in the conference to exchange and present information on activities affecting flame retardant (FR) chemicals. A copy of the conference program is attached.

Mr. Buczek gave some opening remarks, noting AFSC's activity regarding the proposed American Home Fire Safety Act (AHFSA, Senate bill S.1798). He also noted AFSC's support of CPSC's effort to establish possible flammability standards for upholstered furniture, and EPA's activities on FR chemicals. He stated that one of his organization's goals for 2005 was to complete work on national standards for upholstered furniture and mattresses.

Mr. Davies and Ms. Vokes discussed EPA's Design for Environment (DfE) program on upholstered furniture. The CPSC staff is participating in this effort. This "green chemistry" program is intended to help manufacturers identify alternatives to pentabromodiphenyl oxide (PBDPO) and octabromodiphenyl oxide (OBDPO); these chemicals are being phased out of production in 2004. They described the upholstered furniture project as an important model for future DfE projects. They announced an upcoming (December 9-10, 2004) workshop at which they plan to present their environmental review of PBDPO/OBDPO substitutes.

Mr. Ray presented a paper on recent CPSC activities on upholstered furniture and mattresses and bedding. Copies of the submitted paper and presentation slides are attached. Mr. Ray noted that a new regulatory options package would be forwarded to the Commission (and be available to the public) in Fall 2004. Mr. Ray answered a number of questions about recent industry recommendations on upholstered furniture, the relationship between CPSC and state regulations, and possible FR materials applications to meet furniture and mattress standards.

Mr. Damant spoke about CPSC, California and other standards development proceedings, and described existing test methods and FR chemical applications. He encouraged CPSC to issue uniform national flammability standards to avoid confusion among manufacturers and state regulators.

Mr. Matsumi discussed product standards in Japan, including JIS and ISO voluntary specifications for foam filling materials used in upholstered furniture. He noted the Japan Fire Retardants Association's (JFRA) support of a possible new JIS standard currently under consideration to conform to recent ISO standard upgrades. JPRA maintains contact with AFSC to keep abreast of U.S. and other international standard developments.

Mr. Bundy discussed a NIST study of heat release in plastic materials, chiefly those used in TV and computer cabinet applications. This study found a very strong relationship between peak heat release in fire testing and the risk of igniting nearby combustibles.

Mr. Squires discussed Asian FR chemical-related regulatory activities. He noted that in Japan, environmental monitoring and reporting is mandatory for manufacturers of hexabromocyclododecane (HBCD). He also noted that Chinese authorities were considering draft regulations similar to the European Union's Restrictions on Hazardous Substances (ROHS) system for electrical and electronic products.

Mr. Kroon discussed the EU chemical risk assessments for phosphorus chemicals. He noted that a report on two such compounds, TDCP and TCPP, used in polyurethane foam and other applications is expected to be published in early 2005.

Mr. Dawson discussed EU chemical risk assessment work on brominated flame retardants (BFRs) and antimony trioxide (AT). The BFR work is considered to be the most comprehensive review being performed for any FR chemicals. Reports on decabromodiphenyl oxide (DBDPO, the most widely used commercial BFR), PBDPO and OBDPO are complete. Studies on other BFRs are continuing. A ban on PBDPO and OBDPO in the EU became effective in August 2004. No action was recommended by the EU Commission on DBDPO, based on the risk assessment; however, DBDPO remains on the ROHS list of chemicals to be phased out, under the EU's 'precautionary principle' and uncertainties about environmental persistence, possible neurotoxicity, and the potential for DBDPO to de-brominate into more toxic, lower-brominated compounds. The European chemical industry strenuously opposes the ROHS designation of DBDPO, and has proposed a 10-year program of environmental monitoring and human health biomonitoring as an alternative to a European ban on DBDPO. An ongoing NIST photolytic analysis study on possible DBDPO de-bromination was also discussed. Mr. Dawson suggested an alternate view of the European precautionary principle: why replace a thoroughly-studied chemical like DBDPO with several as-yet-unstudied substitutes?

Mr. Moss described U.S. government activities on FRs generally. He noted that the risk assessments in the U.S. are generally performed by industry, e.g., under EPA's Voluntary Children's Chemical Exposure Program (VCCEP), and reviewed by EPA. He stated that EPA did not have sufficient data to support regulation of polybrominated diphenyl oxides (PBDOs, often referred to in Europe as polybrominated diphenyl ethers, or PBDEs) under their principle Toxic Substances Control Act (TSCA) authority, but that a Significant New Use Rule (SNUR) on PBDPO and OBDPO would likely be issued soon, following the discontinuation of those compounds by the remaining U.S. manufacturer. Mr. Moss characterized a SNUR as a 'regulatory backstop,' and described the upholstered furniture FR chemical SNUR under cooperative development by EPA and CPSC staff. An EPA summary report on DBDPO is expected to be completed in late 2004, with possible recommendations for further activity and research.

Mr. Buszard described the proposed EU chemical REACH program (Registration, Authorization and Evaluation of Chemicals), an outgrowth of a 2001 white paper that could affect thousands of FR and other chemical uses, including consumer product applications. This program would put the burden on industry to demonstrate 'safe use' of chemicals; the EU could regulate FR chemicals assessed under this program, based on the precautionary principle. Mr. Buszard also discussed an initiative by the European Environmental Bureau (EEB), a group of 'green' non-government organizations to identify and require labeling for *all* chemicals in all products; he stated that a goal of this initiative was to phase out all PBDEs. He discussed various European industry efforts opposing implementation of the REACH and EEB programs.

Attachments

AMERICAN FIRE SAFETY COUNCIL

Annual International Fire Safety Conference

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September 27-29, 2004

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The Flamingo Hotel
Las Vegas, NV

[redacted]

8:30am-9:00am (Savoy)
WELCOME & INTRODUCTION
AFSC Chairman, Mark Buczek, *Ripplewood Phosphorus*

9:00am-10:00am
DESIGN FOR THE ENVIRONMENT
Clive Davies & Kathleen Vokes, U.S. EPA

10:30am-12:00 Noon
FIRE SAFETY STANDARDS
Moderator, Susan Landry, *Albemarle*

RECENT DEVELOPMENTS IN EUROPEAN TEST METHODS AND STANDARDS
Dave Buszard, *Great Lakes Chemical Corporation*

RECENT CPSC ACTIVITIES ON UPHOLSTERED FURNITURE
Dale Ray, *CPSC*

LEGAL ISSUES IN U.S. RELATED TO FLAME RETARDANCY
Allen Lockerman, *Hawkins & Parnell*

1:30pm-5:00pm (Savoy)
STATUS OF FIRE TESTS FOR RESIDENTIAL FURNISHINGS
Gordon Damant, *Inter-City Testing & Consulting Corporation*

JAPANESE PERSPECTIVE OF FIRE STANDARDS
Shigeru Matsumi, *Great Lakes Chemical Corporation*

FULL SCALE FLAMMABILITY MEASURES FOR ELECTRONIC EQUIPMENT
Matthew Bundy, *National Institute of Standards and Technology*

FIRE SAFETY ISSUES ASSOCIATED WITH TRANSPORTATION VEHICLES
Marcelo Hirschler, *GBH International*

[redacted]

8:30am-12:00 Noon (Savoy)
FIRE SAFETY
Moderator, Glade Squires, *AmeriBrom*

CHALLENGES OF FIRE SAFETY IN LAS VEGAS
Deputy Fire Marshal Jeffrey Donahue, *Las Vegas Fire & Rescue Department*

FIRE SAFETY IN EUROPE
Fire Chief Albrecht Broemme, *Berlin Fire Department*

US FIRE STATISTICS FOR 2003
Marty Ahrens, *National Fire Protection Association (NFPA)*

YOUTH FIRE CENTER INTERVENTION PROGRAM
Kathryn Hooper, *City of Henderson Fire Dept.*

1:30pm-5:00pm (Savoy)
REGULATORY
Moderator, Dave Sanders, *Great Lakes Chemical Corporation*

ASIAN FLAME RETARDANT REGULATORY UPDATE
Glade Squires, *AmeriBrom*

EUROPEAN PHOSPHOROUS FLAME RETARDANT REGULATORY UPDATE
Sander Kroon, *Ripplewood Phosphorus*

EUROPEAN BROMINATED FLAME RETARDANT REGULATORY UPDATE
Raymond Dawson, *Albemarle*

UNITED STATES FLAME RETARDANT UPDATE
Ken Moss, *US EPA*

REACH (EU CHEMICALS) UPDATE
Dave Buszard, *Great Lakes Chemical Corporation*

U.S. Consumer Product Safety Commission

Update on CPSC Rulemaking: Upholstered Furniture and Mattresses

American Fire Safety Council
September 27, 2004
Dale Ray, Project Manager*

*Mr. Ray's views have not been reviewed or approved by, and do not necessarily reflect the views of, the Commission. Because Mr. Ray prepared this presentation as a part of his official duties as a CPSC employee, the information herein is in the public domain, and may be freely reprinted.

Upholstered Furniture and Mattresses & Bedding Fires

- Leading causes of fire deaths associated with consumer products
- 1995-99 addressable fire losses:
  - Upholstered furniture -- 460 deaths
  - Mattresses & bedding -- 440 deaths
- Estimated societal costs = $5.75 billion

Upholstered Furniture

- New Advance Notice of Proposed Rulemaking (ANPR) in *Federal Register* 10-23-03*
- Possible CPSC standard to address the risk of both cigarette- and small open flame-ignited fires
- Follows staff recommendation to expand the existing regulatory proceeding **
- Several industry groups support a uniform, national mandatory standard
- CPSC staff options package re: possible proposed rule and alternatives in 2004

*See web file at http://www.cpsc.gov/businfo/frnotices/fr04/upholst.pdf
**See web file at http://www.cpsc.gov/library/foia/foia03/brief/ignition.pdf

October 2003 ANPR

- Cigarette fires account for a substantial majority of furniture fire losses
- Previous ANPR addressed small open flame, but draft standard would reduce risk from both types of ignition
- Expanded proceeding builds on existing CPSC staff draft standard approach
  - --Possible Cigarette Ignition performance requirements
  - --Possible revised Small Open Flame Ignition requirements
  - --Barrier Alternative

Industry Support for a National Mandatory Standard

AFMA letter (May 3, 2003)
- Seek pre-emption of state regulations
- Concern that projected voluntary UFAC conformance may be inadequate
- Recommendation: CPSC mandatory national flammability performance regulation

Industry Support for a National Mandatory Standard

Fabric Coalition letter (June 27, 2003)
- Seek shared burden among stakeholders
- Recommendation: Require revised TB-117 small open flame *and* cigarette resistance for foam / filling materials; *plus* manufacturer chooses *either* specified small open flame resistance for fabrics *or* CPSC staff provision for barriers

Industry Support for a National Mandatory Standard

AFMA / Fabric Coalition / UL / NASFM letter (December 19, 2003)

- Recommendation: Performance standard for ***both*** small open flame & cigarette resistance
- Fabric Coalition approach for small open flame resistance

Industry Support for a National Mandatory Standard

API Report (January 2004)

- Interlaboratory study data
- Conclusion: composite mockup standard best measures small open flame performance
- Mass loss rate acceptance criteria practical, repeatable, reproducible

Industry Support for a National Mandatory Standard

AFMA letter (May 13, 2004)

- Fabric coalition small open flame test
- "TB-117+" cigarette & small open flame requirements for foam fillings and non-foam cushion core materials
- BS 5852 requirements for non-foam *seat* cushion wraps (batting) + ASTM / UFAC requirements for cotton batting and arm construction materials

Industry Support for a National Mandatory Standard

AFSC / AFMA / UFAC / NTA / PFA / ISPA / CCDF / DFA letter (July 12, 2004)

- Recommendation: Performance standard for ***both*** small open flame & cigarette resistance
- AFMA / Fabric Coalition approach for cigarette and small open flame resistance

California BHF Support for a National Mandatory Standard

BHF letter (December 6, 2003)

- CPSC standard should incorporate the best elements of CPSC staff and revised TB-117 drafts
- BHF continuing development of revised TB-117 for possible proposal

Possible FR Technologies to Meet a Standard

2001 Draft

- Cover fabrics
- Barriers / interliners

2004 Industry Recommendations

- Cover fabrics
- Foam filling materials
- Non-foam "cushion core" materials
- Non-foam "cushion wrap" materials
- Barriers / interliners

Upholstered Furniture: Next Steps

- CPSC staff evaluation of public comments*
- Complete technical work on revisions of CPSC staff draft standard; economic & environmental analyses
- Continue sharing information with California BHF and monitoring TB-117 progress
- Continue working with EPA on possible Significant New Use Rule (SNUR) for flame retardant chemicals, and on DfE furniture industry partnership
- CPSC staff briefing package for Commission consideration of possible proposed rule and significant alternatives – Fall 2004

*See web files at http://www.cpsc.gov/library/foia/foia04/pubcom/pubcom.html (Parts 1 & 2)

Mattresses & Bedding

- Advance Notice of Proposed Rulemaking (ANPR) for mattresses in *Federal Register* 10-11-01*
- Possible CPSC standard to address the risk of open flame-ignited fires; supplement existing cigarette ignition standard (16 CFR 1632)
- Addresses CCFSM petitions
- Broad industry support for a uniform, national mandatory standard
- CPSC staff options package re: possible proposed rule and alternatives in Fall 2004

*See web file at http://www.cpsc.gov/businfo/frnotices/fr02/openflam.pdf

CPSC Staff Draft Standard

- Based on NIST full scale test method (as in TB-603) limiting heat release rate for mattresses; bedding excluded
- NIST screening test
- Possible requirements for prototype & confirmation testing, pooling, recordkeeping, labeling

Mattresses & Bedding: Next Steps

- CPSC staff decision package with regulatory options
  - Analysis of ANPR comments
  - Draft standard / NPR for mattresses
  - ANPR option for bedding
  - Continue exploring screening test options
  - Prepare for full scale test capability (NIST / ATF)
  - Options package to Commission Fall 2004

For Further Information:

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U.S. CONSUMER PRODUCT SAFETY COMMISSION
RECENT ACTIVITIES ON UPHOLSTERED FURNITURE

Dale R. Ray
Project Manager
U.S. Consumer Product Safety Commission[1]
Bethesda, MD USA

Abstract:

The U.S. Consumer Product Safety Commission (CPSC) is considering a possible flammability performance regulation for upholstered furniture. Residential fires in which upholstered furniture was the first item ignited account for more fire deaths than any other category of consumer products. Under an advance notice of proposed rulemaking (ANPR) published in October 2003, the CPSC staff is considering a range of alternatives to address the risk of upholstered furniture fires ignited by smoking materials (chiefly smoldering cigarettes) and by small open flame sources (such as lighters, matches and candles). Various components or materials used in furniture construction could be subject to proposed flammability requirements; the nature and scope of these requirements could significantly affect how flame retardant (FR) chemistry may be used in components to achieve compliance. The CPSC staff continues to work with industry, government and other stakeholders to determine the best technical approach for a possible standard; the staff is also working with the Environmental Protection Agency (EPA) to evaluate the need for possible controls on FR chemicals.

[1] The author prepared this paper as part of his official duties at the U.S. Consumer Product Safety Commission. The paper is in the public domain and may be freely excerpted or reprinted. The views expressed have not been reviewed or approved by, and do not necessarily reflect the views of, the Commission.

Introduction

The U.S. Consumer Product Safety Commission (CPSC) was created in 1973 by an act of Congress (the Consumer Product Safety Act, 15 U.S.C. § 2051 *et seq.*) as an independent Federal regulatory agency with the primary mission to protect the public from unreasonable risks of product-related death and injury. The agency currently has three Commissioners, who collectively set policy and vote on matters of regulatory action, and a staff of about 470. CPSC's fiscal year 2004 budget appropriation was $59.6 million.

The Commission has undertaken numerous fire safety activities over the years that have contributed to a decline in U.S. residential fire losses. These activities include mandatory fire safety standards for mattresses, matchbooks, carpets and rugs, cigarette and multi-purpose lighters, apparel and children's sleepwear, solid fuel heating equipment, and cellulose home insulation. CPSC has also supported numerous voluntary standard development efforts on almost every significant category of products associated with fire hazards.

Despite gradual reductions in residential fire losses over the past two decades, the risk to the public from fires involving consumer products remains high. In 1999, fire departments responded to an estimated 337,300 unintentional, residential structure fires in the U.S. (i.e., excluding incendiary and suspicious fires). These fires caused an estimated 2,390 civilian deaths, 14,550 injuries, and $4.24 billion in property damage.

Two of CPSC's current major fire safety initiatives are rulemaking proceedings on upholstered furniture and mattresses. These activities may lead to increases in the use of various flame retardant (FR) technologies and materials to meet new federal flammability performance standards. Recent developments regarding the agency's approach on the furniture proceeding may significantly affect the way FRs are used in these products.

Upholstered Furniture Flammability

Upholstered furniture fires are a leading cause of fire deaths among products under CPSC's jurisdiction. For 1995-99, ignitions of upholstered furniture caused an estimated annual average of 6,600 residential fires that, based on their ignition mechanisms and locations, could be addressed by a flammability standard. The losses from these addressable fires included an estimated 460 deaths, 1,110 injuries and $130 million in property damage (excluding losses from incendiary and suspicious fires). The societal cost of these addressable furniture fire losses (in 2002 dollars) was about $2.75 billion. Smoking material-ignited furniture fires--virtually all involving cigarettes--accounted for most of the addressable furniture fire losses (410 of the deaths and 750 of the injuries for the period). The other principal furniture fire risk involves ignition by open flames, predominantly small flame sources like lighters, matches and candles (50 deaths and 360 injuries).

The CPSC staff's furniture testing conducted over the past two decades shows a steady increase in cigarette resistance, attributable to the rising popularity of smolder-resistant polymeric materials such as thermoplastic fabrics and polyurethane foam fillings. The cigarette ignition criteria of existing voluntary guidelines established by the Upholstered Furniture Action Council (UFAC) in 1978 encouraged the use of cigarette ignition-resistant materials and constructions. Most currently produced furniture does not readily ignite from smoldering cigarettes.

In 1993, the National Association of State Fire Marshals (NASFM) petitioned CPSC to initiate a regulatory proceeding to address all fire risks associated with upholstered furniture. NASFM suggested that CPSC adopt California or other existing standards. The Commission granted the petition in part, with respect to small open flame ignition; the Commission denied the petition with respect to large open flame ignition, and deferred action on cigarette ignition pending further evaluation of the level of cigarette ignition resistance among currently produced furniture. The Commission published an advance notice of proposed rulemaking (ANPR) in June 1994.

Pursuant to the Commission's decision, the CPSC staff developed a draft small open flame performance standard. This draft standard was first released in 1996, and was revised and published in a 2001 CPSC staff briefing package. The draft standard contained performance tests for seating area composites (using a bench scale test method and seat/back cushion mockups) and for dust covers. As an alternative to the seating area test, the draft standard allowed manufacturers to use fire-blocking barriers, or interliners, to prevent fire growth. The CPSC staff's draft small open flame standard relied heavily on upholstery cover fabrics or underlying barrier materials to provide protection for flexible foam or other interior filling materials in the finished article of upholstered furniture. In the CPSC laboratory's furniture mockup tests, some FR fabrics that are widely used in the United Kingdom, as well as some experimental fire-blocking barriers, were observed to perform well in combination with non-FR polyurethane foam.

CPSC held a public meeting in 2002 to obtain information and recommendations from stakeholders. A number of industry representatives recommended that the Commission consider regulating both cigarette and small open flame aspects of the furniture fire risk, especially in view of the likelihood that a standard would reduce fire losses from both types of ignition, and in anticipation of possible new rulemaking by the California Bureau of Home Furnishings and Thermal Insulation (BHF) to amend its existing furniture regulation, Technical Bulletin (TB) 117.

Following the public meeting, the CPSC staff reviewed the latest available data on upholstered furniture fire hazards, and recommended that the Commission expand its rulemaking proceeding to cover both cigarette and small open flame aspects of the risk. The Commission published another ANPR in October 2003 announcing the agency's intent to consider possible rulemaking on both cigarette and small open flame ignition. This action allowed the CPSC staff to consider requirements aimed specifically at reducing cigarette fire losses.

In response to the 2003 ANPR, some fifteen commenters provided technical data or recommendations as to the direction of the CPSC staff's draft standard. Several industry groups, under the general leadership of the American Furniture Manufacturers Association (AFMA) and the Fabric Coalition (a group of six textile producers), agreed to a recommendation that CPSC adopt cigarette and small open flame requirements for a range of furniture materials and components – including cover fabrics, polyurethane foam and other "cushion core" resilient filling materials, batting or other "cushion wrap" filling materials, and fire-blocking barriers – instead of requirements for composite seating assemblies, as in the CPSC staff's 2001 draft standard. The proponents of this approach asserted that it would effectively spread the required fire protection over all of the basic elements of upholstered furniture construction, without emphasizing any single component (e.g., cover fabric). The American Fire Safety Council (AFSC) and other groups endorsed this proposal in 2004.

In early 2004, the CPSC staff again met with stakeholders to discuss the various recommendations and supporting data. The staff agreed to consider the industry's material/component approach, with the goal in mind of providing a demonstrably adequate level of fire protection at reasonable cost, and with appropriate relative emphasis on the two major risk elements, cigarette and small open flame ignition. The CPSC staff is presently revising its draft standard, and plans to forward a briefing package of regulatory alternatives to the Commission in late 2004.

A standard containing requirements for multiple individual components or materials would essentially call for each of the basic construction components to contribute to the overall level of safety provided by the assembled article of upholstered furniture. This could significantly affect the type, quantity and application method of FR chemistry choices available to manufacturers and suppliers. For example:

- Less reliance on cover fabrics may result in lower FR loadings or, in some cases, no FR chemistry may be needed to yield complying performance;
- Greater protection provided by "cushion wrap" batting products could lead to new FR chemistry applications or other methods of reducing the contribution to combustion (cotton batting is now reportedly produced with boric acid treatment to reduce smoldering and flaming, but polyester batting is not FR treated);
- Requirements for flexible foam fillings could require new FR formulations (e.g., upgrades similar to those necessary to meet possible TB-117 revisions); and
- Requirements for fire-blocking barriers, used to protect interior materials in lieu of (or in combination with) other approaches, may encourage continued development of a variety of new FR treatments or inherently FR fiber technologies, especially in higher-end furniture for which material limitations or aesthetic compromises are undesirable.

The CPSC staff is refining the details of its draft standard based on the likely effectiveness of various alternate performance requirements, and on economic and FR chemical use considerations. As FR technologies continue to evolve for these

applications, furniture manufacturers and component/material suppliers will have more choices for achieving improved fire safety.

FR Chemical Issues

A CPSC standard would specify flammability performance criteria. Furniture and textile manufacturers have reported that FR fabrics would likely be used to meet a small open flame standard, especially for lower-priced, mass-market furniture. Principal among projected FR cover fabric technologies were FR latex backcoatings (especially for predominantly thermoplastic-fiber fabrics like polyester or olefin) or immersion or topical FR finishes (for predominantly cellulosic-fiber fabrics like cotton or rayon). Some FR treatments may also be used to achieve smolder resistance. A wide variety of fire-blocking barrier materials could also be incorporated, using either FR chemical treatments or inherently FR fibers.

One of the goals of the agency's standard development project is to improve fire performance without imposing other, potentially offsetting risks. The likelihood of FR use led CPSC to investigate whether FR treatments could pose risks to human health or the environment. In 1998, the Commission deferred regulatory action pending an evaluation of potential toxic health effects associated with possible consumer exposure to FR fabric treatments. The agency held a public hearing to gather additional information on human toxicity, ecotoxicity, and other chemical risk-related issues.

The Fire Retardant Chemicals Association (FRCA, now AFSC) identified 16 chemical compounds or classes as the most likely candidates for use in fabrics to meet a small open flame standard. Some of these have been used in upholstery fabrics, either in the U.K. or in other U.S. textile applications; none is used in U.S. residential furniture fabrics. The 16 compounds or classes are:

- Decabromodiphenyl oxide
- Hexabromocyclododecane
- Phosphonic acid, (3-{[hydroxymethyl]amino}-3-oxopropyl)-dimethyl ester
- Tetrakis (hydroxymethyl) phosphonium salts
- Zinc borate
- Alumina trihydrate
- Magnesium hydroxide
- Ammonium polyphosphates
- Antimony trioxide
- Tris (chloropropyl) phosphate
- Tris (1,3-dichloropropyl-2) phosphate
- Calcium and zinc molybdates
- Antimony pentoxide and antimonates
- Chlorinated paraffins
- Aromatic phosphate plasticizers
- Organic phosphonates

These general chemical classes comprise over 50 individual compounds. The CPSC staff prepared toxicity reviews of compounds representing the 16 classes. These reviews contributed to the staff's exposure and risk assessment and to a National Academy of Sciences (NAS) report on these chemicals.

NAS Study

In CPSC's fiscal year 1999 appropriation, Congress directed the agency to sponsor an independent, 12-month study of FR chemicals by the National Academy of Sciences' Committee on Toxicology. In addition to the CPSC staff studies already underway, the NAS study was to assess potential health risks associated with the use of FRs that might be used in upholstered furniture fabrics to meet a CPSC flammability standard. The Commission was prohibited from proposing any upholstered furniture regulation until it considered the NAS's conclusions.

The final NAS report, "Toxicological Risks of Selected Flame Retardant Chemicals," was published in July 2000. The NAS report concluded that 8 of the 16 FR chemicals reviewed would present minimal risks, even under extreme conditions of exposure. These were:

- Decabromodiphenyl oxide
- Hexabromocyclododecane
- Phosphonic acid, (3-{[hydroxymethyl]amino}-3-oxopropyl)-dimethyl ester
- Tetrakis (hydroxymethyl) phosphonium salts (chloride salt)
- Zinc borate
- Alumina trihydrate
- Magnesium hydroxide
- Ammonium polyphosphates

Additional exposure studies were recommended for the remaining 8 chemicals to determine the need for further toxicity studies.

CPSC Staff Risk Assessment

Under the Federal Hazardous Substances Act (FHSA, the legislation under which CPSC has the authority to regulate chemical risks associated with consumer products), whether a substance is "hazardous" depends not only on toxicity, but also on dose-response, exposure and risk. The CPSC staff evaluated potential FR chemical health effects by considering each of these elements. The staff conducted its evaluation in the context of the Commission's Chronic Hazard Guidelines, issued in 1992 under provisions of the FHSA. Under the guidelines, a substance is considered chronically "toxic" if it is either known to be or is probably toxic in humans. The substance is "known to be toxic" only if there is sufficient evidence in humans; it is "probably toxic" if there is either limited evidence in humans or sufficient evidence in animals. If a substance is considered "toxic" due to chronic toxicity, then a quantitative risk assessment is performed to

determine whether the chemical may fall within the "hazardous substance" definition of the FHSA. The quantitative risk assessment includes consideration of dose response, bioavailability and exposure.

As noted above, the CPSC staff prepared reviews for each of the 16 FR compounds or classes identified by the FRCA. The staff reviewed all available information on acute and chronic toxicity, including carcinogenic, neurological, and reproductive or developmental effects, as well as any systemic (e.g., liver or kidney) effects. The staff calculated acceptable daily intake (ADI) values for chronically toxic compounds; upholstered furniture containing FR chemicals designated as toxic and presenting potential exposure exceeding the ADI could be considered "hazardous" under the FHSA.

The CPSC staff then estimated potential exposure to FR chemicals from treated furniture fabrics. From among the 16 potential-use chemical classes reported by the FRCA, the staff identified and selected for assessment 8 compounds that were already in use in furniture (e.g., in U.K. fabrics or California filling materials) or were reported by manufacturers as highly likely to be used in fabrics to meet a small open flame standard. The staff evaluated data for dermal and oral routes of exposure, and used mathematical models to estimate inhalation exposure (since inhalation exposure data were generally lacking). The staff analysis considered bioavailability and dose-response data for adults and children, and considered the effect of FR chemical application methods on potential exposure.

The CPSC laboratory staff conducted migration tests on samples of fabrics with four FR chemicals currently in use in the U.K.: antimony trioxide (AT), decabromodiphenyl oxide (DBDPO), hexabromocyclododecane (HBCD), and phosphonic acid (PA). Migration tests were also conducted on fabric samples containing a fifth chemical, tetrakis hydroxymethyl phosphonium chloride (THPC), currently used in apparel fabrics and considered a candidate for cotton upholstery fabrics. The laboratory staff developed methods for measuring chemical migration from upholstery fabrics. The staff also estimated exposure, using surrogate compounds, for 3 additional chemicals used in related applications (textiles or foam fillings): cyclic phosphonate ester (CPE, one of the compounds in the organic phosphonates class), 2-ethylhexyl diphenyl phosphate (EHDP, one of the aromatic phosphate plasticizers), and tris (1,3-dichloropropyl) phosphate (TDCP).

Using the data on hazard assessment and dose-response from the toxicity reviews, and data from the exposure studies, the staff evaluated the risks to consumers associated with the use of selected FR chemicals either most likely to be used or of greatest concern. Based on the available scientific data for the most likely FR chemical candidates, the staff concluded that a number of existing FR chemicals -- decabromodiphenyl oxide (DBDPO), hexabromocyclododecane (HBCD) and phosphanic acid (PA) – were not likely to present a hazard to consumers and could be used in upholstered furniture cover fabric or barrier treatments. The staff also concluded that the use of TDCP could present

a hazard to consumers. The staff generally agrees with the findings of the NAS study. To help resolve some remaining uncertainties, the staff is following the development by outside parties of additional data regarding:

a. potential airborne levels of AT that may be released from treated furniture fabrics;
b. the possible reproductive and developmental neurotoxicity of DBDPO and related compounds, and the relevance of these data to humans;
c. the possible subchronic or chronic toxicity of HBCD;
d. the chemical composition and toxicity of organophosphorous extractants from fabrics treated with THPC; and
e. the occurrence of DBDPO and HBCD in the environment and in human tissue.

CPSC / EPA Cooperative Activities

The CPSC staff is working cooperatively with the staff of the U.S. Environmental Protection Agency (EPA) in two areas related to upholstered furniture flammability. First, EPA is continuing to develop a possible Significant New Use Rule (SNUR) under section 5 of the Toxic Substances Control Act (TSCA). This rule could require chemical companies to notify EPA, at least 90 days in advance, of their intent to distribute existing FR chemicals for use in residential upholstered furniture. This would trigger a life-cycle environmental and human health risk review encompassing manufacturing, use and disposal; EPA would consider industrial, occupational, residential, environmental, and general public exposures in determining the need for any subsequent action. Companies could be required to provide specific additional data (e.g., toxicity or exposure studies) for certain compounds. Additional controls could subsequently be imposed on the use of any FRs found to present unreasonable risks.

Second, CPSC staff is participating in a government/industry partnership under EPA's Design for the Environment (DfE) program. The goal of this effort is to help manufacturers and component / material suppliers become aware of FR chemical-related issues and seek more environmentally friendly chemical treatments or other approaches to improving upholstered furniture flammability performance. Industry partners include furniture manufacturers, component and chemical suppliers, and environmental groups. Together, these cooperative activities will further the CPSC staff's goal of improving the fire performance of upholstered furniture flammability standard without resulting in adverse health risks.

For More Information

Information on various CPSC activities is available on the agency's Internet web site, www.cpsc.gov. This includes the October 2003 ANPR and supporting staff briefing packages on upholstered furniture flammability. A new briefing package, summarizing the ANPR comments, presenting the staff's revised draft flammability performance

standard and regulatory alternatives, and discussing FR chemical issues, is expected to be available to the public in late 2004. CPSC documents and information are also available from CPSC's Office of the Secretary (telephone 301-504-0800, fax 301-504-0127) or through the Commission's toll-free Hotline at 1-800-638-CPSC.