



## **U.S. CONSUMER PRODUCT SAFETY COMMISSION STAFF BRIEFING PACKAGE ON UPHOLSTERED FURNITURE\***

**January 2006**

The U.S. Consumer Product Safety Commission (CPSC) has released a January 2006 CPSC staff briefing package, "Status Update on Regulatory Options for Upholstered Furniture Flammability." This package discusses options to address the risk of fire from ignitions of residential upholstered furniture. CPSC published an advance notice of proposed rulemaking (ANPR) on this matter in October 2003.

The briefing package includes a copy of the CPSC staff's current (2005) revision of its draft standard, containing performance requirements for cigarette and open flame ignition resistance; an earlier version of this staff draft standard was presented to stakeholders at a May 2005 public meeting. The package also analyzes several options, including:

- the staff's 2005 revised draft standard;
- a 2001 CPSC staff draft standard containing only open flame ignition performance requirements;
- a 2004 industry-recommended standard;
- a 2002 draft revision of an existing California standard; and
- variations on the staff's 2005 revised draft standard:
  - the smoldering ignition provisions only;
  - the draft without the small open flame provisions for loose filling materials; and
  - the draft with an added small open flame cover fabric provision

In accordance with an Office of Management and Budget bulletin requiring formal peer review of highly influential or significant scientific documents, the CPSC staff has initiated peer reviews of three key staff reports contained in the briefing package: a preliminary regulatory analysis; a preliminary risk assessment; and a technical rationale report. Upon completion of this process (anticipated in Spring 2006) the staff will forward the peer-reviewed reports to the Commission along with additional information with which the Commission may assess whether to propose a rule on upholstered furniture flammability.

Hard copies of this briefing package are available from CPSC's Office of the Secretary, 4330 East-West Highway, Bethesda, MD 20814-4408. Inquiries about the briefing package may be directed to Mr. Dale R. Ray, Project Manager, tel. 301-504-7704 or e-mail [dray@cpsc.gov](mailto:dray@cpsc.gov). This document is in the public domain, and may be freely copied or reprinted.

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\*The information presented in this document was prepared by the CPSC staff; it has not been reviewed or approved by, and does not necessarily represent the views of, the Commission.



**BRIEFING PACKAGE**  
**Status Update on**  
**Regulatory Options for**  
**Upholstered Furniture Flammability**

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January 2006

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## Executive Summary

On October 23, 2003, the U.S. Consumer Product Safety Commission (CPSC) published an advance notice of proposed rulemaking (ANPR) in the *Federal Register*, announcing the agency's intent to consider action to address the risk of residential fires associated with cigarette and small open flame ignitions of upholstered furniture. This ANPR expanded the scope of an ongoing regulatory proceeding initiated under a previous ANPR published by the Commission in 1994. Public comments submitted in response to the 2003 ANPR consistently supported a CPSC uniform national standard, although the comments expressed a wide range of views on technical issues. The CPSC staff developed a revised draft flammability performance standard, incorporating a number of technical recommendations submitted by stakeholders and improvements developed by the staff.

The staff presented its revised draft standard to the public most recently in May 2005, and held public meetings with stakeholders on numerous occasions to discuss technical issues related to a possible proposed rule. The latest revision of the staff's 2005 draft standard, developed with consideration of additional stakeholder comments and recommendations, is presented in this briefing package along with a number of other regulatory options the Commission could consider in determining whether to issue a notice of proposed rulemaking (NPR) under the Flammable Fabrics Act.

The most recent national fire loss estimates indicate that from 1999 to 2002, an annual average of 4,800 residential fires in which upholstered furniture was the first item ignited could be addressed by a flammability standard. These addressable fires resulted in an estimated annual average of 360 deaths, 740 injuries and \$133 million in property damage. Societal costs associated with these losses averaged about \$2.1 billion annually. About 80% of the deaths and 65-70% of the injuries and property damage were from cigarette-ignited fires. The remainder involved ignitions of upholstered furniture by small open flame ignition sources such as lighters, matches and candles.

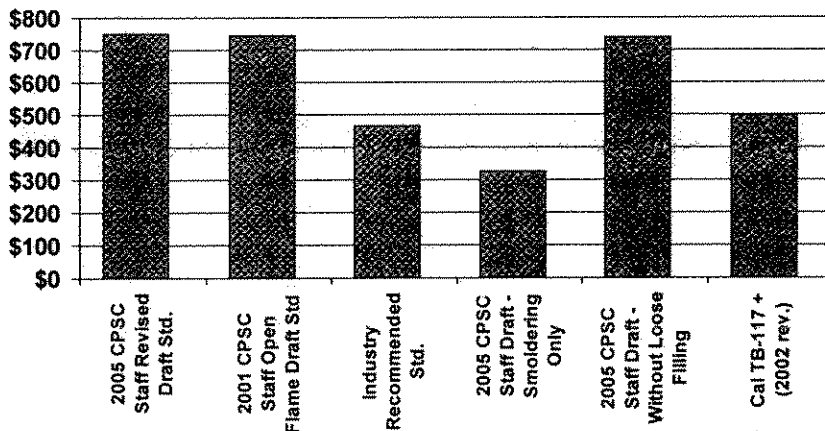
In developing a draft standard, the CPSC staff considered the role of the ignition behavior of different upholstery materials and their post-ignition contribution to fire growth. The staff's 2005 revised draft standard contains performance requirements for fabrics and fillings, and for fire-blocking barriers. This would promote the use of ignition-resistant or slower-burning upholstery materials to reduce the risk of death and injury.

The CPSC staff has conducted extensive technical research and laboratory testing to evaluate upholstery materials, support the development of performance test methods and evaluate comments and recommendations from stakeholders. The staff has also benefited from technical research performed by others, including the California Bureau of Home Furnishings & Thermal Insulation

and industry groups. The CPSC staff plans additional technical work to corroborate the findings of this research; however, sufficient technical information currently exists to conclude that a standard could substantially reduce residential upholstered furniture fire losses.

In addition to evaluating the staff's 2005 revised draft standard, the staff's preliminary regulatory analysis identified and analyzed several other significant regulatory alternatives, including a previous 2001 staff draft small open flame standard, a 2004 industry coalition-recommended standard, a 2002 draft revision of the California standard (Technical Bulletin 117), and variations on the staff's 2005 revised draft standard. The CPSC staff's 2005 revised draft standard is estimated to have discounted benefits of about \$936 million for a year's production of complying upholstered furniture, and estimated economic costs of about \$184 million, for *net* benefits of about \$752 million. The other options would also likely have significant net benefits to society, ranging from about \$327 million to \$750 million per year's production of complying furniture, as shown below.

**Estimated Net Benefits of Principal Regulatory Alternatives on Upholstered Furniture**  
(\$ Millions)



Suppliers of some materials would likely use flame retardant (FR) chemicals to comply with either the staff's 2005 revised draft standard or the major alternatives. While all upholstery materials would have to contribute to fire safety under the staff's 2005 revised draft standard, there would be relatively little reliance on FR upholstery cover fabrics, and relatively more reliance on FR filling materials. FR fabric usage would probably be considerably more widespread either under the CPSC staff's 2001 draft standard or the 2002 draft revision to the California standard, due to the open flame fabric test requirements in those draft standards; FR fabrics would also be required, in lesser quantities, under the industry coalition proposal option. The CPSC staff's risk assessment of the two

predominant filling material FRs suggests, based on limited data, that exposure to the most widely used compound is unlikely to present any appreciable health risk to consumers. A similar assessment for selected FR-treated barrier materials prepared for the open flame mattress rule indicates no appreciable health risk associated with the use of those FRs in barriers, and the staff's 2001 risk assessment found no appreciable health risk associated with a range of fabric FRs.

To address environmental concerns thoroughly, the staff is continuing to work with the U.S. Environmental Protection Agency (EPA) staff to develop a Significant New Use Rule (SNUR) for FR chemicals, to help prevent the use of hazardous FRs. A proposed SNUR could accompany a proposed CPSC rule. CPSC also participated in an EPA Design for the Environment program working with industry to identify and develop more environmentally sound FRs in filling materials. In view of the relatively small likely increase in FR usage, the ongoing efforts to use available, more environmentally preferable FRs, and the available regulatory mechanisms to mitigate any environmental risks that may be identified in the future, the staff concludes that none of the alternatives under consideration would have significant adverse impacts on human health or the environment.

The CPSC staff has encouraged voluntary standards activity as an alternative to federal rulemaking. There has been little activity in this area since 2001, however, and the staff does not foresee a flammability standard being developed through the voluntary consensus process.

This briefing package presents the results of the staff's work to date to develop a revised draft standard and evaluate alternatives. In accordance with a 2004 Office of Management and Budget bulletin requiring formal peer review of highly influential or significant scientific documents, the staff has initiated peer reviews of three major recent staff reports included in this briefing package – the engineering technical rationale report (attached at **Tab C**), the preliminary regulatory analysis of costs and benefits (attached at **Tab E**) and the preliminary health risk assessment of filling material FR chemicals (attached at **Tab F**). These staff documents have also been posted on the CPSC web site for public access. Upon completion of the peer review processes for these documents - anticipated in Spring 2006 - the staff will forward the peer-reviewed reports to the Commission along with additional information with which the Commission may assess whether to issue an NPR, and determine the content of any such notice.



UNITED STATES  
 CONSUMER PRODUCT SAFETY COMMISSION  
 WASHINGTON, DC 20207

Memorandum

Date: January 30, 2006

TO : The Commission  
 Todd Stevenson, Secretary

THROUGH: Page C. Faulk, General Counsel *PCF*  
 Patricia M. Semple, Executive Director *PS*  
 Lowell F. Martin, Deputy Executive Director *L.F.M.*

FROM : Jacqueline Elder, Assistant Executive Director for  
 Hazard Identification & Reduction  
 Dale R. Ray, Project Manager, *DRR*  
 Directorate for Economic Analysis  
 301-504-7704

SUBJECT : Status Update on Regulatory Options for  
 Upholstered Furniture Flammability

The U.S. Consumer Product Safety Commission (CPSC) is considering regulatory options to address the risk of residential fire associated with smoldering cigarette and small open flame ignition of residential upholstered furniture. The Commission published an advance notice of proposed rulemaking (ANPR) in the October 23, 2003 *Federal Register* (a copy of the ANPR is attached at **Tab A**). This briefing package presents information developed pursuant to the 2003 ANPR, including analyses of public input and technical information to support the CPSC staff's draft flammability performance standard and a number of other regulatory options.

The staff previously developed a draft flammability standard under a 1994 ANPR, addressing the risk of small open flame-ignited upholstered furniture fires; the staff presented this draft standard in a 2001 Commission briefing package.\* The staff substantially revised its draft standard based on recent data and recommendations provided by stakeholders in response to the 2003 ANPR. The staff presented its most recent revised draft standard at a May 2005 public meeting, and has made further revisions in response to stakeholder comments. In accordance with a December 2004 Peer Review Bulletin issued by the Office of Management & Budget (OMB), key technical staff reports in this briefing package are presently undergoing peer review in preparation for Commission consideration of a possible notice of proposed rulemaking (NPR).

\*U.S. Consumer Product Safety Commission, "Briefing Package on Upholstered Furniture  
 CPSC (O) (U) (C) (S) (E) (A) (N) (P) (R) Regulatory Options," October 2001.

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## I. Background

Following development of the CPSC staff's 2001 draft small open flame standard, the staff held a public meeting in 2002 to discuss its draft standard with interested parties and to solicit recommendations on the direction of the proceeding. At the public meeting, a number of industry representatives and others recommended expanding the scope of the proceeding to cover explicitly the risk of fire associated with smoldering cigarette-ignited residential upholstered furniture fires. Subsequently, the staff recommended expanding the scope of the proceeding to address the risk of both smoldering and open flame ignitions. Fire loss data substantiated this staff recommendation: despite the downward trend in smoking material-related furniture fire losses and the lack of a nationwide voluntary small open flame standard, cigarette ignitions continued to account for most upholstered furniture fire-related deaths, injuries and property damage.

The Commission agreed that the staff should re-examine the emphasis placed on these two principal ignition mechanisms and consider appropriate revisions to the draft standard. The 2003 ANPR sought comment on issues relating to the kinds of standard provisions that might best address the furniture fire risk in its entirety.

CPSC received 13 written comments during the 60-day formal comment period following publication of the ANPR. Since that time, interested parties have provided 14 additional written submissions in the form of letters, position statements or technical presentations at meetings. The staff is analyzing all 27 as ANPR comments, and expects to receive more submissions prior to Commission consideration of a possible NPR.

The development of a revised standard addressing both cigarette and small open flame ignition of upholstered furniture has been evolutionary. The staff met with various stakeholder groups since 2003 to discuss the technical data and recommendations submitted in response to the ANPR. During 2004, an industry coalition formed to provide joint recommendations on performance tests for most upholstery seating area materials. The coalition and some of its individual member organizations met with the staff to present data supporting their position that upgraded component material test results would correlate adequately with composite performance results.

In October 2004, the staff held a public meeting to present the direction of the staff's revised draft standard. While some meeting participants expressed general support for the staff's direction, others expressed concern about the technical and commercial feasibility of some of the performance requirements in the draft. The staff took these concerns into account, and made additional modifications to the draft standard in order to reduce potential manufacturing costs without significantly affecting projected effectiveness. The staff held another public meeting in May 2005 to present the revised draft standard, and posted the draft on the CPSC web site. After conducting further research and considering additional stakeholder input, the staff made additional revisions to its draft standard.

The staff's chief guiding principle is to seek reasonably effective provisions for smoldering and small open flame ignition performance, taking into account the hazards attributable to these two ignition mechanisms. The staff's 2005 revised draft standard recognizes the primary contribution of smoldering ignition to the overall risk of death and injury, and balances risk reduction and practicability. It is supported by data suggesting a high level of effectiveness at reducing cigarette and small open flame fire losses. The staff's current revised draft standard and technical rationale are described in greater detail below in Sections III and IV.

In response to stakeholder recommendations and concerns, the staff has identified several other options that could be incorporated into a possible NPR. These include:

- the staff's current (2005) revised draft standard;
- the staff's previous (2001) small open flame standard;
- a 2004 industry-recommended standard;
- a 2002 draft revision of an existing California standard; and
- variations on the staff's draft standard:
  - the smoldering ignition provisions only;
  - the draft without the small open flame provisions for loose filling materials; and
  - the draft with an added small open flame cover fabric provision.

Each of these options is discussed in this memorandum. Technical issues are presented in Section III, and in the attached staff technical reports. The staff's preliminary regulatory impact analysis of benefits and costs of the draft standard and significant alternatives, and preliminary regulatory flexibility analysis of possible impacts on small entities, are described in Section VII. The regulatory analysis also considers a "no action" alternative that would rely on voluntary activity to address the risk.

The staff has sought to develop a cost-effective draft standard that would substantially reduce the risk. Further, in its regulatory approach, the staff has sought to reduce the previous 2001 draft standard's reliance on flame retardant (FR) chemical treatments for upholstery cover fabrics and, to the extent possible, reduce the use of FRs overall to meet a standard, consistent with the staff's goal of providing adequate fire safety without imposing potential chemical risks to consumers or the environment. Discussions of FR chemical issues and the staff's environmental assessment are presented in Section VIII.

## **II. Fire Hazard Update**

The 2003 ANPR noted that ignitions of upholstered furniture continue as a leading cause of residential fire-related deaths, injuries and property damage. For 2002, the Directorate for Epidemiology's annual report of U.S. residential fire losses

estimated a total of 8,600 non-intentional furniture fires, resulting in an estimated 460 civilian deaths, 940 injuries and about \$252 million in property damage.\*\*

Average annual estimates for the most recent available multi-year period (1999-2002) provide a more stable descriptor of the hazard than annual estimates, since the annual estimates tend to fluctuate significantly from year to year. Average annual upholstered furniture fire losses for this 4-year period were 9,000 fires, 520 deaths, 1,040 injuries and \$242 million in property damage.

Not all residential upholstered furniture fire losses are *addressable* by a flammability standard. The reported fire incidents do not always involve smoking materials or small open flame sources like lighters, matches or candles. Further, the involvement of upholstered furniture in the fire is not always clearly or consistently identified in the reported information. The staff's procedure for identifying addressable losses incorporates techniques designed to exclude fires that could not be demonstrably and directly affected by a product performance standard. The staff's estimates may tend, therefore, to understate true losses. The Directorate for Epidemiology's fire loss report appears at **Tab B**. This report provides a detailed discussion of the staff's estimation procedure for total and addressable fire losses, and recent changes to the National Fire Incident Reporting System (NFIRS) that affect the way the estimates are derived.

A majority – 4,800 annually, or about 53% - of estimated fires that occurred during the 1999-2002 period would be addressable by a flammability standard. Estimated addressable fire losses are shown in Table 1.

**Table 1**  
**Residential Upholstered Furniture:**  
**Estimated Average Annual Addressable Fire Losses 1999-2002\***

	Smoking Materials	Small Open Flame	Total
Fires	3,600	1,300	4,800
Deaths	300	60	360
Injuries	480	260	740
Property Damage	\$91 mil.	\$42 mil.	\$133 mil.

\*All estimates within categories are rounded; totals are based on unrounded estimates; property loss estimates are unadjusted for inflation over time. Source: CPSC Directorate for Epidemiology, 2005

The table shows that ignitions from smoking materials (almost always cigarettes) account for about 83% of estimated deaths and about 68% of estimated injuries and

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\*\* U.S. Consumer Product Safety Commission, Directorate for Epidemiology, "1999 Revised – 2002 Residential Fire Loss Estimates," November 2005. See <http://www.cpsc.gov/library/fire02.pdf>.

property damage. Reductions in the addressable fire losses represent the potential benefits to society of a flammability standard or other action. The estimated benefits are calculated in the staff's preliminary regulatory analysis, a summary of which is presented below in Section VII.

Analyses of in-depth fire investigations (IDIs) conducted by the CPSC staff have also contributed to the agency's standards development activity. The IDI reports often provide useful descriptions of fire scenarios and product involvement. The staff recently developed new fire investigation guidelines and began a new study to assign for investigation and analyze upholstered furniture fires. This ongoing effort will contribute to the staff's knowledge on upholstered furniture fire losses.

### **III. Standards Development Research and Laboratory Testing**

To respond to stakeholders' technical recommendations and to provide support for the performance requirements of the staff's revised draft standard, the staff performed a substantial amount of research and laboratory testing. The engineering research and laboratory testing supporting the staff's previous draft small open flame standard presented in the 2001 briefing package provided a useful foundation of knowledge upon which the staff could build in developing the current, extensively revised 2005 draft standard for both cigarette and small open flame ignition performance. The technical staff reviewed existing standards and fire science data and conducted laboratory tests to evaluate the cigarette and small open flame ignition propensity of upholstered furniture and to develop an appropriate performance test approach. Supporting reports from the Directorate for Engineering Sciences and the Directorate for Laboratory Sciences are attached at **Tab C**.

#### **A. Addressing the Risk**

With the October 2003 ANPR, the Commission expanded its proceeding to address both cigarette and small open flame ignition of upholstered furniture. The staff reviewed the national fire loss information and used this to focus the development of a revised draft standard that would address the two principal ignition mechanisms. The staff's draft standard contains performance requirements using both cigarette and open flame ignition sources, but places relatively greater emphasis on the primary ignition mechanism of smoldering from lit cigarettes.

The staff also considered the role of the ignition behavior of different upholstered furniture materials and their post-ignition contribution to fire growth. While ignition resistance is an ideal goal, all upholstery materials will ignite and burn if subjected to sufficient heat, whether from smoldering, flaming or other ignition sources. These sources can often represent a fire threat beyond that which can reasonably be addressed by an ignition resistance standard. Therefore, the staff also sought to limit the rapid burning rate of many upholstery materials, particularly interior fillings, not to eliminate fire growth but rather to slow it enough to delay the onset of untenable fire

conditions, and to allow additional escape time for occupants of the residence, thereby reducing deaths and injuries. Thus, the draft standard incorporates requirements limiting the mass loss over time of interior fillings, and requirements limiting the mass loss of standard fillings (i.e., specified test materials with known performance characteristics) that are used with tested cover fabrics or barriers.

## **B. Performance Test Approach**

The staff reviewed the performance requirements of and rationale for existing flammability standards that might address the risk. There are three basic sets of flammability test methods: the Upholstered Furniture Action Council (UFAC) voluntary guidelines (for cigarette resistance only); California Technical Bulletins (TB) 116, 117 and 133, administered by the California Bureau of Home Furnishings and Thermal Insulation (BHF); and the British standard BS-5852, developed by the British Standards Institute and referenced in the United Kingdom (U.K.) mandatory regulations. Aspects of these methods have been adopted by consensus voluntary standards organizations and industry groups, including ASTM International (formerly the American Society for Testing & Materials), the National Fire Protection Association (NFPA) and the Business and Institutional Furniture Manufacturers of America (BIFMA), the International Standards Organization (ISO) and in some state and local fire codes.

Most of these existing standards use bench-scale tests to evaluate different materials. Composite tests of the assembled, actual materials used in the finished article of furniture yield the best indication of the performance of the finished article; however, composite testing of actual materials is costly and impractical for most upholstered furniture producers, since there is a large number of materials – especially cover fabrics – that may all have to be tested. The staff concluded that material tests using a composite seating mockup approximating the geometry of actual furniture constructions is reasonably representative of the performance of the finished article. These seating mockups are constructed using the material being tested in combination with standardized substrates or other materials that possess known, realistic but challenging flammability performance characteristics.

The staff also sought to maintain flexibility for manufacturers and suppliers in compliance methods. The tests in the staff's draft standard measure the ignition *performance* of the materials subject to each requirement. There are no specified physical characteristics of the tested materials; similarly, there are no requirements for the use of any chemical treatment of the materials. For example, to help certain smolder-prone, predominantly cellulosic fiber fabrics comply, fabric producers could either a) modify the fiber content or other physical characteristics of the fabric, b) add FR chemical treatments or finishes, or c) continue to offer the non-complying fabric for use with complying fire-blocking barriers in the finished article of furniture. Similar options are available for all materials subject to the staff's draft standard, so as not to limit innovative technologies or unnecessarily eliminate material choices from the market.

### C. Industry Recommendations

In 2004, the industry coalition comprised of the American Furniture Manufacturers Association (AFMA, now known as the American Home Furnishings Alliance, or AHFA), the Upholstered Furniture Action Council (UFAC), the Polyurethane Foam Association (PFA), the International Sleep Products Association (ISPA), the American Fire Safety Council (representing flame retardant chemical suppliers), the American Textile Association (ATA, now the National Textile Association, or NTA) and the Decorative Fabrics Association (DFA)/Coalition of Converters of Decorative Fabrics (CCDF) recommended that the Commission consider a set of performance requirements developed by AFMA and the Fabric Coalition (a group of six fabric suppliers). This proposal included:

- a small open flame cover fabric component burn rate test taken from the Commission's Clothing Textiles Standard (16 CFR 1610, as modified with a 5 second flame exposure time instead of 1 second as in the CPSC regulation; this is referred to as the Fabric Coalition "5-second test");
- the California TB-117 (2002 draft revision) tests for cigarette and small open flame ignition of resilient foam filling materials;
- the U.K. / BS 5852 open flame test for non-foam, i.e., fibrous, fillings used in horizontal "cushion wraps;"
- ASTM E-1353 (UFAC) tests for cigarette ignition resistance of fibrous fillings in horizontal "cushion wraps" and arms; and
- an unspecified test for fire barrier materials to be devised by CPSC, but preferably with a more realistic and reproducible ignition source than the U.K. wooden crib ignition source specified in the previous 2001 CPSC staff draft.

FR treatments would generally be required for most predominantly thermoplastic-fiber fabrics and most foam filling materials to meet these recommendations. The industry proposal did not specifically include the smoldering test for cover fabrics included in the UFAC voluntary industry guidelines.

The CPSC staff reviewed available test data and other technical information and conducted tests at the CPSC Laboratory to evaluate the stakeholder recommendations. The staff agreed that the Fabric Coalition 5-second small open flame fabric component test is reasonably repeatable and reproducible. This test has been in widespread use for apparel testing for over five decades; it is a reliable screening method to identify fast-burning apparel fabrics. The test as proposed, however, neither represents the geometry of furniture constructions nor accounts for the interaction of fabric and other materials during combustion – a factor that is important in assessing the flammability performance of upholstery fabrics. The staff concluded that the Fabric Coalition 5-second proposed test does not adequately evaluate fabric component performance in upholstered furniture configurations, and would be of relatively low effectiveness at reducing fire losses.

In the absence of a cigarette fabric test, using the Fabric Coalition fabric test could encourage the use of smolder-prone fabrics. CPSC Laboratory testing demonstrated that the kinds of fabrics (i.e., heavier weight, high cellulosic content) that burn slowly and pass the Fabric Coalition test are the fabrics that produce the worst smoldering performance, transferring more heat to filling materials over a longer time duration. This represents an undesirable potential adverse effect on smoldering ignition resistance. Further, FR treatments would probably be needed for most thermoplastic fiber fabrics to meet the Fabric Coalition open flame fabric test. FR treatments for those products could add modest improvement in open flame resistance; however, as noted in Section VII, estimated hazard costs associated with furniture made with these predominantly thermoplastic fabrics are very low; thus, the potential contribution of FR thermoplastic fabrics to the level of safety provided by a standard is relatively low. The staff concluded that sufficient protection for poor small open flame-performing fabrics can be achieved with fire resistive filling materials without encouraging the use of FR treatments for thermoplastic-fiber fabrics.

For fibrous filling materials – predominantly polyester (and to a lesser extent, cotton) fiber batting, the industry-recommended U.K. BS 5852 open flame test uses an ignition source (a 135 mm gas flame applied to a seating mockup for 40 seconds) that is larger than the 35 mm / 20 second source in the BS 5852 fabric test. It specifies maximum combustion time (2 minutes for flaming, 15 minutes for other forms) rather than mass loss. Complying polyester batting would reportedly not have to be FR treated, but would have to be free of silicone lubricants, or “slickeners,” used to facilitate upholstered furniture manufacturing. These materials would either be made from “dry” fiber or from fiber slickened with non-silicone lubricants. Currently produced FR cotton batting would reportedly comply without modification. These open flame resistant materials would also meet the industry-recommended UFAC / ASTM provisions for smolder resistance.

The furniture industry proposal contained no minimum performance requirements for loose filling materials such as blown polyester fiberfill, feathers, down, etc., and no small open flame requirements for arm padding. About half of currently produced upholstered furniture pieces have loose fill-containing back cushions and padded vertical inside arm surfaces.

Polyester loose fiberfill is most often used in vertical seating areas (in roughly half of currently produced furniture units); it is relatively cigarette ignition resistant but may contribute to rapid and intense burning if ignited by a small open flame. Excluding these vertical-location seating area materials from any minimum performance requirements would reduce the safety benefits that could be gained from the use of other, more fire-resistant materials in close proximity to seat cushion and arm fillings.

The staff concluded that it is reasonable to incorporate some aspects of the furniture industry proposal into tests to evaluate upholstered furniture material performance, including a) the UFAC mockup approach to evaluate the smoldering performance of individual materials, and b) the mass loss approach of the TB-117 small

open flame specifications. The staff's analysis indicates that other aspects, including the 5-second small open flame fabric test, the combustion time acceptance criteria for fibrous fillings, and the limitations on which filling materials would be within the scope of the standard, would not provide significant fire safety benefits.

#### **D. Technical Research and Laboratory Testing**

The CPSC Laboratory has performed extensive testing of various upholstered furniture materials and composites to establish the performance requirements of the staff's draft standard. Pertinent test data have also been provided by the California BHF and industry groups. The testing examined the smoldering and open flame performance of upholstery cover fabrics, resilient foam filling materials, fibrous fillings and fire barriers.

To establish appropriate requirements for the smoldering ignition performance of the various upholstery materials, the staff reviewed existing test methods and outside proposals. The staff also evaluated the smoldering behavior of different fabrics, fillings and barriers, identified standard test materials, i.e., cover fabric and foam substrate, and assessed possible performance parameters such as char length, mass loss and combustion time. This evaluation, including the CPSC Laboratory's cigarette testing, indicated that:

- The UFAC / ASTM bench-scale seating mockup is adequate to evaluate materials' relative smoldering performance;
- Vertical surface char length does not assess smoldering performance as well as mass loss of the interior filling material (i.e., foam substrate);
- A standard FR urethane foam substrate with specific performance characteristics is appropriate to evaluate the smoldering performance of fabrics, other fillings, and barriers; and
- Fire barriers should be evaluated for both smoldering and open flame resistance to ensure that they provide protection from both ignition sources to the assembled article of furniture.

To establish appropriate open flame performance requirements for upholstery materials, the staff reviewed existing test methods and outside proposals, and conducted laboratory testing. The staff's research and testing indicated that:

- The U.K. (BS-5852) / CPSC staff bench-scale seating mockup is adequate to evaluate material performance;
- Mass loss measurements over time provide a reasonable indicator of material performance (mass loss over time is a direct mathematical function of heat release rate, which best represents the fundamental characteristics of material fire behavior);
- Standard test materials (cover fabric and foam substrate) should be specified to establish the performance of individual upholstery materials, with strict standard material performance requirements to ensure consistent test results; and



- Performance tests for all filling materials are sufficient to provide a reasonable level of protection without cover fabric requirements.

The performance tests, standard materials and pass / fail criteria in the staff's 2005 revised draft standard reflect the findings of the CPSC Laboratory test programs to date. A set of eleven supporting staff research reports prepared by the Directorate for Laboratory Sciences was posted on the CPSC web site in mid-2005 (see <http://www.cpsc.gov/library/foia/foia05/os/os.html>). These reports provide detailed information on a wide variety of test method development issues.

Several stakeholders have recommended that CPSC establish a correlation between its bench scale tests and "real world" performance. The California BHF and some industry representatives have conducted some limited tests that indicate good large scale correlation for the seating mockup tests in the 2002 revised draft TB-117. These tests compared the performance of materials in small mockups (i.e., seat and back, without arms) to larger mockups (as used in TB-133, the larger-scale California standard for non-residential furniture). To supplement the staff's bench scale testing, the staff in 2005 executed an Interagency Agreement (IAG) with the National Institute of Standards and Technology (NIST) to conduct larger scale mockup tests of upholstery materials. This test program is intended to provide supplemental data on how well the performance of materials in bench scale mockup tests relates to their performance in larger scale mockup tests of constructions that more closely represent the seating areas of finished articles of upholstered furniture. The laboratory testing phase of a pilot study for this program was completed in December 2005. The staff is currently assessing the results of the NIST laboratory testing and will adjust the plans for future large scale testing accordingly.

As testing by the CPSC staff and by stakeholders has progressed, a concern has arisen regarding the consistency of the performance of standard test materials (cover fabric and polyurethane foam substrate) specified in the staff's 2005 revised draft standard. This concern is of significance chiefly in determining the performance of upholstery materials in the open flame tests, and relates primarily to the standard cover fabric. While earlier CPSC Laboratory tests in 2004 indicated that the standard cotton velvet fabric (also specified in the California TB-117 smoldering tests) performed consistently in open flame tests, later tests identified variability that could adversely affect the repeatability and reproducibility of the tests. A staff report at **Tab C** presents additional information on this issue.

The staff concluded that these standard materials needed to be carefully controlled and specified. Therefore, the staff has added specific flammability performance requirements for standard materials to the 2005 revised draft standard; these requirements would ensure that the standard materials are within a reasonable range of performance before they could be used to qualify other materials for use in complying articles of furniture.

The staff met with stakeholders and with the standard materials manufacturers in 2005 to discuss the observed test results and to explore possible explanations and solutions. A number of physical properties may contribute to flammability performance variability; it is possible that these properties can be adequately controlled. Substantial progress has been made on standard foam, but the staff has not yet resolved the variability observed in the cotton velvet test fabric. The staff is, therefore, assessing alternative standard fabrics, including certain synthetic fiber or plain woven fabrics that are inherently more homogeneous than cotton, and nonwoven fabrics suggested by some industry stakeholders. The staff may also consider modifications to the acceptance criteria in its 2005 revised draft standard to reflect any changes in standard materials.

In addition to the tests performed to establish requirements for presently used upholstery materials, the CPSC Laboratory conducted tests on a variety of existing and experimental fire-blocking barrier materials to evaluate the smoldering and open flame performance of materials that may be available to comply with a possible standard, and to support a recommendation for an appropriate open flame ignition source in a barrier test. This work was also in response to industry recommendations to consider barrier ignition sources other than the U.K. ignition source #5 (a burning 40mm x 40mm x 60mm wooden crib on the mockup's horizontal surface) referenced in the staff's previous 2001 draft small open flame standard.

In 2002-2003, the CPSC Laboratory evaluated 12 different barriers, including FR treated woven cottons used to meet the U.K. regulations, aramid and melamine / aramid blends, novoloids, and melamine / modacrylic / polyester blends. In general, barriers that did well in crib tests did not always provide protection for polyurethane foam filling materials in small open flame tests: the burning cover fabrics often overwhelmed the barriers. The barriers generally performed better in cigarette ignition tests, but did not always improve the performance of the mockup compared to tests without the barriers. The staff identified a number of existing barrier materials that provide adequate protection from both cigarette and open flame ignition when used with all but the most extreme burning cover fabrics.

The staff used infrared imaging to model the post-ignition behavior of burning cover fabrics, and conducted limited tests to evaluate some other ignition sources, including a gas burner developed by the AFMA Flammability Committee, another gas burner developed by the CPSC Laboratory, the U.K. source #2 (35 mm butane flame, 20 second exposure) small open flame source used in tests of other materials subject to the staff's draft standard, and the U.K. source #3 (240 mm butane flame, 70 second exposure) open flame source. These produced a range of performance relative to the reference small open flame mockup. The results indicated that the U.K. open flame source #3, used with a standard cover fabric, provided the most realistic challenge to barriers designed to resist a small flame-ignited burning cover fabric. The staff reports on the CPSC web site contain summary tables and additional details on this testing.

#### **IV. CPSC Staff 2005 Revised Draft Flammability Standard**

In developing a revised draft flammability standard addressing both cigarette and small open flame ignitions of residential upholstered furniture, the CPSC staff considered the available hazard information, existing standards development research together with the latest CPSC Laboratory data, and technical information developed by other organizations. The staff also considered economic, health and environmental factors.

The latest version of the staff's 2005 revised draft standard is attached at **Tab D**. This draft of the standard has also been posted on the CPSC web site (see <http://www.cpsc.gov/library/foia/foia06/os/os.html>). This draft standard contains flammability performance requirements for materials used in most residential upholstered furniture. Consistent with rulemaking requirements under the Flammable Fabrics Act, products that do not present a significant fire risk, such as furniture intended for use outdoors or in non-residential occupancies, are not subject to the draft standard. The draft standard applies to residential seating products intended for indoor use and constructed with contiguous upholstered seats and backs or arms (i.e., approximately horizontal and vertical seating surfaces). This includes:

- Household furniture, such as chairs and sofas (including motion furniture and sleep sofas);
- Home office furniture sold through retailers or otherwise available for household use; and
- Upholstered furniture used in dormitories or other residential occupancies.

The draft standard does not apply to:

- Outdoor furniture, such as patio chairs and chaise lounges;
- Articles without contiguous upholstered horizontal and vertical seating surfaces, such as ottomans, decorative pillows or seating pads, and many office chairs and dining chairs;
- Commercial or industrial furniture not intended or sold for household use;
- Furniture intended or sold solely for use in hotels and other temporary lodging and hospitality establishments; and
- Futons, flip chairs, the mattress portions of sleep sofas and other articles intended primarily for sleeping that are covered under the existing CPSC mattress flammability standard (16 CFR 1632) or the proposed mattress open flame standard (drafted as 16 CFR 1633).

The staff's 2005 revised draft standard is designed to achieve the goal of resistance to ignition and limited fire growth by means of a series of performance tests for the major upholstery materials in furniture constructions that contribute significantly to fire behavior:

- Cover fabrics, the outermost layer of upholstery;
- Resilient filling materials, such as polyurethane foam cushion cores;
- Fibrous filling materials, such as cushion wraps or toppers made of polyester fiberfill or cotton batting;
- Loose filling materials, such as blown polyester fiber, shredded foam, feathers, down, etc., and interliner fabrics that must encase and serve as barriers for non-complying loose fillings; and
- Fire-blocking barriers that must be used in combination with any non-complying materials; there are different performance requirements for a) interior barriers used between cover fabrics and interior fillings, and b) upholstery cover fabric or other outer covering material barriers.

The staff's 2005 revised draft standard is designed to afford flexibility to manufacturers, importers and component and material suppliers by allowing four different, equally acceptable means of compliance. Compliance for finished articles of upholstered furniture would be established in accordance with one of the following classifications:

Type I (Interior Barrier): furniture items made with interior fire barriers placed between the cover fabric and any interior resilient, fibrous or loose fillings; the fillings themselves need not comply with any flammability requirement (although, for example, a fibrous filling layer could serve as the interior barrier).

Type II (Cover Barrier): furniture items made with a cover barrier (e.g., leather, wool, or FR fabrics) as the outermost upholstery material; again, interior fillings need not comply with any flammability requirement.

Type III (Specified Materials): furniture items made with upholstery materials (cover fabrics, resilient fillings such as urethane foam, fibrous materials such as polyester or cotton batting, and loose fillings such as polyester fiberfill) that meet individual performance test requirements for each material. If loose filling material is present and qualified with an interliner, it is designated "Type III-B."

Type IV (End Product Materials): furniture items made with any specific combination of materials that, when assembled, meet composite, as-built performance test requirements for each combination; individual materials need not comply with any requirement, so long as the combination of those materials provides acceptable protection.

The performance requirements are designed to reduce the risk of fire from smoldering and small open flame ignition. The staff adapted elements of existing standards, including California Technical Bulletin 117, ASTM E-1353 (tests from the Upholstered Furniture Action Council voluntary industry guidelines) and the U.K. Regulations (based on the British Standards Institute standard BS-5852). This general materials test approach is consistent with stakeholders' recommendations, although the

CPSC staff has made some modifications to achieve consistent and reliable performance measurements.

Material tests are conducted using a seating mockup of fabric and filling. For each tested material, the goal is to limit the mass loss from combustion (smoldering, melting, or flaming); each material helps prevent or delay full involvement of the article of furniture. Pass / fail criteria are based on maximum acceptable mass loss percentages within a specified test period. Smoldering performance is measured at the end of a 30 minute test; open flame performance is measured at the end of a 45 minute test. Three replicates or test passes are conducted for each material test; no replicate or sample can exceed the specified mass loss limits. These mass loss and test duration limits would require that materials be more difficult to ignite, and burn more slowly if ignited; available data indicate that progressive combustion beyond these limits is likely to involve the entire finished article of furniture.

While the various materials in Type III upholstered furniture may have to pass as many as seven individual performance tests, there are only two basic sets of similar tests for each material – one set for smoldering ignition performance and another set for small open flame ignition performance. Type I, II and IV furniture need only pass two tests – one smoldering and one open flame. The various tests summarized below are set forth in detail in the draft standard posted on the agency's web site.

#### **A. Smoldering Ignition Performance Tests**

The primary provisions of the staff's 2005 revised draft standard directly address smoldering ignition from cigarettes. All cover fabrics or materials and all interior filling materials must pass their respective performance tests, or be used with cigarette and open flame resistant interior or cover barriers (except for Type IV furniture tested in an actual materials composite configuration). Table 2 on page 16 presents a summary of the smoldering ignition performance tests.

#### **B. Small Open Flame Ignition Performance Tests**

The staff's 2005 revised draft standard also contains provisions to address small open flame ignitions. In addition to providing protection from small flame ignition, these performance tests for upholstery materials and optional fire barriers contribute to the protection of materials from the progression of smoldering to flaming combustion. Table 3 on page 17 presents a summary of the open flame performance tests.

As with the smoldering tests, upholstery materials must pass their respective open flame tests, or be used with cigarette and open flame resistant fire barriers. Cover fabrics or materials (e.g., leather) may be qualified as Type II cover barriers for use with non-complying interior fillings, using the small open flame cover barrier test (and the fabric smoldering test) to evaluate the ability of the cover material to protect non-complying fillings from small flame ignition. Type I interior fire barriers placed directly beneath cover fabrics may be qualified for use with non-complying cover fabrics *and*

interior fillings, using a larger open flame interior fire barrier test (and the interior barrier smoldering test) to evaluate the ability of the barrier to protect non-complying fillings in the presence of a burning cover fabric. In Type III products, the open flame filling material requirements provide adequate protection in combination with the smoldering requirements for fabrics and fillings; thus, there is no Type III open flame test for cover fabrics.

### **C. Summary of Materials Performance Tests**

As noted above, finished articles of upholstered furniture are identified as Type I, II, III or IV, depending on the method chosen by the manufacturer to establish compliance. Table 4, on page 18, outlines the performance tests by type of furniture.

### **D. Implementing Rules & Regulations**

In addition to flammability performance requirements, the staff's 2005 revised draft standard contains provisions relating to certification and recordkeeping, testing to support guaranties issued by material suppliers, and labeling of finished articles of upholstered furniture. These quality assurance and quality control-related requirements are intended to help manufacturers, importers and suppliers ensure that their products comply, and to help the CPSC staff enforce the draft performance standard. These provisions are contained in Subpart B of the draft standard.

#### Certification & Recordkeeping

Manufacturers and importers would certify that their finished articles of upholstered furniture comply. This certification may be based on guaranties issued by materials suppliers stating that their materials met the applicable requirements. Manufacturers and importers would be required to retain records demonstrating compliance, including test records or other information to support guaranties from material suppliers, as well as model or stock-keeping unit identification and physical samples or swatches of materials used in finished products. Manufacturers and importers (and material suppliers) would also have to retain distribution records for their products (and respective materials). These records must be retained for as long as the finished article or material is produced or imported, and for three years thereafter.

#### Testing to Support Guaranties

To certify compliance for finished articles of upholstered furniture, manufacturers and importers may rely on guaranties of compliance issued by material suppliers under the Flammable Fabrics Act (FFA). The FFA requires that these guaranties be supported by reasonable and representative tests sufficient to establish that production units of materials meet the applicable tests. There are no specific sampling or periodic production testing requirements in the staff's 2005 revised draft standard. Manufacturers or importers of materials or furniture would be responsible for establishing appropriate test programs to support any certifications of compliance.

**Table 2**  
**CPSC Staff 2005 Revised Draft Standard for**  
**Upholstered Furniture Flammability:**  
**Smoldering Resistance Tests**

<b>Material</b>	<b>Test Description</b>	<b>Test Requirement</b>
Cover Fabric (Type III) and Cover Barrier Fabric (Type II)	<ul style="list-style-type: none"> <li>• Modified ASTM/UFAC seating mockup, 3" thick</li> <li>• Std. FR foam substrate</li> </ul>	Maximum 10% mass loss of substrate @ 30 minutes
Fibrous Filling (Type III)	<ul style="list-style-type: none"> <li>• Modified ASTM/UFAC seating mockup, 3" thick</li> <li>• Std. FR foam substrate</li> <li>• Std. cover fabric</li> </ul>	Maximum 10% mass loss of substrate @ 30 minutes
Loose Filling and Loose Filling Interliner (Type III, including option B)	<ul style="list-style-type: none"> <li>• Modified ASTM/UFAC seating mockup, 3" thick</li> <li>• Loose fill, or interliner w/ std. loose fill substrate</li> <li>• Std. cover fabric</li> </ul>	Maximum 10% mass loss of loose filling @ 30 minutes
Resilient Filling (Type III)	<ul style="list-style-type: none"> <li>• Modified ASTM/UFAC seating mockup, 3" thick</li> <li>• Std. cover fabric</li> </ul>	Maximum 10% mass loss of resilient filling @ 30 minutes
Interior Fire Barrier (Type I)	<ul style="list-style-type: none"> <li>• Modified ASTM/UFAC seating mockup, 3" thick</li> <li>• Std. FR foam substrate</li> <li>• Std. cover fabric</li> </ul>	Maximum 10% mass loss of substrate @ 30 minutes
End Product Materials (Type IV)	<ul style="list-style-type: none"> <li>• Modified ASTM/UFAC seating mockup, 3" thick</li> <li>• Actual materials used in end product</li> </ul>	Maximum 10% mass loss of filling materials @ 30 min.

**Table 3**  
**CPSC Staff 2005 Revised Draft Standard for**  
**Upholstered Furniture Flammability:**  
**Open Flame Resistance Tests**

<b>Material</b>	<b>Test Description</b>	<b>Test Requirement</b>
Fibrous Filling (Type III)	<ul style="list-style-type: none"> <li>• BS 5852 seating mockup</li> <li>• Std. FR foam substrate</li> <li>• Std. cover fabric</li> <li>• 35 mm / 20 sec. flame</li> </ul>	Maximum 20% mass loss of mockup @ 45 min.
Loose Filling and Loose Filling Interliner (Type III, including option B)	<ul style="list-style-type: none"> <li>• BS 5852 seating mockup</li> <li>• Loose fill, or interliner with std. loose fill substrate</li> <li>• Std. cover fabric</li> <li>• 35 mm / 20 sec. flame</li> </ul>	Maximum 20% mass loss of mockup @ 45 min.
Resilient Filling (Type III)	<ul style="list-style-type: none"> <li>• BS 5852 seating mockup</li> <li>• Std. cover fabric</li> <li>• 35 mm / 20 sec. flame</li> </ul>	Maximum 20% mass loss of mockup @ 45 min.
Interior Fire Barrier (Type I)	<ul style="list-style-type: none"> <li>• BS 5852 seating mockup</li> <li>• Std. non-FR foam substrate</li> <li>• Std. cover fabric</li> <li>• 240 mm / 70 sec. flame</li> </ul>	Maximum 20% mass loss of mockup @ 45 min.
Cover Fire Barrier (Type II)	<ul style="list-style-type: none"> <li>• BS 5852 seating mockup</li> <li>• Std non-FR foam substrate</li> <li>• 35 mm / 20 sec. flame</li> </ul>	Maximum 20% mass loss of mockup @ 45 min.
End Product Materials (Type IV)	<ul style="list-style-type: none"> <li>• BS 5852 seating mockup</li> <li>• Actual materials used in finished end product</li> <li>• 35 mm / 20 sec. flame</li> </ul>	Maximum 20% mass loss of mockup @ 45 min.



**Table 4**  
**CPSC Staff 2005 Revised Draft Standard for**  
**Upholstered Furniture Flammability:**  
**Performance Requirements By Type of Furniture**

Section	Test	Type I: Interior Barrier	Type II: Cover Barrier	Type III: Specified Materials	Type IV: End Product Materials
1634.4	Cover Fabric Smoldering Resistance		√	√	
1634.5	Fibrous Filling Material Smoldering Resistance			√	
1634.6	Loose Filling Material Smoldering Resistance			√*	
1634.7	Loose Filling Interliner Smoldering Resistance			√*	
1634.8	Resilient Filling Material Smoldering Resistance			√	
1634.9	Interior Fire Barrier Material Smoldering Resistance	√			
1634.10	End Product Materials Smoldering Resistance				√
1634.11	Fibrous Filling Material Open Flame Resistance			√	
1634.12	Loose Filling Material Open Flame Resistance			√*	
1634.13	Loose Filling Interliner Fabric Open Flame Resistance			√*	
1634.14	Resilient Filling Material Open Flame Resistance			√	
1634.15	Cover Barrier Fabric Open Flame Resistance		√		
1634.16	Interior Fire Barrier Open Flame Resistance	√			
1634.17	End Product Materials Open Flame Resistance				√

\*Note: For Type III loose fillings, manufacturer elects to comply as either Type III (without a loose filling interliner - sections 1634.6 + 1634.12) or Type III-B (with a lose filling interliner - sections 1634.7 + 1634.13).

## Labeling

The staff's 2005 revised draft standard provides that each finished article of upholstered furniture must carry a permanent label containing a statement certifying that it complies with the standard, and identifying the method of compliance (e.g., Type I, II, III-A, III-B, or IV), the identity of the manufacturer or importer, the location and date (month and year) of manufacture, and the model and lot number of the furniture item. This information would be required to be separate from any other, non-CPSC label. The label would help retailers and consumers identify products and materials in the event of a recall or other corrective action.

## **V. California Regulatory Activity**

California Technical Bulletin 117 contains both smoldering and small open flame resistance performance requirements. Complying upholstered furniture is generally similar to furniture sold in other states, except that California furniture is typically made with FR resilient foam filling materials. In 2002, the California BHF released their draft revision to TB-117. This draft revision contained upgraded performance requirements for small open flame ignition resistance of filling materials, and a cover fabric performance test similar to that in the CPSC staff's 2001 draft small open flame standard. The TB-117 smoldering resistance provisions were not changed.

The California BHF has not yet proposed amending TB-117 to incorporate the 2002 draft revision. While they have continued to conduct research on upholstered furniture flammability and have provided technical support to the CPSC staff, their recent efforts have been related to a state legislative mandate to issue TB-603 for mattresses and TB-604 for bedding products. Their 2003 ANPR comment expressed support for a CPSC uniform national standard and for the approach and material tests in the CPSC staff draft. They recommended that the Commission consider adopting elements of the 2002 draft revised TB-117 into a proposed CPSC rule. The CPSC staff's 2005 draft standard contains some requirements that are similar to provisions of the 2002 draft revised TB-117.

## **VI. Voluntary Standards Activity**

Since the Commission's original ANPR on upholstered furniture was published in 1994, the staff has encouraged industry groups to develop voluntary flammability requirements through a recognized standards organization. Such a voluntary standard could serve in lieu of a mandatory CPSC rule. The UFAC voluntary industry program's cigarette ignition tests developed in the 1970s are embodied in ASTM E-1353 and other voluntary test methods. The staff previously estimated voluntary UFAC conformance at about 86% of furniture production in the late 1990s.

Although fire losses from cigarette-ignited upholstered furniture fires have been declining, large numbers of deaths and injuries remain. The UFAC program allows the

use of highly ignitable cover fabrics in combination with more smolder-resistant materials (e.g., polyester batting) underneath; these conforming combinations are not always adequate to prevent fire growth. Further, some non-conforming furniture may use ignitable fabrics without smolder-resistant batting. As noted above, the UFAC voluntary program does not address open flame ignitions.

In 1996, a group of industry representatives established a work group within the ASTM E5.15 Subcommittee on Contents and Furnishings to develop a possible small open flame standard test method. CPSC staff attended meetings of this work group and provided technical information to support development of a possible voluntary standard. The work group considered existing methods and sponsored research into possible approaches to addressing the risk; however, the work group did not develop a consensus on any proposed method.

By 2001, most of the participant organizations had stated their support for a CPSC national mandatory standard. Some industry groups expressed concern about an impending proposed amendment to California TB-117, and action in other states' legislatures concerning upholstered furniture regulations. AFMA's 2003 correspondence to CPSC asked that the agency issue a federal rule that would preempt TB-117 or other state rules. Further, some industry groups expressed the view that a mandatory rule was needed because products from some foreign sources would be less likely to conform to voluntary standards than would domestic products, thereby giving imports an advantage in this highly cost-competitive market.

There has been little activity in the ASTM Subcommittee work group since 2001, and no action in response to the Commission's 2003 ANPR. While it is possible that the substance of a CPSC proposed rule could be adopted in a voluntary standard, the concerns about multiple state rules and the potential low level of voluntary conformance would remain. The staff has not backed away from its overall commitment to voluntary standards; however, the prospects for voluntary action in the absence of a CPSC proposed rule appear remote.

## **VII. Economic Impact Analysis**

A CPSC rule based on the staff's 2005 revised draft standard or any of several significant alternatives identified by the staff would be a "major rule" under the Congressional Review Act (5 U.S.C. § 801, *et seq.*), as the expected annual impact of the rule would exceed \$100 million. In accordance with the requirements of the Flammable Fabrics Act, the Directorate for Economic Analysis has prepared a preliminary regulatory analysis of societal benefits and costs associated with the staff's 2005 revised draft standard and these alternatives. An early version of this analysis was posted on the Commission's web site in October 2005 for public review (see <http://www.cpsc.gov/library/foia/foia05/os/os.html>). An updated version of the preliminary regulatory analysis and the staff's initial regulatory flexibility analysis of

potential impacts on small entities, including small businesses that may be affected by a possible CPSC rule, are attached at **Tab E**.

### **A. Preliminary Regulatory Analysis**

The staff's 2005 revised draft standard would affect the more than 1,600 manufacturers and importers of upholstered furniture, the 100-200 textile manufacturers that derive a significant share of their revenues from household furniture fabrics, and fewer than 100 suppliers of resilient polyurethane foam, fibrous and loose filling materials. Nearly all of the affected firms would be classified as small businesses (i.e., fewer than 500 employees) under Small Business Administration guidelines.

For most upholstered furniture products, compliance with the draft standard would likely involve the use of flame retardant polyurethane foam fillings, FR polyester fiber cushioning or FR barrier materials, and cigarette ignition resistant upholstery fabrics and other covering materials. The staff estimates that up to about 10% of the roughly 31.5 million sofas and chairs produced annually would be constructed with either FR cover fabrics or fire barriers between the cover fabric and filling materials.

#### Projected Benefits

Projected reductions in societal costs associated with the addressable fire risk constitute the potential economic benefits of a standard to the public. The risk of fire associated with upholstered furniture currently in use can vary greatly, largely dependent on the ignition characteristics of cover fabrics. Using CPSC Laboratory test data on the relative ignition propensity of furniture with different types of cover fabrics, the staff estimated the present value of the societal costs associated with upholstered furniture fires. The expected costs of the deaths, injuries and property damage, discounted at 3% over the 15-17 year average product useful life, ranged from under \$20 per unit for furniture covered with the least smoldering ignition prone fabrics (i.e., predominantly thermoplastic fiber fabrics such as polyester, polyolefin and nylon) to over \$200 per unit for furniture covered with the most smoldering ignition-prone fabrics (i.e., a subset of predominantly cellulosic fiber fabrics such as cotton, viscose and rayon). The staff estimates that, with current materials used in upholstered furniture production, the discounted present value of societal costs from addressable cigarette and small open flame ignitions, over the expected useful life of furniture produced in a year, is about \$1.3 billion.

Based on estimates of effectiveness from laboratory test results and engineering judgment, the present value of the expected benefits (for both smoldering and open flame ignition) of the staff's 2005 revised draft standard would range from an estimated \$10.30 per unit for furniture with predominantly thermoplastic fabrics, to about \$166 per unit for furniture with the most smolder-prone cellulosic fabrics. The aggregate present value of the expected benefits associated with one year's production of complying upholstered furniture (about of 31.5 million units) is estimated at about \$936 million.

### Estimated Costs

Manufacturers and importers would incur costs associated with changes in materials to comply with the staff's 2005 revised draft standard. The most significant potential cost is related to the cigarette performance of certain fabrics, and the prevalence of fire barrier use. The staff estimates that approximately 10% of current (pre-standard) fabric yardage may fail the draft fabric smoldering test, and would therefore require FR treatments or the application of complying fire barriers. For these products, increased resource costs associated with materials, labor, distribution, testing to support guaranties, and recordkeeping are estimated at about \$15-21 per unit, on average (more in each case for sofas, less for chairs). These estimates also include costs associated with FR filling material used in furniture made with FR fabrics.

For the approximately 60% of products that would be constructed with FR filling materials but would not require FR fabrics or barriers, increased resource costs are estimated at an average of under \$7 per unit. This includes costs associated with the use of FR foam and other filling material modifications, as well as recordkeeping and labeling. For the remaining 30% of products made with complying cover barrier materials, such as leather, wool, and some vinyl coated or other fabrics, cost increases associated with testing and certification would be minimal.

Total aggregate costs of the staff's 2005 revised draft standard are estimated to range from \$175-194 million per year's production of complying upholstered furniture, with a midpoint of \$184 million.

### Expected Net Benefits

With estimated discounted benefits of \$936 million over the useful life of complying upholstered furniture produced in a year and a midpoint of the range of annual costs of \$184 million, projected annual net benefits to society associated with the staff's revised draft standard total \$936 million – \$184 million = \$752 million. The staff conducted a sensitivity analysis of several factors that could affect the estimates of benefits and costs, including different discount rates, value of statistical life estimates, injury costs, reasonable ranges of effectiveness and potential compliance costs; this sensitivity analysis concluded that alternate assumptions about these factors would still yield substantial positive net benefits.

### Retail Price Impacts

Because of the expected increase in costs of producing upholstered furniture that complies with the staff's 2005 revised draft standard, and markups in price that may be applied in the chain of distribution, consumers would likely pay higher retail prices for complying products. While the actual retail price increase will depend on a number of factors, traditional industry markups could result in retail price increases of up to about \$15 per unit for the estimated 60% of all complying furniture constructed with only treated filling materials, up to about \$37 for the estimated 6% of all complying furniture

with FR-treated fabrics, and up to about \$48 for the estimated 4% of all complying furniture produced with fire-blocking interior barriers. Minimal, if any, increases would apply to the approximately 30% of all furniture constructed with complying cover barrier materials (e.g., leather, wool, etc.).

### Other Regulatory Alternatives

The staff considered a number of alternatives to the staff's 2005 revised draft standard. These include: a) proposing the staff's previous (2001) draft small open flame standard; b) proposing a rule based on the 2004 furniture industry-recommended standard; and c) proposing the requirements of the 2002 draft revision of California TB-117. In addition, the staff evaluated a "no action" alternative under which voluntary industry action may address the risk to the public. The staff also identified three significant alternatives within the draft standard, including: a) deleting all open flame performance tests (i.e., a "smoldering only" alternative); b) deleting specific Type III open flame tests for loose filling material; and c) adding Type III small open flame fabric requirements. Each of these options is described briefly below and detailed in the preliminary regulatory analysis.

One alternative is the staff's previous 2001 draft small open flame standard. Compliance with that draft standard would require small open flame resistant cover fabrics or fire barriers. The staff estimated that most fabrics would be FR-treated to comply. This approach would yield smoldering ignition resistance benefits as well as open flame resistance benefits. Aggregate benefits are estimated at about \$1,031 million, and costs are estimated at about \$282 million. The expected annual net benefits of the staff's 2001 draft standard (about \$749 million) are essentially equivalent to the staff's 2005 revised draft standard (about \$752 million); however, the net benefits of the staff's 2001 draft would be achieved at significantly higher cost (\$282 million vs. \$184 million).

Another alternative is the 2004 furniture industry-recommended standard. The staff evaluated the various recommended test methods and pass / fail criteria of this alternative, and concluded that the basic approach was sound but that the recommended tests, especially the Fabric Coalition 5 second fabric test, would be significantly less effective overall than the performance tests in the staff's 2005 revised draft standard. Based on the staff's analysis, aggregate benefits of a rule based on the industry proposal would likely be \$614 million or less, i.e., at least \$322 million less than the \$936 million estimated for the CPSC staff's 2005 revised draft standard. The costs of compliance for a rule based on the industry proposal are estimated to be about \$146 million, or \$38 million lower than the CPSC staff's 2005 revised draft. Estimated annual net benefits would, therefore, be at most \$468 million, or about \$284 million lower than the CPSC staff's 2005 revised draft.

Another alternative is the revised (2002) draft of California TB-117. This draft standard contains open flame performance requirements for cover fabrics (similar to those of the CPSC staff's 2001 draft small open flame standard) as well as cigarette

and open flame requirements for filling materials. It does not incorporate a barrier option. Filling material requirements would apply to all furniture, regardless of fabric ignitability. Most cover fabrics would receive FR treatments. The projected aggregate benefits for the 2002 revised draft TB-117, at about \$881 million, would be somewhat lower than those of the CPSC staff's 2005 revised draft (\$936 million). Estimated costs would be approximately double, however, at about \$380 million. Thus, estimated annual net benefits would be about \$501 million, or about \$251 million less than the CPSC staff's 2005 revised draft.

The preliminary regulatory analysis also considered some alternatives within the staff's 2005 revised draft standard:

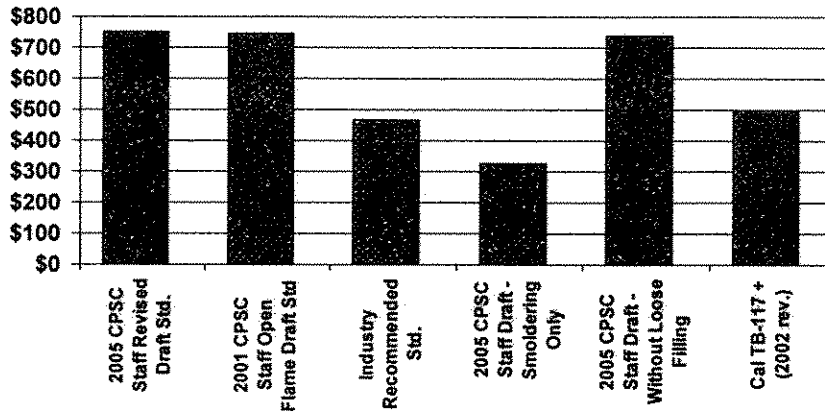
Adding a small open flame cover fabric test for Type III furniture – even one that is less stringent than the test in the staff's 2001 draft standard - would result in FR treatments for most fabrics. Non-FR cover fabrics could still be used in other complying types of furniture constructions. This option could increase potential gross benefits somewhat, although many of the benefits associated with an open flame fabric requirement would already be achieved under the current 2005 revised draft without this test. This option would also add approximately \$100 million in estimated costs. The staff's analysis suggests that the costs of this option would likely exceed the potential benefits, regardless of how effective the requirement would be in addressing open flame ignitions.

Adopting only the smoldering ignition performance requirements of the staff's 2005 revised draft standard could reduce costs substantially, to about \$48 million. Existing filling materials and most fabrics would probably comply without modification. Some fabrics would be modified or used with barriers, but without the open flame filling materials requirements, the expected benefits would also be substantially lower, at about \$375 million. Estimated annual net benefits of a smoldering-only standard would be about \$327 million.

Deleting the loose filling open flame requirements from the staff's 2005 revised draft standard would reduce costs by about \$55 million (based on current cost estimates for FR materials), down to about \$129 million. Loose fillings (typically polyester fiberfill) are used in the back cushions of about half of current furniture production. Since non-FR loose fillings would not provide fire protection, expected benefits would also be reduced, by about \$70 million, down to \$866 million. Estimated annual net benefits of a no-loose-fill standard would, therefore, be about \$737 million.

Figure 1 on the following page presents a summary of the estimated net benefits of the various principal options identified by the staff.

**Figure 1**  
**Estimated Net Benefits of Principal Regulatory**  
**Alternatives on Upholstered Furniture**  
 (\$ Millions)



Source: CPSC Directorate for Economic Analysis, 2006

If the Commission opted to take no action on upholstered furniture, a voluntary standard could potentially be developed to address cigarette and small open flame fire losses. The effectiveness of such a standard would depend on its requirements and the level of voluntary industry conformance. There is, however, no such voluntary standard currently in effect; the effort begun in 1996 through ASTM to establish a voluntary standard is currently inactive. Further, while estimated current conformance to the UFAC voluntary cigarette ignition guidelines is high, at about 90%, the future level of conformance, especially among the growing share of products that are imported, is uncertain. Moreover, the UFAC program alone would not prevent the deaths and injuries that would be effectively addressed by the staff's 2005 revised draft standard or the other action alternatives.

An additional factor that may affect upholstered furniture fires in the absence of CPSC action is the New York state regulation requiring all cigarettes sold in that state to self-extinguish if left unattended, in accordance with a test method developed by the National Institute of Standards and Technology (NIST) and embodied in ASTM standard E 2187-02, "Standard Test Method for Measuring the Ignition Strength of Cigarettes." This regulation became effective in June 2004. Similar legislation has been considered in several states, and enacted in Vermont and California (to become effective in 2006 and 2007, respectively). Further, in June 2005, Health Canada published Canadian national regulations in the *Canada Gazette* (affecting cigarettes produced or imported on or after October 1, 2005) based on the New York law. Complying cigarettes may reduce but not eliminate residential smoldering ignition fires. Preliminary 2005 New York data reportedly indicated a reduction in cigarette fire losses in New York. The staff plans to review the New York data and conduct laboratory tests to evaluate the potential



reduction in smoldering ignition propensity associated with cigarettes that meet this regulation, and their potential effect on product-related fire losses.

## **B. Initial Regulatory Flexibility Analysis**

The Regulatory Flexibility Act (RFA) requires that proposed rules be reviewed for potential economic impacts on small entities, including small businesses. Section 603 of the RFA requires the Commission to prepare and make available for public comment an Initial Regulatory Flexibility Analysis describing potential effects on small entities and identifying impact-reducing alternatives. The CPSC staff analyzed potential small business impacts for the staff's 2005 revised draft standard and the significant regulatory options, including options that could reduce costs to or other economic burdens on small firms.

Most firms producing, importing or supplying materials for use in upholstered furniture are small. In 2002, 71% of U.S. upholstered furniture manufacturing establishments – many of which are also importers – had fewer than 20 employees; 98% had fewer than 500 employees (the Small Business Administration's definition of "small" for firms to qualify for small business loans). About 50% of U.S. fabric producers had fewer than 20 employees; 67% had fewer than 500 employees. An estimated 99% of polyurethane foam and fibrous filling material suppliers had fewer than 500 employees.

Under the CPSC staff's 2005 revised draft standard, the cost of producing furniture would rise for all firms. In most cases, the costs are expected to be modest; as noted above, the estimated per-unit cost for about 90% of all complying furniture is \$7 or less. These costs would generally be proportional to production volume, and would not be borne disproportionately by small firms.

The staff's 2005 revised draft standard does not include a mandatory small open flame cover fabric test requirement, which could, if imposed, add substantially to manufacturers' and suppliers' costs, decrease potential net benefits, and disproportionately affect small firms with relatively less ready access to fabric finishing services. That draft standard also contains performance requirements that afford manufacturers and suppliers some flexibility in selecting an approach to achieve compliance. For example, manufacturers could use cover or interior fire barriers in lieu of other complying materials; many small, low-volume producers would opt to do this, thereby maintaining the large selections of specialized (but non-complying) fabrics and fillings that differentiate those firms in the market. The high average price of furniture made with decorator fabrics tends to moderate the relative impact of the draft standard, since the use of barriers would not constitute a large percentage cost increase for most of these firms' products.

The staff's 2005 draft standard also minimizes testing costs for small firms, most of which do not have testing facilities or ready access to them. Since the draft standard allows suppliers to issue guaranties of compliance for materials to manufacturers, the

manufacturers would not have to test composites of their fabrics and filling materials, thereby greatly reducing testing costs that might fall disproportionately on low-volume, small firms.

The staff evaluated some potentially burden-reducing alternatives within the draft standard, including extending the effective date to 18 months after promulgation (instead of 12 months) and modifying the scope to exclude certain products, e.g., dining and home office chairs, most of which are already excluded since they do not have contiguous upholstered seats and backs. The staff concluded that these two alternatives would not significantly reduce small firms' costs or affect their competitive positions.

The staff reviewed several other possible regulatory options. The staff's 2001 draft small open flame standard would have relatively greater cost impacts on small textile suppliers, and relatively lesser cost impacts on small filling material suppliers. Adopting the industry proposal would have significantly lower overall cost impacts; the lower-cost variations on the staff's 2005 revised draft would reduce costs to a lesser extent. Adopting the 2002 draft revision of California TB-117 would likely have somewhat higher overall cost impacts on small firms, as would adding a small open flame fabric test to the CPSC staff's 2005 draft. As noted in the regulatory analysis discussion above, none of these options would have higher net benefits to consumers. If the Commission decides to issue an NPR, the staff will revise its draft preliminary analyses in accordance with the specific options to be addressed in the NPR.

## **VIII. Flame Retardants: Health and Environmental Issues**

In addressing the hazards associated with upholstered furniture fires, the CPSC staff has sought to improve fire safety without creating additional hazards to human health or the environment. This objective can be achieved with flame retardant chemistry, which has found many applications over the years; approximately 1 billion pounds of FRs are used in the U.S. annually, including uses in upholstered furniture and many other consumer products. Some stakeholders have expressed concern, however, regarding possible health or environmental effects of FR chemical use. Some studies have suggested that certain FRs may be harmful or inappropriate for consumer product use. In some cases, the concerns may be attributed to a lack of toxicity data, or studies demonstrating the environmental persistence of some FRs. CPSC has the authority to regulate chemical health hazards under the Federal Hazardous Substances Act (FHSA), if a substance or product presents an unreasonable risk based on toxicity, exposure and bioavailability.

Since manufacturers first reported that they would likely meet a small open flame performance standard by using FR upholstery cover fabrics, the staff has extensively investigated possible chemical hazards that could be associated with new or expanded FR uses in furniture. The Commission considered this a sufficiently important issue to hold a public hearing in 1998 to gather relevant information. At that time, the staff also

enlisted the aid of other federal agencies – principally, the U.S. Environmental Protection Agency (EPA) – to help evaluate potential FR chemical risks.

In the agency's FY 1999 appropriation, Congress prohibited CPSC from rulemaking on upholstered furniture pending a National Academy of Science (NAS) study on FR chemicals. The NAS study, completed in 2000, identified several FRs that could be used in upholstered furniture cover fabrics without presenting human health risks. The CPSC staff also prepared a risk assessment, for the 2001 staff draft open flame standard, of the most likely-use or highest-concern upholstery fabric FRs; the staff concluded that several could be used without posing significant health risks to consumers.

FR chemicals would likely be used to comply with the staff's 2005 revised draft standard or most of the alternatives discussed in this briefing package. Under the staff's 2005 draft, FRs would more often be used in filling materials (chiefly polyurethane foam) rather than in cover fabrics. The staff has prepared a risk assessment of the principal filling material FRs, updated other available information on FR chemical health issues and reviewed potential environmental impacts of a possible proposed rule. Staff reports on these topics are attached at **Tab F**.

Further, in 2005, the staff submitted a request to the National Toxicology Program (NTP) of the Department of Health and Human Services nominating for review several FRs that might be used in mattresses or upholstered furniture. The NTP committee is meeting to consider the CPSC staff's request on January 31, 2006. The purpose of this review is to encourage research to fill in some of the data gaps for these chemicals. The NTP review will be a relatively long-term project that contributes to the level of knowledge about these chemicals among scientists and regulators.

#### **A. Filling Material FR Risk Assessment**

The Directorate for Health Sciences prepared a quantitative exposure and risk assessment (i.e., with numerical risk estimates) for the two leading filling material FRs. These are a proprietary brominated aryl ester / aromatic phosphate blend (developed as a replacement for pentabromodiphenyl oxide, which has been discontinued following regulatory action by the state of California and by the EPA) and tris (1,3-dichloropropyl-2) phosphate (TDCP). The assessment incorporated a number of assumptions that would tend to overstate potential risks; this approach is consistent with OMB's January 2006 draft bulletin on risk assessment practices.

The evaluation included an extensive review of available toxicity data, limited migration studies at the CPSC Laboratory, estimates of average daily dose (ADD) and acceptable daily intake (ADI) levels for oral, dermal and inhalation exposure, and calculations of Hazard Index (HI) values for non-cancer chronic effects. In addition, for TDCP, the staff calculated a lifetime average daily dose (LADD) in combination with a cancer potency estimate to evaluate the potential cancer risk. A calculated HI of greater than 1.0 is considered to be hazardous for the given route of exposure. A cancer risk of

greater than 1 per million is generally considered relevant for regulatory consideration under the Commission's 1992 FHSA chronic hazard guidelines.

For the proprietary aryl ester aromatic phosphate blend FR, insufficient toxicity data were available to calculate an ADI directly for the constituent chemicals or for the product as a whole. Therefore, the staff considered data for similar chemicals where possible. This use of surrogate compounds is a common and accepted toxicological methodology when information on a specific chemical is lacking. For the phosphate components of the blend, the staff's estimate of the total HI for all routes of exposure ranged from 0.003 to 0.3 for adults and 0.006 to 0.6 for children. Although the available test data are very limited, these exposures would not be expected to pose any appreciable health risk to consumers. For the brominated aryl ester component of the blend, insufficient data were available to estimate the risk directly; however, the estimated exposure was sufficiently low that the chemical would have to be more toxic than any other additive FR chemical previously reviewed by the staff to pose an appreciable risk. Thus, it is unlikely, based on available information, that this FR would pose any appreciable risk to consumers.

For TDCP, the available toxicity data were more extensive. The staff estimated the ADI from the lowest observed adverse effect level (LOAEL) for non-cancer effects in a two-year animal study. Estimated exposures to TDCP were near or above the ADI for non-cancer health effects; the calculated HI was 0.9 for adults and 1.7 for children. The LADD / cancer potency estimates yielded cancer risks of 140 per million for adults and 7 per million for children exposed up to age two. Dermal exposure and indirect oral exposure are the principal contributors to exposure and risk. The staff's preliminary estimates indicate that TDCP as used in some upholstered furniture could pose both cancer and non-cancer health risks. Additional testing would be needed to confirm this preliminary conclusion.

## **B. Fire Blocking Barrier FRs**

In a study prepared for the CPSC staff's January 2006 mattress briefing package, the staff reviewed available information on potential exposure and risk for FRs that might be used in fire blocking barriers. These FRs included antimony trioxide (AT), boric acid, decabromodiphenyl oxide (DBDPO), vinylidene chloride, ammonium polyphosphate (APP) and melamine. These chemicals were evaluated for potential dermal, oral and inhalation exposure and risk using the same basic methodology as for the upholstered furniture FRs. Based on migration data for AT, boric acid and DBDPO, the staff concluded that none of these three FRs in mattress barriers would pose any appreciable risk of health effects to consumers. There was no detectable migration of vinylidene chloride in extreme extraction studies. APP and melamine do not satisfy the FHSA definition of "toxic." The study suggests that there are a number of commercially available FR mattress barriers that could be used without posing any appreciable health risks to consumers. While some barriers for upholstered furniture may be constructed somewhat differently, it is likely that similar materials would be used, and potential

exposure times would be no greater than in mattresses; thus, the same conclusion would likely apply.

### **C. Update on Upholstery Cover Fabric FRs**

The staff's 2001 FR chemical risk assessment focused on five chemicals identified as the most likely candidates for use with upholstery cover fabrics. The assessment concluded that three of the five, DBDPO, hexabromocyclododecane (HBCD) and phosphonic acid, (3-[[hydroxymethyl]amino]-3-oxopropyl)-, dimethyl ester (PA, based on limited data), were not likely to pose a significant chemical hazard to consumers if these compounds were used in upholstered furniture. Some data gaps remained for the other two, antimony trioxide (AT) and tetrakis (hydroxymethyl) phosphonium chloride (THPC).

The Directorate for Health Sciences reviewed the latest available information on the toxicity and potential risk associated with these five chemicals. The new information did not change any of the overall conclusions of the previous staff risk assessment. The staff will continue to monitor any new study data that become available.

### **D. Polybrominated Diphenyl Ethers (PBDEs)**

Particular attention in recent years has been paid to FRs containing bromine. These are a structurally diverse group of chemicals widely used in plastics, textiles and other materials. Certain brominated flame retardants (BFRs) have been detected in the environment and in human and animal tissues. This has led to concerns about potential adverse health and environmental effects, especially for the class of compounds known as polybrominated diphenyl ethers (PBDEs, also widely referred to as polybrominated diphenyl oxides, or PBDPO). PBDEs include three basic commercial compounds: deca-, octa- and penta-bromodiphenyl ether. The lower brominated compounds, especially penta-BDPO, tend to persist in the environment, including indoors, and bioaccumulate in humans and animals. Some studies suggest that penta-BDPO may volatilize or leach from FR polyurethane foam and be released in landfills. There is also some concern that deca-BDPO may break down in the environment over time into lower brominated compounds of higher concern, such as penta-BDE. The evidence on this issue, however, is inconclusive.

Deca-BDE (or DBDPO) is widely used in plastics but has also been used in textile coatings, chiefly in synthetic upholstery cover fabrics to confer small open flame resistance. Until recently, penta-BDE was the most commonly used FR in resilient polyurethane foams in upholstered furniture (e.g., to meet California TB-117). This compound was phased out of U.S. production in 2004 and replaced by other, non-PBDE chemicals. Octa-BDE has been used in some plastics but is not used in either fabrics or resilient foams, and was also reportedly phased out of production in 2004.

Both penta-BDE and octa-BDE have been banned in the European Union (EU), effective in August 2004, and in California, Michigan, Hawaii and Maine (all effective by

2008). Sweden has also proposed to ban deca-BDE, effective in 2007, invoking the "precautionary principle" that substances can be regulated in the absence of sufficient data to evaluate the potential risk. An EU risk assessment, however, concluded that neither deca-BDE in plastics (including thermoplastic upholstery fabrics) nor penta-BDE in upholstery foam presents a hazard to consumers.

The principal U.S. government agency investigating PBDEs is the Environmental Protection Agency (EPA). EPA recently published a PBDE Plan that describes that agency's ongoing research and regulatory activities. As noted above, the CPSC staff assessed the potential risks associated with the use of deca-BDE in upholstery cover fabrics and in mattress barriers, and concluded that those applications would not present a health hazard to consumers. The CPSC staff will continue to follow ongoing studies regarding these and other FR chemicals.

### **E. EPA Activities**

The EPA has primary responsibility for regulating chemical risks in the U.S., and is involved in a number of activities related to FR chemicals. EPA's principal activities on FR chemicals are conducted through the High Production Volume (HPV) Challenge Program and the Voluntary Children's Chemical Evaluation Program (VCCEP). The HPV Challenge evaluates potential risks related to consumer, occupational and environmental exposures; the VCCEP focuses on risks to children. In addition, EPA's Office of Research and Development (ORD) is conducting or sponsoring research on human and environmental effects associated with brominated FRs. The CPSC staff participates in an EPA interagency BFR working group, which identifies and prioritizes research needs, and shares information and resources.

In 2004, EPA proposed a Significant New Use Rule (SNUR) for penta-BDE and octa-BDE. This rule requires that chemical producers notify EPA of their intent to reintroduce either of these chemicals into the U.S., and provide health and environmental data. The SNUR was proposed when production of the two chemicals stopped. The proposed SNUR also authorizes EPA to review any intended production or importation in advance and take action to control potential risks as needed. EPA may submit a final SNUR to the Office of Management and Budget (OMB) in 2006.

The U.S. producer of penta-BDPO submitted pre-manufacturing notice (PMN) information on the company's proprietary aromatic phosphate blend (described in Section VIII-A, above) to EPA as required under EPA's New Chemicals Program. EPA has reviewed this new chemical for possible adverse impacts, and has not announced any plans to impose any controls; the company started production in 2004.

The CPSC staff has been working with EPA's Office of Pollution Prevention and Toxics (OPPT) to develop a SNUR for certain FR chemicals that may be used in upholstered furniture. EPA is preparing to submit the draft SNUR to OMB for review. The staff's intent is that a SNUR could be proposed roughly concurrent with any CPSC proposed rule. As with EPA's other programs, the SNUR evaluation process covers

consumer, occupational and environmental risks. The SNUR could be used to obtain additional data where needed. These data could be used to establish controls on the use of FR chemicals to reduce potential risks to human health or the environment.

CPSC also participated in an EPA-sponsored Design for the Environment (DfE) "Furniture Flame Retardancy Partnership" program, established at the request of the furniture industry. This program focused initially on evaluating substitutes for penta-BDPO, but considered a range of possible FR candidates. The program will help manufacturers and suppliers become more aware of FR chemical issues, and encourage these firms to identify and use more environmentally sound FR chemistry in their products. EPA published its report on this project on the DfE website in May 2005.

The CPSC staff continues to work cooperatively with EPA staff on the various FR chemical-related efforts. All of these activities will help discourage or prevent the use of potentially harmful FRs in upholstered furniture.

## **F. Environmental Assessment**

The National Environmental Policy Act of 1969 (NEPA) requires Federal agencies to consider the impact of their actions on the environment, with particular attention to those actions that have significant adverse or irreversible impacts. Generally, CPSC rules establishing performance requirements have little or no potential effect on the human environment; environmental assessments are not usually prepared for these rules. In view of concerns, however, about possible environmental risks associated with the use of FR chemicals, the CPSC Executive Director has directed the staff to prepare an Environmental Assessment (EA) to determine whether an Environmental Impact Statement (EIS) is necessary or if a Finding of No Significant Impact (FONSI) is appropriate. The Directorate for Economic Analysis' preliminary environmental assessment, attached at **Tab F**, discusses these issues.

The CPSC staff's 2005 revised draft standard specifies flammability performance requirements; it does not require the use of any particular material or substance to comply. Manufacturers and suppliers have flexibility in the approach they wish to take. Because of this flexibility, the extent to which each FR chemical will be used is uncertain. It is almost certain, however, that some FRs will be used in most furniture.

The staff's 2005 revised draft standard does not contain small open flame requirements for cover fabrics. Thus, while some FRs, notably PA and THPC, may be used to impart smolder resistance to a relatively small number of predominantly cellulosic-fiber fabrics, the overall use of FRs in fabrics is likely to be minimal. The major use of FRs in upholstered furniture meeting the staff's revised draft standard would be in interior filling materials, chiefly resilient polyurethane foam and, to a lesser degree, some fibrous or loose fillings, and some fire-blocking barriers. Chemicals available for synthetic filling material applications include a variety of phosphorus, chlorine, bromine or nitrogen-containing chemicals. Some barriers could include FRs previously identified for use in cover fabrics, depending on their fiber content. All cotton

batting currently used in upholstered furniture is produced with boric acid to achieve smolder and flame resistance (for this type of use, boric acid is not expected to be a health or environmental concern).

Approximately 350 million pounds of polyurethane foam are used annually in residential upholstered furniture production. About 25% of polyurethane foam now used in residential upholstered furniture is FR-treated. The staff estimates that roughly 30-60 million additional pounds of FR chemicals would be required under the staff's draft standard, based on estimated FR loadings of 10-20% for those foams not already meeting California TB-117. Additionally, a small amount of FR chemicals could be used in certain cover fabrics, fire barriers and non-foam filling materials; this is estimated at 2-10 million pounds annually. The overall increase in FR chemical usage attributable to the CPSC staff's draft standard – roughly 30-70 million pounds – is estimated to be on the order of 3-7% of total annual FR consumption in the U.S.

The staff also considered the relative environmental impact of major regulatory alternatives. These include the staff's previous 2001 draft small open flame standard, the 2004 AFMA / Fabric Coalition industry proposal, the 2002 revised draft California TB-117 standard, variations on the staff's 2005 draft standard, and "no action" and labeling-only alternatives.

Under the staff's previous 2001 draft, an estimated 66% of cover fabrics (mostly the predominantly thermoplastic fiber fabrics), along with some fire barriers, would be FR treated, but filling materials would generally not. Total FR usage could be in the range of about 45 million pounds for fabric usage, which is within the range estimated for the 2005 revised CPSC staff draft, although the specific FRs and the application methods would differ.

Under the 2004 industry proposal, all foam filling materials and most cover fabrics would be FR treated. Fibrous and loose fillings would not be treated. Total FR volume could be potentially higher than under the staff's 2005 revised draft standard.

Under a rule based on the 2002 draft revision of California TB-117, all filling materials and most fabrics would be FR treated. The TB-117 open flame fabric requirements are similar to those of the 2001 CPSC staff draft, but there is no fire barrier option. Total FR volume would likely be the highest of any alternative.

Under the variations on the CPSC staff's 2005 draft, FR usage would be lower than either the 2005 or 2001 versions. A "smoldering only" standard with no open flame requirements would require FRs only for furniture constructed with certain highly smolder-prone cover fabrics. Many of these fabrics could simply be reformulated to comply without FRs; some might be FR-treated, and others might be used in conjunction with barriers. Estimated annual FR usage would be substantially less than under the 2005 staff draft. A "no loose fill" standard would use the same foam filling material FRs, but loose fillings - used in about half of all seat backs - would not be modified. Thus, total FR usage would be slightly lower than under the staff's 2005 draft that contains open flame loose fill requirements.



Under a "no action" alternative, no additional FRs would be used to comply with a Federal rule; however, some increased use could still occur to meet amended California or other regulations. Of course, this alternative would leave the fire risk unaddressed on a nationwide basis. Labeling would also not require FR chemical use. An additional consideration is that residential fires release toxic compounds, such as dioxins, hydrogen cyanide, and polycyclic aromatic hydrocarbons, into the environment. The unquantifiable reduction in these releases that would be achieved under a nationwide standard would be foregone under the "no action" or labeling alternatives.

Although some toxicity or environmental concerns exist regarding some FRs, there are FRs that would not be of significant concern if used in residential upholstered furniture. In view of the relatively small likely increase in FR usage, the ongoing efforts to use available, more environmentally preferable FRs, and the available regulatory mechanisms to mitigate any environmental risks that may be identified, the staff concludes that none of the alternatives presently under consideration, including the staff's 2005 revised draft flammability standard, would have significant adverse impacts on human health or the environment. Once the peer review of the pertinent reports is complete, the staff will provide recommendations on whether a FONSI is appropriate.

## **IX. Conclusions**

With the October 2003 ANPR, the Commission directed the staff to develop a possible flammability standard to address the risk of fire from smoldering and small open flame ignition of upholstered furniture, and to evaluate possible regulatory alternatives. Accordingly, the staff developed its 2005 revised draft standard, in consultation with industry, government and other stakeholders. This draft standard would greatly reduce the risk and would have substantial estimated net benefits to the public, without posing appreciable health or environmental risks. The preliminary regulatory analysis indicates that the staff's 2005 revised draft standard would have substantial net benefits to the public, as would any of a number of significant options, including alternatives recommended by various stakeholders.

In accordance with new OMB requirements for peer review of influential scientific information used in federal decision-making after June 2005, the staff has established a formal peer review process and initiated peer review of three major staff reports: the preliminary regulatory analysis of potential economic costs and benefits; the preliminary health risk assessment of FR chemicals in filling materials; and the technical rationale report supporting the staff's 2005 revised draft standard. The peer review of these documents is expected to be completed in the Spring of 2006.

Upon completion of this process, the staff plans to forward the peer-reviewed reports and additional information to the Commission for consideration. The staff will present the latest available information from ongoing technical studies, public comments and other stakeholder input to assist the Commission in determining whether to move

forward with a notice of proposed rulemaking, and if so, what the NPR's contents would be.

## List of Attachments

- Tab A** CPSC *Federal Register* advance notice of proposed rulemaking on upholstered furniture flammability, 68 FR 60629, October 23, 2003
- Tab B** CPSC Directorate for Epidemiology memorandum, M. Levenson, Upholstered Furniture Addressable Fire Loss Estimates for 1999 – 2002, November 21, 2005
- Tab C** CPSC Directorate for Engineering Sciences report, R. Khanna, Technical Rationale Report for the CPSC Staff's Draft Proposed Standard for the Flammability of Upholstered Furniture, January 2006
- CPSC Directorate for Laboratory Sciences memorandum, L. Fansler, Upholstered Furniture Project – Update on Standard Materials, December 29, 2005
- Tab D** CPSC Staff Draft Standard for Upholstered Furniture, December 2005
- Tab E** CPSC Directorate for Economic Analysis report, C. Smith, Preliminary Regulatory Analysis of a Draft Proposed Rule to Address Cigarette and Small Open Flame Ignition of Upholstered Furniture, December 2005
- CPSC Directorate for Economic Analysis report, C. Smith, Proposed Rulemaking on Upholstered Furniture Flammability: Initial Regulatory Flexibility Analysis, December 2005
- Tab F** CPSC Directorate for Health Sciences report, M. Babich, T. Thomas & K. Hatlelid, CPSC Staff Preliminary Risk Assessment of Flame Retardant (FR) Chemicals in Upholstered Furniture Foam, January 2006
- CPSC Directorate for Health Sciences memorandum, M. Babich, Update on the Toxicity of Selected Flame Retardant Chemicals, July 20, 2004
- CPSC Directorate for Health Sciences memorandum, M. Babich, Brominated Flame Retardant Chemicals, September 1, 2004
- CPSC Directorate for Laboratory Sciences memorandum, D. Cobb & B. Bhooshan, Migration of Flame Retardant Chemicals in Upholstered Furniture Foam, December 10, 2005
- CPSC Directorate for Economic Analysis report, R. Franklin, Environmental Assessment of a Draft Proposed Flammability Standard For Residential Upholstered Furniture, December 23, 2005

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