



UNITED STATES
 CONSUMER PRODUCT SAFETY COMMISSION
 WASHINGTON, DC 20207

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VOTE SHEET

Date: AUG 16 2001

TO : The Commission
 Todd Stevenson, Acting Secretary

FROM : Michael S. Solender, General Counsel (MS)
 Stephen Lemberg, Assistant General Counsel (SL) *SL*
 Patricia M. Pollitzer, Attorney (PP) *PP*

SUBJECT : Options to address open flame ignition of mattresses/bedding; Petitions
 requesting various actions concerning mattress flammability

Attached is a briefing package from the staff discussing options to address open flame ignition of mattresses/bedding and petitions submitted by Whitney A. Davis, director of the Children's Coalition for Fire-Safe Mattresses. The petitioner requests that the Commission issue rules requiring: (1) an open flame test similar to the full-scale test set forth in California Technical Bulletin 129; (2) an open flame test similar to the component test set forth in British Standard 5852; (3) a label warning of the flammability of polyurethane foam; and/or (4) a permanent, fire-proof mattress identification tag. The staff recommends that the Commission issue an advance notice of proposed rulemaking ("ANPR") that could result in a flammability standard to reduce the hazard of open flame ignition of mattresses/bedding. The staff also recommends that the Commission grant the two petitions requesting standards and deny the remaining two petitions.

Please indicate your vote on the following options.

- I. Options to Address Open Flame Ignition of Mattresses/Bedding
 - A. Approve the draft ANPR without change.

 Signature

 Date

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8-16-01
 No Mfrs/Private Labels or Products Identified
 Excepted by _____
 Firms Notified _____

Initial *MS* Date *8/16/01*

B. Approve the draft ANPR with the following changes (please specify):

Signature

Date

C. Do not approve the draft ANPR.

Signature

Date

D. Take other action (please specify):

Signature

Date

II. Petition FP 00-1 Requesting standard similar to full-scale test in California TB 129.

A. Grant petition FP 00-1.

Signature

Date

B. Deny petition FP 00-1 and direct staff to prepare a denial letter.

Signature Date

C. Defer petition FP 00-1.

Signature Date

III. Petition FP 00-2 Requesting standard similar to component test in British Standard 5852.

A. Grant petition FP 00-2.

Signature Date

B. Deny petition FP 00-2 and direct staff to prepare a denial letter.

Signature Date

C. Defer petition FP 00-2.

Signature Date

IV. Petition FP 00-3 Requesting warning label for flammable mattresses.

A. Grant petition FP 00-3.

Signature Date

B. Deny petition FP 00-3 and direct staff to prepare a denial letter.

Signature

Date

C. Defer petition FP 00-3.

Signature

Date

V. Petition FP 00-4 Requesting mattress identification tag.

A. Grant petition FP 00-4.

Signature

Date

B. Deny petition FP 00-4 and direct staff to prepare a denial letter.

Signature

Date

C. Defer petition FP 00-4.

Signature

Date

Tab A



**BRIEFING PACKAGE
OPTIONS TO ADDRESS OPEN FLAME IGNITION OF
MATTRESSES/BEDDING**

and

**PETITIONS FROM THE CHILDREN'S COALITION FOR FIRE-SAFE
MATTRESSES**

For Further Information Contact:
Margaret L. Neily, Project Manager
Directorate for Engineering Sciences
(301) 504-0508

CPSA 6 (b)(1) Cleared

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EXECUTIVE SUMMARY

Among all products within the Commission's jurisdiction, mattress and bedding fires are one of the leading causes of injury and were second only to upholstered furniture in the number of deaths in 1998. In 1998, mattress or bedding items were first to ignite in about 18,100 residential fires that resulted in 390 deaths, 2,160 injuries, and \$208.3 million in property damage. Over the five-year period from 1994 through 1998, children under age 15 represented over 75% of the deaths in fires ignited by candles, matches, and lighters, and incurred over 1/3 of the injuries from these fires.

Since before 1998, the Commission staff has been involved in evaluating these fires and potential options for addressing this hazard. Some fires begin with a small open flame directly igniting the mattress. However, most begin with the flame igniting the bedding that then becomes a large fire igniting the mattress. The Sleep Product Safety Council (SPSC) is sponsoring research at the National Institute for Standards and Technology (NIST) to characterize the hazard and help develop an effective performance test. CPSC is sponsoring NIST to develop a related, small-scale screening test for use in regulatory enforcement.

The Commission also received four petitions from the Children's Coalition for Fire-Safe Mattresses (CCFSM) requesting expanded flammability standards for mattresses. The staff has analyzed public comments on the suggested tests, labeling, and identification tags.

The Commission staff reviewed existing standards that could be applicable to open flame ignition of mattresses, including those offered by the CCFSM. While many initially appear to address the hazard, they lack adequate test requirements, conditions, or a clear relationship to typical residential fire scenarios. They involve excessive testing costs and unnecessarily limit mattress designs, constructions, and materials that could provide a reduced fire hazard.

A substantial portion of the deaths and injuries from the open flame ignition of mattresses and bedding is potentially addressable by a performance standard that uses a relatively large ignition source (representing typical burning bedding), limits fire intensity, and prevents flashover. The staff supports the research and test development effort underway at NIST because it has been designed to measure and define more clearly the fire risk involved in the residential mattress fire scenario. Improved mattress materials and designs are being developed to help meet the fire performance demands envisioned. The NIST tests and analyses will help form the basis for an appropriate performance standard with the required technical rationale. Accordingly, the staff recommends that the Commission begin a rulemaking for a standard to reduce deaths and injuries from the open flame ignition of mattresses.

The four petitions from the Children's Coalition for Fire-Safe Mattresses (CCFSM) suggest a variety of approaches to reducing deaths and injuries from fires involving the open-flame ignition of mattresses. FP 00-1 and FP 00-2 requested that the

Commission initiate rulemaking to adopt a full-scale test (similar to California TB-129) and a small-scale component test (similar to BS 5852) for mattresses, respectively. While the staff review of existing standards identified deficiencies in these tests and a rulemaking will not necessarily result in adoption of these specific tests, the staff recommends granting these two petitions to issue an ANPR as noted above. In the course of the rulemaking, the staff will consider options for full-scale and small-scale tests. The staff will recommend the best approach after completion of the technical research program currently underway.

The staff recommends that the Commission deny the other two petitions from the CCFSM. FP 00-3 requests rulemaking to require mattresses to carry polyurethane foam combustibility warning labels. Such labels do not accurately represent the hazard from the complete mattress product and would be ineffective in influencing safer consumer behavior. FP 00-4 requests rulemaking to require fire-proof mattress identification tags to be inside each mattress. These tags will not reduce fire losses. It would be more appropriate to consider the potential benefits of various types of labeling in the context of a particular standard developed through rulemaking. The staff will further evaluate labeling options if the Commission agrees to initiate a rulemaking proceeding.



United States
CONSUMER PRODUCT SAFETY COMMISSION
 Washington, D.C. 20207

MEMORANDUM

DATE: AUG 16 2001

TO : The Commission
 Todd A. Stevenson, Acting Secretary

Through: Michael S. Solender, General Counsel *MS*
 Caroline J. Croft, Executive Director *CC*

FROM : *for* Ronald L. Medford, Assistant Executive Director
 Office of Hazard Identification and Reduction
 Margaret L. Neily, Project Manager *MLN*
 Directorate for Engineering Sciences
 (301-504-0508 Ext. 1293)

SUBJECT: Options to Address Open flame Ignition of Mattresses/Bedding and
 Petitions from the Children's Coalition for Fire-Safe Mattresses

I. ISSUE

The open flame ignition of mattresses/bedding¹ continues to cause a significant number of deaths and injuries, especially to children. Since before 1998, the Commission staff has been involved in evaluating these fires and potential options for addressing this hazard. Some fires begin with a small open flame directly igniting the mattress. However, most begin with the flame igniting the bedding that then becomes a large fire igniting the mattress. The mattress industry supports the development of a mandatory standard for mattresses; and the Sleep Product Safety Council is sponsoring research needed to characterize the hazard and develop an effective performance test. CPSC is sponsoring development of a related screening test at the National Institute of Standards and Technology. The Commission has also received four petitions from the Children's Coalition for Fire-Safe Mattresses (CCFSM) requesting expanded flammability standards for mattresses. (Tab A) This package presents information supporting the initiation of rulemaking to reduce these deaths and injuries and makes recommendations regarding the disposition of the CCFSM petitions.

II. BACKGROUND

Among all products within the Commission's jurisdiction, mattress and bedding fires are one of the leading causes of injury and were second only to upholstered furniture

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in the number of deaths in 1998.² National fire data from 1998 show that fires and fire deaths associated with smoldering ignition of mattress/bedding continue to decline since the CPSC mandatory standard for cigarette ignition resistance became effective in 1973. Deaths due to open flame ignitions (e.g. lighters, candles, and matches) have not declined as dramatically, decreasing from 150 in 1980 to 100 in 1998. (Tab B)

In 1995 CPSC conducted a field investigation study to learn more about cigarette-ignited fires and open flame fires. The report, issued in 1997, showed that about 70% of the open flame fires involved child play and that 68% of the open flame deaths were to children playing with lighters, matches, or other open flame sources. The mattress was ignited directly by open flame in about 24% of the cases; however, bedding was the first item to ignite in about 60% of the cases. In the latter scenario, the fire had already developed to a considerable size before the mattress became involved. A similar study conducted by the National Association of State Fire Marshals (NASFM) in 1997 confirmed these findings.³

A CPSC Chairman's Roundtable, conducted in February 1998, was intended to develop approaches to address these fires and fire deaths. The Roundtable concluded that technical studies were needed and that a public education effort should be considered. The industry's Sleep Products Safety Council (SPSC), an affiliate of the International Sleep Products Association (ISPA), sponsored a research program at the National Institute of Standards and Technology (NIST) to provide the technological basis for future performance requirements that could be included in a standard for mattresses and/or bedclothes. The mattress industry also began developing an expanded public education program in cooperation with other interested organizations.

In March 2000, the Commission received four petitions from the Children's Coalition for Fire-Safe Mattresses (CCFSM) requesting that the Commission issue performance standards and labeling requirements to address the open flame ignition of mattresses. CCFSM also requested that the Commission require a permanent, fire-proof identification tag attached inside all mattresses.

III. REVIEW OF OPEN FLAME IGNITION OF MATTRESSES/BEDDING

A. Incident data (Tab B)

In 1998, mattress or bedding items were first to ignite in about 18,100 residential fires that resulted in 390 deaths, 2,160 injuries, and \$208.3 million in property damage. Over the five-year period from 1994 through 1998, children under age 15 represented over 75% of the deaths in fires ignited by candles, matches, and lighters, and incurred over one third of the injuries from these fires. (See Table 7, Tab B.) The most common ignition sources for the incidents involving deaths of these children were candles, matches and lighters. Among victims 15 years of age and older, smoking materials were the most common ignition sources causing death. In 1998, smoking materials accounted for 5,300 fires, 230 deaths, 660 injuries, and \$61.3 million in property damage.

Since mattress fires often involve an ignition source of burning bedding, initially ignited by a smaller source; and because few materials can resist such a large ignition source, the typical approach of preventing ignition of a mattress through a product performance standard is not reasonable. However, limiting the fire intensity and preventing flashover in mattress/bedding fires could result in a reduction in the number of casualties due to such fires. Flashover occurs when a fire becomes so intense that all exposed surfaces ignite nearly simultaneously, and quickly spreads through the structure. While victims intimate with the ignition may still be at risk due to their direct contact with the burning mattress and bedclothes, preventing flashover may reduce the number of casualties to other victims inside and outside the room of fire origin. The most recent staff report on mattress/bedding fire incidents at **Tab B** was prepared in light of this technical approach to reducing fire losses, which will be discussed later in this package.

A standard incorporating an ignition source representing burning bedding could address deaths and injuries from fires caused by smoking materials, traditional small open flame sources (candles, matches, and lighters), as well as other heat sources (e.g. heat escaping from fueled equipment, molten material, short circuit arcs, and heat from overloaded equipment). The staff estimates that an open flame standard designed to reduce heat release (fire intensity) and prevent flashover could reduce the number of victims outside the room of origin and a portion of victims in the room of origin, but not those intimately involved in the ignition. This means that, for victims of all ages, as many as 300 deaths and 1,460 injuries each year could be addressed. Of these as many as 60 deaths and 130 injuries to children younger than five years could be addressed by such a standard.

B. Market information (Tab C)

The International Sleep Products Association (ISPA) represents about 725 wholesalers, retailers, and manufacturers of conventional mattresses and foundations, accounting for over 80% of total U.S. sales of these products. The high cost of transportation limits foreign trade in these products, so domestic production accounts for virtually all mattresses in use. The market for mattresses has been growing at a rate of about 3% per year in recent years. ISPA estimates 1999 sales at \$2.8 billion.

The expected useful life of mattresses is about 14 years. Based on estimates from ISPA and previous staff studies, the Commission's Product Population Model estimates about 240 million mattresses may have been in use in residential, commercial, and institutional applications at the end of 1999.

The top four producers operate about one-half of the 800 production facilities in the U.S. and account for over 50% of the total U.S. production of mattresses. The remainder of the production facilities are operated by smaller manufacturers that tend to be family-owned firms supplying mattresses and foundations to a regional market. While renovated mattresses account for as much as 25% of those in use in some parts of the country, the total extent of such renovated mattress use is unknown.

The top four retailers accounted for 13% of the market in 1999, while the top 24 accounted for 40% of all U.S. sales of mattresses and foundations.

In addition to mattresses sold for residential use, others are produced for institutional (hospital, military housing, and correctional facility) and commercial (hotel and motel) use. According to ISPA, 1999 sales of mattresses for institutional and commercial use totaled about \$268 million or about 2 million mattresses. While most of these would be similar in price to residential mattresses, those meeting the flammability requirements of California's TB 129 are more expensive than residential mattresses. TB 129, discussed later in this package, is a full-scale fire test of mattresses used in California and recommended by one of the CCFSM petitions. TB 129 mattresses are available to consumers within a week by special order from retail distributors. Retailers are not likely to promote these sales actively, choosing to avoid the topic of perceived safety issues and desiring to move existing stock rather than special order items.

C. Recent industry activities (Tab D)

In 1999 the industry updated the consumer safety information provided on widely used mattress hang tags and permanent labels. Explicit warnings and safety messages for fire and other hazards are included in these materials. The format was revised to be more appealing to consumers. The information was revised to bilingual English/Spanish and is now also available in English/French. Copies are shown in Tab E. ISPA, along with the National Association of State Fire Marshals, sponsored focus group research to determine better ways to influence safe consumer behavior with such messages. A new web site, www.safesleep.org, provides consumer safety information and materials for the media.⁵

The SPSC has sponsored research at NIST to help reduce deaths and injuries associated with the open flame ignition of mattresses more directly. This substantive research and test development program is discussed in detail in another section of this paper. SPSC recommends that the Commission issue an ANPR to develop a mandatory standard for mattresses that is both relevant to real-life residential scenarios and feasible from an economic and technical perspective. (Tab D)

D. Review of existing standards (Tab E)

The staff has reviewed 13 existing tests or standards relevant to open flame hazards associated with mattresses/bedding. State and local government tests and standards include TB 129, TB 121, and TB 117 from California, the Michigan Roll-up Test, and BFD IX-11 from Boston. Other standards were reviewed from ASTM, formerly the American Society for Testing and Materials, (ASTM E-1474 and ASTM E-1590), Underwriters Laboratories (UL 1895 and UL 2060), the National Fire Protection Association (NFPA 264A and NFPA 267) and the United Kingdom (BS 6807 and BS 5852).

Several of these standards specify tests that are duplicates or modifications of each other. To simplify the discussion of these existing standards, tests are grouped in two broad categories—full-scale fire tests of mattresses (sometimes including bedding items) and small-scale component tests of mattress materials. Important aspects of the standards are shown in the table at **Tab E** and are briefly summarized here.

Full-scale Tests: A full-scale test is generally considered the most reliable in measuring product performance, especially when the product contains multiple materials in a complex construction such as a mattress or mattress/bedding combination. Nine of the tests reviewed are full-scale burn tests of mattresses that can produce large fires. There are only about twelve laboratories in the United States that have test facilities capable of safely conducting these tests and properly controlling emissions produced. These tests are costly, ranging from \$2,000-5,000 per test; and CPSC does not have this type of facility.

TB 129, TB 121, BFD IX-11, ASTM E-1590, NFPA 267, UL 1895, and UL 2060 use gas burners simulating a newspaper fire in a wastebasket, newsprint in a metal container, or burning bedding as the ignition source. The mattress is sometimes tested in combination with a foundation and bedding. Bedclothes are generally optional and unspecified (chosen by the tester). The ignition sources are applied to the side or underneath the mattress. The acceptance criteria, when specified, are intended to minimize the size/intensity of the fire and related hazards rather than prevent ignition. The standards limit the peak rate of heat release and/or total heat release, maximum temperature above the mattress, carbon monoxide concentration, and mass loss.

BS 6807, a voluntary British standard, provides multiple ignition source options for a full-scale test of a mattress or mattress/foundation combination. The top or underside of the mattress is exposed, depending on the specific ignition source. Ignition/non ignition is determined from the exposure to a cigarette, butane flame, wood crib, or bedclothes chosen by the tester.

The Michigan Roll-up Test was designed to test jail pads that had been rolled up and intentionally ignited by inmates. The pad or mattress is rolled and tied, stuffed with newsprint, leaned against a bed frame, and ignited. There is no test criteria specified.

Small-scale tests: The staff reviewed four smaller scale standards, all of which are used for evaluating mattress components rather than the full mattress. One serious drawback of component tests is their inability to accurately predict the real life performance of the full product, a complex combination of mattress/foundation/bedclothes.

TB 117 is mandatory in California for polyurethane foam used in mattresses. The test requires the average flame spread time of 5-inch specimens to be 10 seconds or more.

ASTM E-1474 and NFPA 264A measure the heat release rate of a small specimen of a mattress component material exposed to 35 kilowatts per square meter (kW/m²) from the burner of a Cone Calorimeter.

BS 5852 is a British standard, mandatory for mattress filling materials (typically foam) used in single-filling mattresses. A horizontal/vertical crevice of foam covered with a standard flame-resistant (FR) polyester fabric is exposed to an ignition source. Options include a cigarette, butane flames, and wood cribs of varying sizes with increasing thermal outputs. Maximum smoldering/flaming time and mass loss are specified.

While several of these standards, small and large scale, may ultimately offer the best choices for a test method, test conditions, magnitude and nature of the ignition source, technical rationale, acceptance criteria, etc., we do not have the necessary data for making these choices. As a group, these standards lack clear links to the specific hazard of ignition from burning bedding materials typical of residential fire incidents, which is especially important for establishing an effective acceptance criteria. A better understanding of the fire scenario, the magnitude of the hazard to be addressed, the contribution of burning bedding, and the effectiveness of product changes are needed. With this information, preparation of a reasonable, effective performance standard to reduce deaths and injuries is possible; and mattress materials and constructions suitable for the residential mattress market can be developed.

E. Technical research and test development (Tab F)

From the CPSC and ISPA/NASFM studies of mattress fire incidents and the roundtable discussions, it became clear that a better understanding of the problem, desired performance objectives, and technical means to meet the objectives were needed. Existing standards and tests were inadequate as discussed above, and new technical research was needed to support and develop an effective test method and standard. In 1998, in consultation with CPSC staff, SPSC began sponsoring the necessary research at NIST to define and measure the hazard from open flame ignition of mattresses from burning bedding. The first phase of the research was completed in June 2000⁶, and work on Phase 2 has begun and is scheduled for completion in 2001. CPSC is sponsoring NIST to develop a complementary, smaller scale test method to address practical issues of enforcement and product development. The small-scale test method development will continue into 2002. These programs are summarized here, and discussed in detail in **Tab F**.

1. Phase 1 The Flammability Assessment Methodology for Mattresses-Phase 1, involved four main objectives: (1) initial evaluation of bedding products, (2) characterization of heat impact on a mattress, (3) design of gas burners, and (4) tests of mattresses/bedclothes with burners.

Because the bedclothes are most likely to be the item first ignited and serve as a magnifier for the original, small open flame source, NIST characterized the fire behavior

of bedclothes typically used in residential settings. Tests of twelve combinations of bedclothes (sheets, pillows, comforters, and blankets) produced peak heat release rates that ranged from 50 kW to about 200 kW; all substantially higher than a match or lighter. Peak heat release rate is basically a measure of the intensity of the fire produced by these items.

NIST measured the heat impact imposed on the surface of a mattress by six of the bedding combinations covering a range of performance, from moderate to most intense ignition threat. Measurements of heat flux, duration and affected location were taken. Distinctly different burning conditions existed on the top and side of the mattress, the top being more severe.

NIST then designed two gas burners to consistently simulate the typical heat impact imposed on a mattress top and side by burning bedding products. This is necessary for providing controlled and reproducible test results. The heat flux of the top surface burner is 65 kW/m² with a duration time of either 45 seconds or 70 seconds. The heat flux of the side surface burner is 50 kW/m² with a duration time of either 25 seconds or 50 seconds. These measurements were used to establish appropriate burner intensities and exposure times when applied to the mattress.

The burners were tested on five different types of mattresses to ensure their ability to produce results that correlated with actual tests of burning bedding. One mattress represented current residential technology. The other four mattresses were constructed with different types of potentially fire resisting components, including barrier fabrics, modified fibers, and treated foams. Correlation was good except for one mattress construction that exhibited internal over-pressurization with the ignited bedding. Internal over-pressurization occurs when a flammable gas mixture builds up within the mattress causing rupturing of the mattress seams and allowing fire penetration into the interior. Mattresses with this behavior should be avoided or designed to resist rupturing during a fire.

The research conducted during Phase 1 provided extremely useful information regarding fires involving mattresses and the interaction with bedclothes. Burning bedclothes by themselves were shown to produce large fires, reaching heat release rates up to 200 kW. A 200 kW fire is a much larger fire than a match, candle or lighter ignition source but not large enough to create flashover conditions. Mattresses without bedclothes, however, were shown to produce fires large enough to cause room flashover, adding to the complexity of the hazard. The gas burners appear to successfully simulate most burning bedding conditions and show how mattress materials and construction techniques can be utilized to provide improved mattress fire behavior.

2. Phase 2 Phase 2 of the NIST/SPSC research will determine the ability of small-scale mattresses to predict burning behavior of twin size and larger bedding systems. Phase 2 will also provide an analytical basis for estimating the performance characteristics of the mattress needed to address and reduce the hazard.

Most available fire test data relates to twin size mattresses. To understand the effects of mattress size, it will be necessary to obtain data on larger size mattresses. The research will evaluate the effects of scale from king size to a 2' x 2' mini-mattress, a size commonly used by manufacturers as a selling tool. If the heat release rate behavior or other measure (e.g. weight or mass loss) seen in smaller mattresses correlates with that of larger size mattresses, the ability to conduct safe, convenient mattress tests and produce Fire-Safe products becomes substantially more feasible. Additional tests will evaluate how the lateral dimensions of mattresses affect fire intensity and how different size mattresses impact a specified room environment.

Several factors will be considered in order to estimate the peak rate of heat release from a mattress that would substantially reduce the fire hazard. These include: (1) the effect of bed size and room size on fire size, (2) the proximity of other furnishings around the bed fire and the ignition threat of surrounding objects, and (3) the location of persons with respect to the location of fire origin. Three tiers of hazard for victims of mattress/bedding fires have been identified using National Fire Incident Reporting System data: (1) outside the room of origin, (2) within the room of origin but not in contact with mattress fire and, (3) direct contact with mattress fire. Through analysis of the various tests, NIST will explore the relationship between fire size and the number of fatalities and determine what reduction in bed fire intensity will significantly reduce fatalities based on the three hazard tiers.

Phase 2 has been expanded to include tests of bedclothes (quilts, comforters, pillows) constructed with a variety of flame-resistant filling and cover materials to assess the effect of material changes on the flammability behavior.

3. Small-scale screening test

To be conducted concurrently with Phase 2, CPSC (with funding support from the U.S. Fire Administration) has contracted with NIST to develop a bench scale screening test to be used as a surrogate for full-scale tests of mattresses exposed to burning bedding or equivalent gas burners. Although the most reliable measures of mattress performance are full-scale tests, they are expensive and require specialized facilities. A bench scale test could be used by CPSC for compliance screening and by manufacturers for screening designs/materials. A similar concept is used in the mattress standard (16 CFR 1632) for substitution of tickings and materials used at the tape edge. Test specimens will be from actual production mattresses. Based on the performance of a variety of materials, designs, and constructions, the test will be designed to be more stringent than the full-scale test to avoid problems (such as approving a mattress construction that fails the full-scale test and must be recalled later).

F. California state legislation (Tab G)

Proposed legislation in the state of California, which would mandate a standard to address open flame ignition of mattresses, is on hold until January 2003. In the meantime, the California Bureau of Home Furnishings intends to closely monitor the

progress and conclusions of the NIST mattress flammability research project. A test method coming from this effort could be incorporated in the California legislation; otherwise, California Technical Bulletin 129 may be used for the mattress regulations. A California state standard could be issued in January 2003 and become effective in July 2003.

IV. PETITIONS FROM THE CHILDREN'S COALITION FOR FIRE-SAFE MATTRESSES

A. Summary of petitions and request for public comment

On May 22, 2000 the Commission docketed four petitions (FP 00-1, FP 00-2, FP 00-3, and FP 00-4) from Whitney Davis, Director of the Children's Coalition for Fire-Safe Mattresses (CCFSM). See **Tab A**. In each petition requesting action concerning mattress flammability, Mr. Davis summarizes the history of the Standard for the Flammability of Mattresses and Mattress Pads, 16 CFR 1632, (promulgated by the Secretary of Commerce in 1972). This standard was intended to reduce deaths and injuries associated with cigarette ignition of mattresses—the major problem at the time it was developed. Davis argues that, since mattress manufacturers found that polyurethane foam was the key to resisting cigarette ignition, they have incorporated ever-increasing amounts of foam in residential mattresses. Consumers have enjoyed the resilient cushioning and comfort that polyurethane foam provides. From a fire safety perspective, however, "The resulting mattress fires fueled by the foam and other filling materials eclipsed pre-standard mattress fires in terms of smoke generation, heat production (peak rate of heat release), and flame spread." He recognizes the role of burning bedding which often produces a much larger ignition source for the mattress in these fires.

Supporting the need for a new regulation for mattress flammability, the petitioner notes that since the 1980's, flame-retardant technology has been integrated into mattresses sold in the contract market to institutional purchasers. According to Davis, these mattresses are not readily available to consumers. He suggests that a new standard should require mattress constructions that will provide the consumer substantial additional time to exit (escape) the room or building before the fuel in the mattress becomes involved. He indicates that this can be done by isolating the fuel in the mattress with a barrier or treatment with effective flame retardants to allow sufficient escape time.

The petitioner proposes four options to address open flame ignitions of mattresses. FP 00-1 requests that residential mattresses be required to pass an open flame standard approximating the full-scale test set forth in California Technical Bulletin 129. FP 00-2 requests that residential mattresses be required to pass an open flame standard approximating the component test set forth in British standard BS 5852, Part 2, Ignition Crib 5. FP 00-3 requests mandatory labeling of mattresses with written and icon-based warnings about the fire hazard of polyurethane foam. This would pass the polyurethane foam manufacturers' warning to mattress manufacturers on to the consumer. The last petition, FP 00-4, requests that mattresses be identified by a permanent, fire-proof tag

affixed to the innerspring unit. This would help to identify mattresses involved in fires because, often, the innerspring unit is all that remains after a mattress fire.

B. Staff analysis of public comments

On June 12, 2000, the Commission published a request in the *Federal Register* for public comments on these petitions. Nine comments were submitted by a fire safety expert and various industry associations. (Tab H) Most of these comments were on the general issue of open flame ignition of mattresses rather than the specific petition recommendations. The staff evaluation of these comments is presented below.

1. General comments on the issue of an open flame standard for mattresses/bedding

Comment 1-1:

Several commenters believe CPSC should initiate rulemaking to reduce the risk from open flame ignition of residential mattresses. They suggest that the research work in progress at the National Institute of Standards and Technology (NIST) will be useful in applying state-of-the-art test protocols and ensuring the effectiveness of mattress component materials and constructions in reducing this risk. Several commenters mentioned the importance of providing consumer choice and value while setting performance requirements that are workable for the industry. One commenter suggested pursuing the test concepts in TB 129 and BS 5852 rather than the warning and identification labels.

Response 1-1:

The Commission staff reviewed existing standards that could be applicable to open flame ignition of mattresses. While many initially appear to address the hazard, they lack adequate test requirements, conditions, or a clear relationship to typical residential fire scenarios. They involve excessive testing costs and unnecessarily limit mattress designs, constructions, and materials that could provide the reduced fire hazard desired. The staff supports the research and test development effort underway at NIST because it has been designed to measure and define more clearly the fire risk involved in the residential mattress fire scenario. This research is providing information not previously available. The NIST effort will help form the basis for a performance standard with the technical rationale needed to make the findings required by the Flammable Fabrics Act. A standard must be, among other things, reasonable, appropriate, and technologically practicable. The staff notes that product performance requirements have been more effective in reducing fire hazards than labels such as those requested in FP 00-3 and FP 00-4.

Comment 1-2:

Several commenters noted that the petitioner fails to recognize the hazard as it exists in the real world, a hazard involving a system of materials. The petitions do not appropriately address the flammability risks of a typical residential mattress fire scenario and do not describe appropriate remedies to address the risks in residential settings.

Response 1-2:

Real-life residential bedding fires involve a complex system of materials, typically a mattress and foundation with a collection of bedclothes which may include any number of sheets, blankets, comforters, pillows, quilts and decorative items. The bedclothes add to the complexity of the hazard in that they are a significant contributor to the fire and are a potential secondary source of ignition. The bedding is most often the first item ignited by the ignition source, which in turn ignites the mattress. According to CPSC data, burning bedding is the first item to ignite in about one-half to two-thirds of mattress fire cases (Hiser, 2000; M. Boudreault & L. Smith, 1997). In this scenario, the mattress is essentially exposed to burning bedding, a much larger ignition source than the flame from a match, candle or lighter that may have been the original source of ignition. Burning combinations of typical bedclothes have been found to contribute up to approximately 200 kW to the fire (NIST, 2000), adding to the complexity and severity of the fire hazard.

Possible test methods to address the hazard of residential mattress fires are requested in petitions FP00-1 and FP00-2. The applicability of the requests to address real-life residential mattress fires is unclear. An appropriate test method needs to effectively address the hazard as it exists in real-life fire scenarios, accounting for typical residential mattress constructions, mattress foundations, and bedclothes. The ignition source must be representative of typical ignition sources seen in residential fires. The point of ignition must also be a true and direct measure of the danger posed in a typical mattress fire scenario. The mattress needs to be considered as a finished item, consisting of a variety of components. Any suitable test method must also be feasible, practicable and cost efficient. The staff is not convinced that the test methods set forth in the petitions meet the requirements of an appropriate standard for effectively addressing residential mattress fires.

Comment 1-3:

A number of commenters support the research and test development work at NIST because of its capability of explaining precisely why and how mattresses and bedclothes burn and how best to minimize this serious hazard. The work, based on sound scientific research will be more effective in reducing mattress fire losses than those proposed by the petitions.

Response 1-3:

The current study being conducted by NIST is a scientifically based research program designed to address the open flame ignition of mattresses and bedclothes under conditions that closely resemble real-life residential fire scenarios. The project was initiated because little factual data is available regarding the complex interaction of residential mattress and bedding when exposed to open flame ignition. The study is focused on understanding the dynamics of fires involving mattresses and bedclothes assemblies and on developing appropriate and technologically practicable methodology that can effectively address the hazard. The staff agrees that new regulations should take

a scientific approach, relate closely to the real-life hazard, and significantly and effectively reduce the risk (NIST, 2000).

Comment 1-4:

Two commenters suggest that a valid bench-scale test that predicts the open flame flammability behavior is needed for a reasonable standard. A simple test that can be used widely is most appropriate for a national standard.

Response 1-4:

Full-scale open flame mattress tests are dangerous, costly and require specialized facilities. Presently, there are no U.S. mattress manufacturers and only a small number of laboratories capable of conducting any type of full-scale mattress fire test. While full-scale mattress tests may provide the most definitive measures of mattress fire behavior, a bench scale test is a necessary component of a performance standard. A valid bench or small-scale test provides a method of testing that is practical and cost effective, particularly when many tests are needed. A simple bench scale test would enable mattress manufacturers to conduct some of their own testing, allowing them to proceed more easily with product and design innovation and address safety concerns regarding their facilities and employees. A bench scale test that uses products obtained at retail would also be useful for regulatory and compliance purposes.

Comment 1-5:

One commenter noted that mattress manufacturers have at their disposal many fabrics, barriers, interliners, and other materials with improved fire performance than those used in conventional mattresses. Improvements in mattress fire performance are certainly possible.

Response 1-5:

Mattress construction components with improved fire performance capabilities are currently available. However, the level of performance, appropriateness for end-use and cost effectiveness are issues to be considered. According to various manufacturers of fibers, fabrics, fillings and backcoatings, the industry is actively attempting to improve the fire performance of existing materials and is also working to develop new flame resistant products. Technological advances and innovative manufacturing techniques are expected to increase the number of available products with enhanced flammability characteristics. The availability of new products is expected to make it technically and economically feasible for manufacturers to significantly improve mattress fire performance without having to sacrifice comfort and thick cushioning expected by consumers.

Comment 1-6:

One commenter observed that any standard addressing open flame ignition of mattresses should not jeopardize advantages gained by resistance to cigarette ignition.

Response 1-6:

The Standard for the Flammability of Mattresses and Mattress Pads, codified as 16 CFR 1632, was developed in 1972 to reduce mattress fires caused by smoldering cigarettes. Since promulgation of the standard, mattress fires caused by cigarettes and smoking materials have significantly decreased. The staff agrees that any new regulation regarding mattress flammability should be closely assessed for possible impacts on the benefits of the existing regulations.

2. Petition FP 00-1, California TB 129**Comment 2-1:**

One commenter stated that TB 129 provides a direct measure of the danger posed by the mattress tested. It is excellent for assessing product performance. Another commenter, however, observed that the type of ignition source and point of ignition used in the test are not appropriate for residences.

Response 2-1:

TB 129 was developed to address hazards associated with ignition of mattresses in public institutions. The test requires that the side of a bare mattress be exposed to a propane gas T-burner ignition source (heat output 17.8 kW) intended to simulate a wastebasket filled with burning newspaper. The test measures rate of heat release, mass loss and smoke production. The staff is not convinced that TB 129 provides a test method that is a true and direct measure of the danger posed by a typical residential mattress fire. First, the test does not require the use of bedclothes or mattress foundation while most residential fires involving mattresses involve both bed clothing and mattress foundations. Second, the specified ignition source (gas T-burner) is significantly less severe than the intense flames caused by burning bedding, a typical ignition source of residential mattress fires which can have heat release rates up to 200 kW. Finally, the test requires a side ignition point while many residential fires involve the mattress's top surface. It is unclear as to the level of product performance the test assesses.

Comment 2-2:

Two commenters noted that TB 129 tests are expensive and can only be conducted by a fire test laboratory with large-scale heat release measurement capabilities.

Response 2-2:

Full-scale open flame mattress tests, like TB 129, require specialized fire test facilities and are dangerous and costly to conduct. There are currently no mattress manufacturers and only a small number of laboratories in the United States that have the proper facilities and equipment to conduct full-scale mattress fire tests. Nevertheless, according to NIST research, a full-scale test is the best measure of fire performance of a complex system of mattress, foundation and bedding. This creates practical problems for mattress manufacturers and enforcement that will need to be addressed.

3. Petition FP 00-2, BS 5852, Part 2, Ignition crib 5 ignition source

Comment 3-1:

One commenter stated that British Standard 5852 has been effective in significantly reducing deaths and injuries from upholstery fires.

Response 3-1:

Limited data are available for assessing the effectiveness of BS 5852 in reducing deaths and injuries, particularly for assessing losses from mattress fires. The UK Department of Trade and Technology report, *Effectiveness of the Furniture and Furnishings Regulations*, summarizes the findings of a study commissioned to evaluate the overall benefits of the Furniture and Furnishings Regulations introduced in 1988. In the case of mattresses, the report states that the data on mattresses is less clear than the data for upholstered furniture in part due to slightly different controls. Mattress regulations require the filling materials to meet the regulations for polyurethane foams but do not specify fire resistant requirements for mattress fabric coverings or tickings (DTI, 2000). The study is also limited in that it does not consider variables such as a decrease in smoking, increase in consumer awareness, increased use of smoke alarms, and increase in use of FR products. The staff is not convinced that any current data sufficiently show that a reduction in mattress fires and resulting injuries is a direct result of implementing the BS 5852 standard.

Comment 3-2:

One commenter reported on full-scale tests of UK mattresses which, mostly ignited by a match, show reduced fire intensity. It is not necessary to ensure resistance to burning bedding because the British experience using complying foams has been good and complying foams do not cause big fires with larger ignition sources.

Response 3-2:

Full-scale tests of British mattresses composed of treated foam components may exhibit a resistance to small open flames, such as matches, lighters and candles when compared to mattresses composed of untreated foam. Recent tests, however, show that British mattresses are clearly inadequate when presented with the intense flames and higher heat fluxes typically caused by burning bedding. Several full-scale tests of British mattresses were included in the mattress flammability study conducted at the National Institute of Standards and Technology (NIST). While the British mattresses may take several minutes to reach their peak rate of heat release, the peak rate of heat release observed for the mattresses alone (without bed clothing) was significantly above the level necessary to cause flashover (NIST, 2000).

Testing of mattresses complying with British regulations with bed clothing resulted in an even higher peak rate of heat release, clearly showing that bedding continues to be a major contributor to the fire hazard causing serious flaming of the foam. Suggesting that it is not necessary to consider the behavior of burning bedding since the

British experience using complying foams has been good, and complying foams do not cause big fires with larger ignition sources is not justified by recent data and test results. Current studies reveal the importance of considering the threat caused by burning bedding, despite the type of foam used in the mattress construction.

Comment 3-3:

Commenters indicated that BS 5852 is easy to run and relatively inexpensive. However, it is a composite test, does not assess heat release and does not account for bed clothing in the residential fire scenario.

Response 3-3:

The staff agrees that BS 5852 is a relatively inexpensive and easy to run test method but at the same time is concerned that the test does not measure heat release rates or account for the more severe ignition source from burning bedding. BS 5852 is a composite test that only requires testing of foams and filling if the mattress is composed of a single filling. Addressing only the foam is too restrictive. It does not allow the use of barrier technology and inhibits the use of alternate products and technologies that could be equally or more effective. It also does not allow for options and design features. The staff is not convinced that BS 5852 is an appropriate standard for residential mattresses that heavily rely on design features.

Comment 3-4:

One commenter suggested that a simple test, like BS 5852, that can be used very widely is the most appropriate for a national regulation.

Response 3-4:

The staff agrees that an easy-to-run test is appropriate. It is unclear, however, if the most appropriate test is BS 5852.

4. Petition FP 00-3, Mattress combustibility warning labels

Comment 4-1:

Sleep Product Safety Council product labels have been used on finished mattresses since 1989. The petition suggests a label that is extreme and does not represent the performance of the finished product in a real life fire situation.

Response 4-1:

The petition calls for both written and icon-based warning labels describing polyurethane foam hazards to be permanently affixed to the residential mattress surface so they can be viewed whenever the bedding is changed. The intent of the labels is to make consumers aware that 1) non-FR polyurethane foam in mattresses is highly flammable and emits toxic gases and, 2) cigarettes, matches, and other open flame sources should be kept away from mattresses and non-FR polyurethane foam.

The written warning would approximate the one below that is provided by polyurethane foam manufacturers on shipping containers to their customers:

<p style="text-align: center;"><u>WARNING</u> <u>FLAMMABLE POLYURETHANE FOAM</u> <u>FOAM BURNS RAPIDLY</u></p> <p>When ignited, this foam burns rapidly, resulting in great heat, generating dangerous and potentially toxic gas and thick smoke, consuming oxygen. Burning foam can be harmful or fatal.</p> <p>Keep away from open flame, sparks, or other heat sources. Do not smoke near this foam.</p> <p style="text-align: center;">IF FOAM STARTS BURNING GET OUT!</p> <p>These warnings should be passed on to the ultimate users.</p>

The petitioner also proposed multi-colored icons no less than 6 inches square, that depict a column of flame, a burning cigarette with a line through it, and a burning match with a red line through it.

Child play by children under five and careless smoking habits cause most mattress and bedding fires. Warning labels are not likely to be effective at reducing the risk under these circumstances. Children under five cannot read or comprehend the criticality of warning labels. *The burden for complying with the safety precautions rests with adults.* Labels that warn adults to keep lighters and matches out of the reach of children are unlikely to be effective because children can circumvent adult attempts to comply with this warning.

Risk perceptions and attitudes toward potential fire hazards will likely influence compliance with a "no smoking" label. Smokers with ingrained, careless smoking habits and indifferent attitudes toward fire safety are unlikely to change their behavior on the basis of a warning label.

The petitioner requests that the warning icons be placed on the top of the mattress so it may be viewed each time the bedding is changed. The label's impact as a reminder or reenforcer of behavior is limited under these conditions. The labels will only be in view when all bed linen is removed from the mattress. Therefore, the only individual likely to see and be influenced by the labels is the one who is changing the linen. In addition, habitual exposure to the labels negates their effectiveness because a consumer's perceptual threshold to the label will increase to the point that it is no longer noticed.

SPSC labeling (**Tab D**), currently used by approximately 70% of manufacturers, addresses the same concerns as those of the petitioner. The labels proposed by the petition do not offer any significant advantage over the SPSC labels. A duplication of safety messages may be detrimental to the communication of safety messages and may result in a loss of credibility that causes all the messages to be ignored.

Further, the staff agrees that the label recommended by the petition does not represent the hazard presented by the finished product in a real life fire situation. Polyurethane foam is just one of many components used to construct a mattress. Since there is no assurance that the fire behavior of an individual component has any relation to the likely fire performance of a completed product, the staff agrees that the suggested warning is not appropriate for the final mattress product. The Commission staff concludes that the proposed labeling of non-FR polyurethane foam is not likely to provide protection from mattress and bedding fires and that a change in the product would be more effective in reducing fire losses.

5. Petition FP 00-4, Fire-proof mattress identification tags

Comment 5-1:

One commenter argues that an ID tag would have no impact on the propensity of a mattress to ignite or the intensity of the resulting fire.

Response 5-1:

The petition requests that all mattresses have an identification tag permanently attached to the innerspring unit. The tag must be designed to survive a fire. The staff agrees that such a tag would have no impact on reducing mattress fires or the propensity of a mattress to ignite when exposed to an open flame. Such a tag is not visible to consumers to influence their behavior, and the tag has no influence on the mattress's ability to resist ignition or its performance once ignited. An ID tag could be desirable for identifying mattresses involved in fires to improve the utility of collected fire data and support further regulatory actions. However, the tag cannot be justified in terms of directly reducing death or injury from fires.

V. DISCUSSION AND CONCLUSIONS

A. Support for an ANPR

In 1998, mattress or bedding items were first to ignite in about 18,100 residential fires that resulted in 390 deaths, 2,160 injuries, and \$208.3 million in property damage. Over the five-year period from 1994 through 1998, children under age 15 represented over 75% of the deaths in fires ignited by candles, matches, and lighters, and incurred over 1/3 of the injuries from these fires.

A standard incorporating an ignition source representing burning bedding could address deaths and injuries from fires caused by smoking materials, traditional small open flame sources (candles, matches, and lighters), as well as other heat sources (e.g. heat escaping from fueled equipment, molten material, short circuit arcs, and heat from overloaded equipment). The staff estimates that an open flame standard designed to reduce heat release (fire intensity) and prevent flashover could reduce the number of victims outside the room of origin and a portion of victims in the room of origin, but not those intimately involved in the ignition. This means that, for victims of all ages, as

many as 300 deaths and 1,460 injuries each year could be addressed. Of these as many as 60 deaths and 130 injuries to children younger than five years could be addressed by such a standard.

Industry sponsored research at NIST has provided useful data regarding the behavior of real life mattress fires and burning bedding. In Phase 1 of the research, NIST characterized bed clothing combinations and the heat impact imposed on a mattress surface by bedding combinations. They designed gas burners that could consistently simulate the characteristics of burning bedding. Tests showed that various combinations of materials and mattress constructions that would be desired by the residential market are viable to potentially reduce the risk of mattress fires.

Phase 1 also highlighted significant shortcomings of existing standards and raised additional scientific questions regarding the behavior of mattresses in real life fire scenarios. Phase 2 of the research project will address those concerns and develop a reasonable, scientifically-based standard and test method that would effectively address the hazard of residential mattress fires ignited by open flame sources.

It appears that a full-scale mattress test method may be required for a definitive measure of the fire behavior of a mattress, foundation, bedding ensemble. For practical purposes, when many expensive full-scale tests would be needed, a bench-scale test is an essential component of a performance standard. Objectives of the current research project include the development of such viable test methods to be used for regulatory, compliance and design testing purposes.

The mattress industry supports a decision to initiate rulemaking for a mandatory standard for mattress open flame ignition and is actively involved in the development of supporting technical data, test methods, and improved materials and construction methods for mattresses.

B. Existing standards and petitions

The Commission staff have reviewed existing standards that could be applicable to open flame ignition of mattresses, including those offered by Petitions FP 00-1 and FP 00-2. While many initially appear to address the hazard, they lack adequate test requirements, conditions, or a clear relationship to typical residential fire scenarios. They involve excessive testing costs and unnecessarily limit mattress designs, constructions, and materials that could provide the reduced fire hazard desired. The staff supports the research and test development effort underway at NIST because it has been designed to measure and define more clearly the fire risk involved in the residential mattress fire scenario. This research is providing information not previously available. The NIST tests and analyses will help form the basis for a performance standard with the technical rationale needed to make the findings required by the Flammable Fabrics Act. A standard must be, among other things, reasonable, appropriate, and technologically practicable.

The staff notes that product performance requirements have been more effective in reducing fire hazards than labels such as those requested in FP 00-3 and FP 00-4. The staff believes that the suggested warning labels of FP 00-3 that describe the flammability properties of polyurethane foam would be ineffective and inappropriate for the finished mattress. The identification tag of FP 00-4 is not visible to consumers to influence their behavior. The tag has no influence on the mattress's ability to resist ignition or its performance once ignited and, therefore, would not directly reduce deaths and injuries from mattress fires. However, such tags might be desirable for identifying mattresses involved in fires to improve fire data.

VI. OPTIONS

- A. Issue an ANPR to begin a rulemaking for a mandatory open flame standard for mattresses.
- B. FP 00-1, California TB 129—
Grant or deny the petition to begin a rulemaking to consider a full-scale fire performance test (similar to California TB 129) to reduce deaths and injuries from the open flame ignition of mattresses.
- C. FP 00-2, BS 5852—
Grant or deny the petition and begin a rulemaking to consider a small-scale component test (similar to BS 5852) to reduce deaths and injuries from the open flame ignition of mattresses.
- D. FP 00-3, Mattress combustibility warning labels—
Grant or deny the petition to begin a rulemaking to adopt requirements for polyurethane combustibility warning labels for mattresses.
- E. FP 00-4, Fire-proof mattress identification tags—
Grant or deny the petition to begin a rulemaking to adopt requirements for fire-proof identification tags for mattresses.

VII. RECOMMENDATIONS

A substantial portion of the deaths and injuries from the open flame ignition of mattresses and bedding is potentially addressable by a performance standard that uses a relatively large ignition source (representing typical burning bedding), limits fire intensity, and prevents flashover. The mattress industry, represented by the Sleep Products Safety Council, supports such a mandatory standard. While this staff review has identified deficiencies in existing standards for this purpose, the research work needed to draft appropriate test methods (both full- and small-scale) is underway. Improved mattress materials and designs are being developed to help meet the fire performance demands envisioned. Accordingly, the staff recommends that the

Commission begin a rulemaking to consider a standard to reduce deaths and injuries from the open flame ignition of mattresses.

The four petitions from the Children's Coalition for Fire-Safe Mattresses (CCFSM) suggest a variety of approaches to reducing deaths and injuries from fires involving the open flame ignition of mattresses. FP 00-1 and FP 00-2 requested that the Commission initiate rulemaking to adopt a full-scale test (similar to California TB-129) and a small-scale component test (similar to BS 5852) for mattresses, respectively. While the staff review of existing standards identified deficiencies in these tests and a rulemaking will not necessarily result in adoption of these specific tests, the staff recommends granting these two petitions to issue an ANPR as noted above. In the course of the rulemaking, the staff will consider options for a full-scale test and a small-scale component test so the Commission can determine the best approach to reduce deaths and injuries. The ANPR will discuss these as well as other options to address open flame ignition of mattresses.

The staff recommends that the Commission deny the other two petitions from the CCFSM. FP 00-3 requests rulemaking to require mattress to carry polyurethane foam combustibility warning labels. Such labels do not accurately represent the hazard from the complete mattress product and would be ineffective in influencing safer consumer behavior. FP 00-4 requests rulemaking to require fire-proof mattress identification tags to be inside each mattress. These tags will not reduce fire losses. It would be more appropriate to consider the potential benefits of various types of labeling in the context of a particular standard developed through rulemaking.

END NOTES AND REFERENCES

1. The terms “bedding” and “bedclothes” are used by data collection systems and the industry, respectively, to mean items such as sheets, blankets, pillows and quilts.
2. Mah, J., (2001). 1998 Residential Fire Loss Estimates. Consumer Product Safety Commission, Directorate for Epidemiology, Washington, DC 20207.
3. National Association of State Fire Marshals/ Sleep Products Safety Council. “Wide Awake—A Study of 220 Fires Involving Mattresses.” December 1997.
4. The CCFSM submitted a fifth proposal that was not docketed as a petition. This requested a private enforcement amendment to the rules on renovated mattresses to provide for fines and payment of costs and restitution for sale of renovated mattresses not complying with 16 CFR 1632. The Commission does not have the authority to issue such requirements.
5. Personal communications with Andrea Herman, ISPA, and Patricia Martin, SPSC, 1999 through 2001.
6. Ohlemiller, T.J., Shields, J.R., McLane, R., and Gann, R.G. “Flammability Assessment Methodology for Mattresses,” National Institute of Standards and Technology, June 2000.

Investigator), Department of Marine Biology, Texas A&M University, 5001 Avenue U, Suite 105, Galveston, Texas 77551, has been issued a permit to take Northern fur seals (*Callorhinus ursinus*) for purposes of scientific research.

ADDRESSES: The permit and related documents are available for review upon written request or by appointment in the following office(s):

Permits and Documentation Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910 (301/713-2289); and

Regional Administrator, Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802-1668 (907/586-7221);

FOR FURTHER INFORMATION CONTACT: Ruth Johnson or Simona Roberts, 301/713-2289.

SUPPLEMENTARY INFORMATION: On February 11, 2000, notice was published in the *Federal Register* (65 FR 6997) that a request for a scientific research permit to take fur seals had been submitted by the above-named individual. The requested permit has been issued under the authority of the Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1361 *et seq.*), the Regulations Governing the Taking and Importing of Marine Mammals (50 CFR part 216), and the Fur Seal Act of 1966, as amended (16 U.S.C. 1151 *et seq.*).

Dated: June 6, 2000.

Ann D. Terbush,

Chief, Permits and Documentation Division, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 00-14777 Filed 6-9-00; 8:45 am]

BILLING CODE 3510-22-F

COMMISSION OF FINE ARTS

Notice of Meeting

The next meeting of the Commission of Fine Arts is schedule for June 15, 2000, at 10 a.m. in the Commission's offices at the National Building Museum (Pension Building), Suite 312, Judiciary Square, 441 F Street, N.W., Washington, D.C., 20001-2728. Items of discussion will include designs for projects affecting the appearance of Washington, D.C., including buildings and parks.

Inquiries regarding the agenda and request to submit written or oral statements should be addressed to Charles H. Atherton, Secretary, Commission of Fine Arts, at the above address or call 202-504-2200.

Individuals requiring sign language interpretation for the hearing impaired should contact the Secretary at least 10 days before the meeting date.

Dated in Washington, D.C., May 31, 2000.

Charles H. Atherton,

Secretary.

[FR Doc. 00-14756 Filed 6-9-00; 8:45 am]

BILLING CODE 6330-01-M

CONSUMER PRODUCT SAFETY COMMISSION

Petitions Requesting Standards, Labeling, and Identification Tags for Mattresses

AGENCY: Consumer Product Safety Commission.

ACTION: Notice.

SUMMARY: The Commission has received petitions (FP 00-1, FP 00-2, FP 00-3 and FP 00-4) requesting that the Commission issue performance standards and labeling requirements to address the flammability of mattresses. The petitioner also requests that the Commission require a permanent tag stating the mattress's manufacturer and other identifying information. The Commission solicits written comments concerning the petitions.

DATES: The Office of the Secretary must receive comments on the petitions by August 11, 2000.

ADDRESSES: Comments, preferably in five copies, on the petitions should be mailed to the Office of the Secretary, Consumer Product Safety Commission, Washington, DC 20207, telephone (301) 504-0800, or delivered to the Office of the Secretary, Room 501, 4330 East-West Highway, Bethesda, Maryland 20814. Comments may also be filed by telefacsimile to (301) 504-0127 or by email to cpsc-os@cpsc.gov. Comments should be captioned "Petitions FP 00-1 through FP 00-4, Petitions on Mattress Flammability." Copies of the petitions are available for inspection at the Commission's Public Reading Room, Room 419, 4330 East-West Highway, Bethesda, Maryland.

FOR FURTHER INFORMATION CONTACT: Rockelle Hammond, Office of the Secretary, Consumer Product Safety Commission, Washington, D.C. 20207; telephone (301) 504-0800, ext. 1232.

SUPPLEMENTARY INFORMATION: The Commission has received correspondence from Whitney A. Davis, director of the Children's Coalition for Fire-Safe Mattresses, requesting that the Commission take various actions concerning mattress flammability. The Commission is docketing as petitions his requests for rules requiring: (1) An open flame standard similar to the full-scale test set forth in California Technical Bulletin 129; (2) an open

flame standard similar to the component test set forth in British Standard 5852; (3) a warning label for flammable mattresses; and (4) a permanent mattress identification tag attached to the innerspring of the mattress. The petitioner focuses primarily on the role polyurethane foam plays in mattress fires. He notes that the Commission's existing mattress flammability standard only addresses cigarette ignition; yet childplay with open-flame sources causes nearly two-thirds of mattress fires. He argues that with polyurethane foam mattresses, fires have become increasingly more deadly than with cotton batting mattresses due to increased smoke generation, heat production and flame spread. With regard to labels, he notes that polyurethane foam manufacturers provide warnings to mattress manufacturers, but these warnings are not passed on to the consumer. With regard to an identification tag, the petitioner argues that such a tag would help to identify mattresses involved in fires because often only the innerspring unit remains after a mattress fire. The Commission is docketing these petitions under provisions of the Flammable Fabrics Act, 15 U.S.C. 1191-1204.

Interested parties may obtain copies of the petitions by writing or calling the Office of the Secretary, Consumer Product Safety Commission, Washington, DC 20207; telephone (301) 504-0800. Copies of the petitions are also available for inspection from 8:30 a.m. to 5 p.m., Monday through Friday, in the Commission's Public Reading Room, Room 419, 4330 East-West Highway, Bethesda, Maryland.

Dated: June 6, 2000.

Sadye E. Dunn,

Secretary, Consumer Product Safety Commission.

[FR Doc. 00-14696 Filed 6-9-00; 8:45 am]

BILLING CODE 6355-01-P

CORPORATION FOR NATIONAL AND COMMUNITY SERVICE

New Information Collection; Submission for OMB Review; Comment Request

AGENCY: Corporation for National and Community Service

ACTION: Notice.

The Corporation for National and Community Service (hereinafter the "Corporation") has submitted the following public information collection request (ICR) to the Office of Management and Budget (OMB) for review and approval in accordance with

PETITION FOR RULEMAKING

(16 C.F.R., Ch. II, Part 1051)

PETITION ID: CCFSM-001
PETITION DATE: MARCH 28, 2000
PETITIONER: CHILDREN'S COALITION FOR FIRE-SAFE
MATTRESSES, BY ITS DIRECTOR,
WHITNEY A. DAVIS

SUBJECT: RESIDENTIAL MATTRESSES

EXISTING RULES: 16 C.F.R., CH. II, PART 1632

**ACTION
REQUESTED:** AMENDMENT TO EXISTING RULES TO
SUBSTITUTE OR ADD TO EXISTING
IGNITION SOURCE OF LIGHTED
CIGARETTES WITH TB-129 IGNITION
SOURCE.

COMPANION

PETITIONS: CCFSM-002 (MATTRESS-ALTERNATIVE)
CCFSM-003 (RENOVATED MATTRESSES)
CCFSM-004 (WARNING LABELS)
CCFSM-005 (MATTRESS IDENTIFICATION)

INTRODUCTION:

The Children's Coalition for Fire-Safe Mattresses is a grassroots organization of more than 100 burn survivors, parents, and concerned citizens. It was founded in the fall of 1999, with a commitment to: 1) educate consumers about the risks of mattress fires; 2) publicly advocate an open-flame standard for residential mattresses; and 3) petition the U.S. Consumer Product Safety Commission to timely address the hazard in an effective and impartial manner.

OFFICE OF THE SECRETARY
APR -3 10 2:48

The Children's Coalition is directed by Whitney A. Davis, a California product liability attorney practicing in the area of mattress flammability for over 10 years. This Petition is brought by Mr. Davis on behalf of the Children's Coalition.

The Children's Coalition also submits four other companion Petitions:

- CCFSM-002 (MATTRESS-ALTERNATIVE), concerning an alternative open flame standard;
- CCFSM-003 (RENOVATED MATTRESSES), a private enforcement amendment to the rules on renovated mattresses;
- CCFSM-004 (WARNING LABELS), an interim emergency warning label petition for mattresses; and
- CCFSM-005 (MATTRESS IDENTIFICATION), a petition to require mattress manufacturers to place identification tags on innerspring units which will survive a mattress fire.

Each petition may be considered separately, and work on one petition should not be delayed pending submission or work on other companion petitions.

FACTUAL BASIS:

For more than 30 years, the U.S. Commerce Department, the U.S. Consumer Product Safety Commission, the U.S. Mattress Industry, and advocacy groups have recognized the fire hazards posed by mattresses intended for residential use. Residential mattresses and their bedding constitute a major, if not the greatest single cause of, fire death in the U.S. home.¹

Since the "Notice of Finding of Need" issued by the Department of Commerce in 1971, standards were developed to address the mattress fire problem. However, those standards were aimed specifically at one ignition source – cigarettes. Despite Mattress Industry protests regarding the methods of the original proposed standard on a number of grounds in 1972 and 1973, mattress makers found a way to comply. As a result, mattress/bedding fires started by cigarettes have declined substantially since the adoption of 16 C.F.R., Ch. II, Part 1632 ("Part 1632"). Although it was an imperfect standard, and did not entirely eliminate the risk, the CPSC found it valuable to save lives through addressing the problem in a timely manner.

However, what we knew then, and know now, is that mattresses ignite due to a number of ignition sources. Child play with small open-flame sources cause nearly two-thirds of such fires.² Cigarettes remain an ignition source that cause 30% of such fires, while candles, and electrical appliances also play a role. Analysis of the hazard has been exhaustive, and has spanned these 30 years.

¹ Residential Fires in Mattresses and Bedding, Rev'd May 1997, CPSC

² Wide Awake, 1997

Several things have changed since the adoption of Part 1632. First, upon the advent of the standard, the industry discovered the virtues of polyurethane foam. This foam allowed mattresses to pass the cigarette burn test by allowing effective displacement of heat given off by the cigarette's glowing ember. This development was an improvement over the cigarette ignition resistance of pre-standard cotton batting mattresses. The foam provided resilient cushioning and comfort that consumers fully embraced.

However, placement of polyurethane foam in the mattress also loaded this otherwise harmless home furnishing with a greater amount of easily combustible fuel. This foam resisted ignition by a smoldering cigarette, but easily succumbed to small open flames, or larger ignition sources such as ignited bedding. The resulting mattress fires fueled by the foam and other filling materials eclipsed pre-standard mattress fires in terms of smoke generation, heat production (peak rate of heat release), and flame spread. Deaths from mattress fires due to small open flames have not substantially fallen since 1980.³ Indeed, even cigarette-ignited fires have become more deadly. These death and injury trends may be an indication that only so much can be achieved with smoke detector programs and consumer education. It is time to address the fuel in the mattress.

Second, in the 1990's the widespread sale of "pillowtop" mattresses began in the marketplace. These units are sold as plush models, and with every product cycle they seem to be built with ever-increasing amounts of polyurethane foam. The fuel load in residential mattresses is increasing, and so is the mattress fire death rate. Deaths per 1,000 people in smoking material fires has nearly doubled since 1980. The death rate for open flame mattress fires has risen by 23.5% during that same period.⁴

Third, during the mid 1980's, flame-retardant ("FR") technology had advanced to the point that it could be affordably integrated into the mattresses. Industry members began selling such FR-improved units in the contract market to institutional purchasers. Such units were not sold to consumers. Presently, a consumer does not have an effective option to purchase an FR mattress, even though technology has advanced to make such units easier to manufacture.

One confounding factor in addressing the problem is the role of bed clothes, which present a substantial secondary ignition source in 67% of mattress fires (i.e. the bed clothes are first ignited, which in turn ignite the mattress).⁵ Although such bed clothes constitute a small (from 10% to 25%) addition to the peak heat release,⁶ they constitute an effective means (or fuse) to ignite the foam fuel in the mattress.

Another confounding factor is presented by a hypothetical voluntary industry standard. A competitive disadvantage may be suffered by a compliant

³ Residential Fires in Mattresses and Bedding, Rev'd May 1997, CPSC

⁴ Id. at p. iv.

⁵ Id. at p. v.

⁶ Heat Release Tests of Mattresses and Bedding Systems, California Bureau of Home Furnishings, Damant 1991

manufacturer that incurs increased production costs for an FR mattress, as compared to a non-compliant manufacturer or importer. Further, some in the mattress industry have expressed a speculative concern that the cost of the FR "fix" might cause consumers to flock to renovated mattresses instead of buying a new FR-improved unit.

When considering all of these issues, it is clear that a new FR standard for residential mattresses is technologically practicable. It is likewise clear that the industry needs a mandatory standard to level the "playing field" from the standpoint of price competition. Measures must be taken to make renovated mattresses a safe alternative (as set forth in a companion petition).

Lastly, the FR "fix" that must be applied to the problem need not eliminate the risk of ignition, especially from large open flame ignition sources such as bedding. Rather, the new standard should require mattress construction that will provide the consumer substantial additional time to exit the sleeping room or dwelling before the fuel in the mattress becomes involved. With this goal in mind, the risk from many smaller open flame ignition sources may be eliminated entirely.

Opponents can blame parents, blame the lighter companies, blame the foam companies, blame the textile industry, or blame the pillow-makers. However, the one inescapable conclusion is that the most dangerous and destructive fuel element involved in a mattress fire is the non-FR polyurethane foam. Therefore, to effectively reduce the risk, the fuel in the mattress needs to be isolated by a barrier, or effectively neutralized by FR treatments for a sufficient amount of time to allow victim escape.

While every substance that mankind produces will burn, we have the opportunity to eliminate the hazard as to some ignition sources (cigarettes, small open flame), and significantly reduce the hazard as to others (electrical, ignited bedclothes). The amount of protection afforded by the "fix" merely buys the consumer time to escape the fire. The average response time for fire emergency personnel is approximately 8 minutes. A sleeping room mattress fire can reach flash-over in less than one-half of that time. We propose a single solution that will effectively limit these risks.

While perhaps an imperfect standard may result, as in 1973, the CPSC needs to develop the fortitude to save the lives of our families, rather than chase the perfect laboratory standard that has eluded us for decades.

INCORPORATION BY REFERENCE:

Petitioner incorporates the issues, propositions, conclusions and references contained in FP99-1, which is the Petition for Rule-Making: Fire Hazard Warning Label on Certain Upholstered Furniture, as submitted by the National Association of Fire Marshalls.

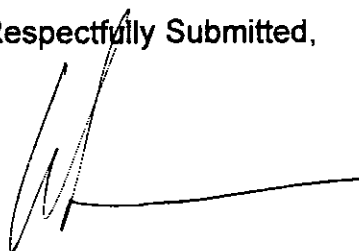
Petitioner incorporates the issues, propositions, conclusions and references contained in the CPSC 1996 Residential Fire Loss Estimates; and the CPSC report entitled "Residential Fires in Mattresses and Bedding, 1997".

Petitioner incorporates by reference California Technical Bulletin 129, as promulgated by the California Bureau of Home Furnishings and Thermal Insulation.

STANDARD REQUESTED:

Petitioner proposes that the CPSC amend 16 C.F.R., Ch.II, Part 1632 to require that residential mattresses under the Commission's jurisdiction pass an open flame standard approximating that set forth in California Technical Bulletin 129. This is a full-scale test, which may be modified by the Commission in some manner to allow for more economic prototype testing.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'W. A. Davis', with a long horizontal line extending to the right.

Whitney A. Davis

Director

Children's Coalition for Fire-Safe Mattresses

1515 K Street, Suite 500

Sacramento, CA

95814

(916) 739-6839 voice

(916) 739-0285 fax

wdavis@hebw.com

PETITION FOR RULEMAKING
(16 C.F.R., Ch. II, Part 1051)

PETITION ID: CCFSM-002

PETITION DATE: MARCH 28, 2000

PETITIONER: CHILDREN'S COALITION FOR FIRE-SAFE MATTRESSES, BY ITS DIRECTOR, WHITNEY A. DAVIS

SUBJECT: RESIDENTIAL MATTRESSES

EXISTING RULES: 16 C.F.R., CH. II, PART 1632

ACTION REQUESTED: ALTERNATIVE AMENDMENT TO EXISTING RULES TO SUBSTITUTE OR ADD TO EXISTING IGNITION SOURCE OF LIGHTED CIGARETTES WITH BS5852, PART 2, IGNITION CRIB 5.

COMPANION PETITIONS: CCFSM-001 (MATTRESS-PRIMARY)
CCFSM-003 (RENOVATED MATTRESSES)
CCFSM-004 (WARNING LABELS)
CCFSM-005 (MATTRESS IDENTIFICATION)

OFFICE OF THE SECRETARY
 APR 3 2 49 PM '00

INTRODUCTION:

The Children's Coalition for Fire-Safe Mattresses is a grassroots organization of more than 100 burn survivors, parents, and concerned citizens. It was founded in the fall of 1999, with a commitment to: 1) educate consumers about the risks of mattress fires; 2) publicly advocate an open-flame standard for residential mattresses; and 3) petition the U.S. Consumer Product Safety Commission to timely address the hazard in an effective and impartial manner.

The Children's Coalition is directed by Whitney A. Davis, a California product liability attorney practicing in the area of mattress flammability for over 10 years. This Petition is brought by Mr. Davis on behalf of the Children's Coalition.

The Children's Coalition also submits, or will submit, four other companion Petitions:

- CCFSM-001 (MATTRESS-PRIMARY), concerning an proposed TB-129-based open flame standard;
- CCFSM-003 (RENOVATED MATTRESSES), a private enforcement amendment to the rules on renovated mattresses;
- CCFSM-004 (WARNING LABELS), an interim emergency warning label petition for mattresses; and
- CCFSM-005 (MATTRESS IDENTIFICATION), a petition to require mattress manufacturers to place identification tags on innerspring units which will survive a mattress fire.

Each petition may be considered separately, and work on one petition should not be delayed pending submission of the other companion petitions.

FACTUAL BASIS:

For more than 30 years, the U.S. Commerce Department, the U.S. Consumer Product Safety Commission, the U.S. Mattress Industry, and advocacy groups have recognized the fire hazards posed by mattresses intended for residential use. Residential mattresses and their bedding constitute a major, if not the greatest single cause of, fire death in the U.S. home.¹

Since the "Notice of Finding of Need" issued by the Department of Commerce in 1971, standards were developed to address the mattress fire problem. However, those standards were aimed specifically at one ignition source – cigarettes. Despite Mattress Industry protests regarding the methods of the original proposed standard on a number of grounds in 1972 and 1973, mattress makers found a way to comply. As a result, mattress/bedding fires started by cigarettes have declined substantially since the adoption of 16 C.F.R., Ch. II, Part 1632 ("Part 1632"). Although it was an imperfect standard, and did not entirely eliminate the risk, the CPSC found it valuable to save lives through addressing the problem in a timely manner.

However, what we knew then, and know now, is that mattresses ignite due to a number of ignition sources. Child play with small open-flame sources cause nearly two-thirds of such fires.² Cigarettes remain an ignition source that cause

¹ Residential Fires in Mattresses and Bedding, Rev'd May 1997, CPSC

² Wide Awake, 1997

30% of such fires, while candles, and electrical appliances also play a role. Analysis of the hazard has been exhaustive, and has spanned these 30 years.

Several things have changed since the adoption of Part 1632. First, upon the advent of the standard, the industry discovered the virtues of polyurethane foam. This foam allowed mattresses to pass the cigarette burn test by allowing effective displacement of heat given off by the cigarette's glowing ember. This development was an improvement over the cigarette ignition resistance of pre-standard cotton batting mattresses. The foam provided resilient cushioning and comfort that consumers fully embraced.

However, placement of polyurethane foam in the mattress also loaded this otherwise harmless home furnishing with a greater amount of easily combustible fuel. This foam resisted ignition by a smoldering cigarette, but easily succumbed to small open flames, or larger ignition sources such as ignited bedding. The resulting mattress fires fueled by the foam and other filling materials eclipsed pre-standard mattress fires in terms of smoke generation, heat production (peak rate of heat release), and flame spread. Deaths from mattress fires due to small open flames have not substantially fallen since 1980.³ Indeed, even cigarette-ignited fires have become more deadly. These death and injury trends may be an indication that only so much can be achieved with smoke detector programs and consumer education. It is time to address the fuel in the mattress.

Second, in the 1990's the widespread sale of "pillowtop" mattresses began in the marketplace. These units are sold as plush models, and with every product cycle they seem to be built with ever-increasing amounts of polyurethane foam. The fuel load in residential mattresses is increasing, and so is the mattress fire death rate. Deaths per 1,000 people in smoking material fires has nearly doubled since 1980. The death rate for open flame mattress fires has risen by 23.5% during that same period.⁴

Third, during the mid 1980's, flame-retardant ("FR") technology had advanced to the point that it could be affordably integrated into the mattresses. Industry members began selling such FR-improved units in the contract market to institutional purchasers. Such units were not sold to consumers. Presently, a consumer does not have an effective option to purchase an FR mattress, even though technology has advanced to make such units easier to manufacture.

One confounding factor in addressing the problem is the role of bed clothes, which present a substantial secondary ignition source in 67% of mattress fires (i.e. the bed clothes are first ignited, which in turn ignite the mattress).⁵ Although such bed clothes constitute a small (from 10% to 25%) addition to the peak heat release,⁶ they constitute an effective means (or fuse) to ignite the foam fuel in the mattress.

³ Residential Fires in Mattresses and Bedding, Rev'd May 1997, CPSC

⁴ Id. at p. iv.

⁵ Id. at p. v.

⁶ Heat Release Tests of Mattresses and Bedding Systems, California Bureau of Home Furnishings, Damant 1991

Another confounding factor is presented by a hypothetical voluntary industry standard. A competitive disadvantage may be suffered by a compliant manufacturer that incurs increased production costs for an FR mattress, as compared to a non-compliant manufacturer or importer. Further, some in the mattress industry have expressed a speculative concern that the cost of the FR "fix" might cause consumers to flock to renovated mattresses instead of buying a new FR-improved unit.

When considering all of these issues, it is clear that a new FR standard for residential mattresses is technologically practicable. It is likewise clear that the industry needs a mandatory standard to level the "playing field" from the standpoint of price competition. Measures must be taken to make renovated mattresses a safe alternative (as set forth in a companion petition).

Lastly, the FR "fix" that must be applied to the problem need not eliminate the risk of ignition, especially from large open flame ignition sources such as bedding. Rather, the new standard should require mattress construction that will provide the consumer substantial additional time to exit the sleeping room or dwelling before the fuel in the mattress becomes involved. With this goal in mind, the risk from many smaller open flame ignition sources may be eliminated entirely.

Opponents can blame parents, blame the lighter companies, blame the foam companies, blame the textile industry, or blame the pillow-makers. However, the one inescapable conclusion is that the most dangerous and destructive fuel element involved in a mattress fire is the non-FR polyurethane foam. Therefore, to effectively reduce the risk, the fuel in the mattress needs to be isolated by a barrier, or effectively neutralized by FR treatments for a sufficient amount of time to allow victim escape.

While every substance that mankind produces will burn, we have the opportunity to eliminate the hazard as to some ignition sources (cigarettes, small open flame), and significantly reduce the hazard as to others (electrical, ignited bedclothes). The amount of protection afforded by the "fix" merely buys the consumer time to escape the fire. The average response time for fire emergency personnel is approximately 8 minutes. A sleeping room mattress fire can reach flash-over in less than one-half of that time. We propose a single solution that will effectively limit these risks.

While perhaps an imperfect standard may result, as in 1973, the CPSC needs to develop the fortitude to save the lives of our families, rather than chase the perfect laboratory standard that has eluded us for decades.

INCORPORATION BY REFERENCE:

Petitioner incorporates the issues, propositions, conclusions and references contained in FP99-1, which is the Petition for Rule-Making: Fire Hazard Warning Label on Certain Upholstered Furniture, as submitted by the National Association of Fire Marshalls.

Petitioner incorporates the issues, propositions, conclusions and references contained in the CPSC 1996 Residential Fire Loss Estimates; the CPSC report entitled "Residential Fires in Mattresses and Bedding, 1997".

Petitioner incorporates by reference British Standards Institution Standard, BS5852, Part 2, Ignition Crib 5.

STANDARD REQUESTED:

Petitioner proposes that the CPSC amend 16 C.F.R., Ch.II, Part 1632 to require that residential mattresses under the Commission's jurisdiction pass an open flame standard approximating that set forth in BS5852, Part 2, Ignition Crib 5. This is a component test, which may be modified by the Commission in some manner to allow for more economic prototype testing.

Respectfully Submitted,



Whitney A. Davis

Director

Children's Coalition for Fire-Safe Mattresses

1515 K Street, Suite 500

Sacramento, CA

95814

(916) 739-6839 voice

(916)739- 0285 fax

wdavis@hebw.com

PETITION FOR RULEMAKING
(16 C.F.R., Ch. II, Part 1051)

PETITION ID: CCFSM-004

PETITION DATE: MARCH 28, 2000

PETITIONER: CHILDREN'S COALITION FOR FIRE-SAFE
MATTRESSES, BY ITS DIRECTOR,
WHITNEY A. DAVIS

SUBJECT: MATTRESS WARNING LABELS

EXISTING RULES: 16 C.F.R., CH. II, SECTION 1632.63

**ACTION
REQUESTED:** AMENDMENT TO 16 C.F.R CH.II, PART 1632,
TO PROVIDE FOR EMERGENCY
RULEMAKING REGARDING MATTRESS
COMBUSTIBILITY WARNING LABELS.

**COMPANION
PETITIONS:** CCFSM-001 (MATTRESS-PRIMARY)
CCFSM-002 (MATTRESSES- ALTERNATE)
CCFSM-003 (RENOVATED MATTRESSES)
CCFSM-005 (MATTRESS IDENTIFICATION)

INTRODUCTION:

The Children's Coalition for Fire-Safe Mattresses is a grassroots organization of more than 100 burn survivors, parents, and concerned citizens. It was founded in the fall of 1999, with a commitment to: 1) educate consumers about the risks of mattress fires; 2) publicly advocate an open-flame standard for residential mattresses; and 3) petition the U.S. Consumer Product Safety Commission to timely address the hazard in an effective and impartial manner.

The Children's Coalition is directed by Whitney A. Davis, a California product liability attorney practicing in the area of mattress flammability for over 10 years. This Petition is brought by Mr. Davis on behalf of the Children's Coalition.

The Children's Coalition also submits, or will submit, four other companion Petitions:

- CCFSM-001 (MATTRESS-PRIMARY), concerning a proposed TB-129-based open flame standard;
- CCFSM-002 (MATTRESS-ALTERNATIVE), concerning a proposed BS5852, Part 2, Ignition Crib 5 open flame standard;
- CCFSM-003 (RENOVATED MATTRESSES), a petition to allow private enforcement of 16 C.F.R., CH.II, Part 1632, as to mattress renovators; and
- CCFSM-005 (MATTRESS IDENTIFICATION), a petition to require mattress manufacturers to place identification tags on innerspring units which will survive a mattress fire.

FACTUAL BASIS:

Petitioner incorporates by reference the Factual Basis sections set forth in companion Petitions CCFSM001 and CCFSM002.

A divergence in warnings has arisen in the mattress industry. Polyurethane foam manufacturers provide the following warning to mattress manufacturers and other customers on its foam shipping containers:

"WARNING

FLAMMABLE POLYURETHANE FOAM

FOAM BURNS RAPIDLY

"When ignited, this foam burns rapidly, resulting in great heat, generating dangerous and potentially toxic gas and thick smoke, consuming oxygen. Burning foam can be harmful or fatal

"Keep away from open flame, sparks, or other heat sources. Do not smoke near this foam."

**IF FOAM STARTS BURNING
GET OUT!**

"These warnings should be passed on to the ultimate users."

Such warnings are not passed on to the ultimate users of mattresses. In fact, most mattress advisories merely inform the user that the mattress complies with the cigarette ignition standard, that the unit contains non-flame-retarded polyurethane foam, and that one should "avoid contact with open flame".

This divergence in warnings fails to inform the ordinary consumer of the risk of death and injury from the foam in a conventional mattress. The mattress advisory fails to set forth the life-threatening conditions created by ignited mattress foam, and minimizes the hazard.

INCORPORATION BY REFERENCE:

Petitioner incorporates the issues, propositions, conclusions and references contained in FP99-1, which is the Petition for Rule-Making: Fire Hazard Warning Label on Certain Upholstered Furniture, as submitted by the National Association of Fire Marshalls.

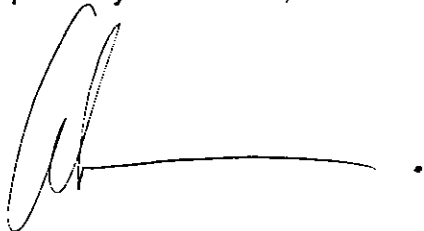
Petitioner incorporates the issues, propositions, conclusions and references contained in the CPSC 1996 Residential Fire Loss Estimates; the CPSC report entitled "Residential Fires in Mattresses and Bedding, 1997".

STANDARD REQUESTED:

Petitioner proposes that the CPSC amend 16 C.F.R., Ch.II, Part 1632, to include:

- A requirement for all mattresses subject to the Commission's jurisdiction to contain an effective written warning approximating that historically provided to mattress manufacturers as set forth above. Such a written warning must be conspicuously placed on the top surface of the mattress, so that it may be viewed each time the bedding is changed..
- A requirement for all mattresses subject to the Commission's jurisdiction to contain an effective multi-colored icon-based warning, no less than 6 inches by 6 inches square, depicting a column of flame, a burning cigarette with a red line through it, and a burning match with a red line through it.

Respectfully Submitted,

A handwritten signature in black ink, consisting of a large, stylized initial 'W' followed by a horizontal line extending to the right, ending in a small dot.

Whitney A. Davis

Director

Children's Coalition for Fire-Safe Mattresses

1515 K Street, Suite 500

Sacramento, CA

95814

916-739-6839 voice

916-739-0285 fax

wdavis@hebw.com

PETITION FOR RULEMAKING
(16 C.F.R., Ch. II, Part 1051)

PETITION ID: CCFSM-005

PETITION DATE: MARCH 28, 2000

PETITIONER: CHILDREN'S COALITION FOR FIRE-SAFE MATTRESSES, BY ITS DIRECTOR, WHITNEY A. DAVIS

SUBJECT: MATTRESS IDENTIFICATION

EXISTING RULES: 16 C.F.R., CH. II, SECTION 1632.63

ACTION REQUESTED: AMENDMENT TO 16 C.F.R CH.II, PART 1632, TO PROVIDE FOR RULEMAKING REGARDING MATTRESS IDENTIFICATION.

COMPANION PETITIONS: CCFSM-001 (MATTRESS-PRIMARY)
CCFSM-002 (MATTRESSES- ALTERNATE)
CCFSM-003 (RENOVATED MATTRESSES)
CCFSM-004 (MATTRESS WARNINGS)

INTRODUCTION:

The Children's Coalition for Fire-Safe Mattresses is a grassroots organization of more than 100 burn survivors, parents, and concerned citizens. It was founded in the fall of 1999, with a commitment to: 1) educate consumers about the risks of mattress fires; 2) publicly advocate an open-flame standard for residential mattresses; and 3) petition the U.S. Consumer Product Safety Commission to timely address the hazard in an effective and impartial manner.

The Children's Coalition is directed by Whitney A. Davis, a California product liability attorney practicing in the area of mattress flammability for over 10 years. This Petition is brought by Mr. Davis on behalf of the Children's Coalition.

The Children's Coalition also submits, or will submit, four other companion Petitions:

- CCFSM-001 (MATTRESS-PRIMARY), concerning a proposed TB-129-based open flame standard;
- CCFSM-002 (MATTRESS-ALTERNATIVE), concerning a proposed BS5852, Part 2, Ignition Crib 5 open flame standard;
- CCFSM-003 (RENOVATED MATTRESSES), a petition to allow private enforcement of 16 C.F.R., CH.II, Part 1632, as to mattress renovators; and
- CCFSM-004 (MATTRESS WARNINGS)

FACTUAL BASIS:

Petitioner incorporates by reference the Factual Basis sections set forth in companion Petitions CCFSM001 and CCFSM002.

It is well known that mattresses burn intensely and often completely in mere minutes. In most cases, all that remains of a mattress involved in a sleeping room fire is the innerspring unit.

The complete destruction of the mattress thwarts its identification for purposes of tracking the product's performance for possible CPSC action, and for purposes of carrying the burden of proof of product identification in a victim's product liability civil action for injury, or more often, death. Also thwarted is any effort by the mattress industry to track product performance to aid in the design of improved mattresses.

The mattress industry has indeed benefited from the prevention of their Mattresses through their highly combustible design. They cannot be held accountable for mattresses that cannot be identified as manufactured by them. This defense is routinely asserted in product liability actions by mattress manufacturers. This occurs as mattress fires become more deadly.

A need has thus arisen to permanently identify mattresses in a manner that will survive a fire. Such technology exists, and is affordable.

INCORPORATION BY REFERENCE:

Petitioner incorporates the issues, propositions, conclusions and references contained in FP99-1, which is the Petition for Rule-Making: Fire Hazard Warning Label on Certain Upholstered Furniture, as submitted by the National Association of Fire Marshalls.

Petitioner incorporates the issues, propositions, conclusions and references contained in the CPSC 1996 Residential Fire Loss Estimates; the CPSC report entitled "Residential Fires in Mattresses and Bedding, 1997".

STANDARD REQUESTED:

Petitioner proposes that the CPSC amend 16 C.F.R., Ch.II, Part 1632, to include:

- A requirement for all mattresses subject to the Commission's jurisdiction to be identified by maker, prototype number, production number and model number. Such identification shall be made by a permanent fire-proof tag affixed to the innerspring unit.

Respectfully Submitted,



Whitney A. Davis

Director

Children's Coalition for Fire-Safe Mattresses

1515 K Street, Suite 500

Sacramento, CA

95814

916-739-6839 voice

916-739-0285 fax

wdavis@hebw.com

Tab B



UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: June 11, 2001

TO : Margaret Neily
Directorate for Engineering Sciences

THROUGH: Susan Ahmed, Ph.D.
Associate Executive Director, Directorate for Epidemiology

Russ Roegner, Ph.D. *RR*
Director, Division of Hazard Analysis

FROM : Signe Hiser, M.S. *SBH*
Mathematical Statistician, Division of Hazard Analysis

SUBJECT : Residential Fires in Mattresses and Bedding 1980 – 1998

Attached is the Epidemiology report that contains estimates for deaths, injuries, and property loss associated with mattress and bedding residential structure fires. The data was compiled for the Briefing Package Options to Address Open Flame Ignition of Mattress/Bedding and Petitions from the Children's Coalition for Fire Safe Mattresses.



RESIDENTIAL FIRES IN MATTRESSES AND BEDDING

1980 – 1998

June 2001

**Signe Hiser
Directorate for Epidemiology
Division of Hazard Analysis
U.S. Consumer Product Safety Commission
Washington, DC 20207**

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Executive Summary

The Federal Standard for the Flammability of Mattresses (and Mattress Pads), 16 CFR 1632, was enacted in 1973 to reduce ignition of mattresses by cigarettes. In April 2000, CPSC received a petition for rulemaking to modify the current flammability standard for mattresses to include additional ignition sources. Current research on mattress ignition due to burning bedding is being conducted at the National Institute of Standards and Technology (NIST). Work by NIST indicates that the prevention of flashover (i.e. when a fire reaches such a level of intensity that it causes all exposed surfaces to ignite, nearly simultaneously) in mattress and bedding fires may result in a reduction in the number of casualties due to such fires. Although victims intimate with ignition may still be at risk due to their direct contact with the bed and burning bedclothes, prevention of flashover may reduce the number of casualties located outside the room of fire origin and a portion of the victims inside the room of fire origin.

- Fires in which a mattress or bedding article is the first item to ignite are responsible for a major portion of the nation's fire casualties. Among the categories of consumer products within the jurisdiction of the CPSC, mattress and bedding fires were one of the leading causes of civilian injury and second only to upholstered furniture in the number of civilian deaths in 1998 (1).
- In 1998, mattress or bedding items were first to ignite in about 18,100 residential fires that resulted in 390 deaths, 2,160 injuries, and \$208.3 million in property damage. Of these fire losses, CPSC estimates that 17,300 fires, 390 deaths, 2,090 injuries, and \$199.1 million in property damage are in-scope (see p. 3) and could potentially be affected by an open flame standard.
 - Of the in-scope fire losses, smoking material ignition sources, which include cigarettes, cigars, and pipes, accounted for 5,300 fires (or about 31 percent of these fires), 230 deaths (59%), 660 injuries (32%), and \$61.3 million in property damage (31%).
 - Candles, matches, and lighters (i.e., the traditional small open flame sources) accounted for 6,400 in-scope fires (37%), 90 deaths (23%), 950 injuries (45%), and \$73.2 million in property damage (37%). Other small open flame ignition sources that resemble the heat released by burning bedclothes, including sparks, embers, or flames escaping from fueled equipment, arcs or sparks from electrical equipment, small torches, hot embers, and fireworks, accounted for 400 fires (2%), 10 deaths (3%), 30 injuries (1%), and \$4.2 million in property damage (2%).
 - Other heat sources that are consistent with the heat impact imposed by burning bedclothes, including heat escaping from fueled equipment, molten material, short circuit arc, and heat from overloaded equipment, accounted for 5,200 fires (30%), 70 deaths (18%), 450 injuries (22%), and \$60.4 million in property damage (30%).

- Since the early 1980's, fires, fire deaths, and fire injuries associated with mattresses and bedding decreased substantially. However, deaths due to open flame ignition of mattresses and bedding have declined but not as dramatically.
- A flammability standard for mattresses designed to reduce heat release would be expected to reduce the number of victims not in the room of fire origin and probably also have some effect on the victims not intimately involved in ignition but in the room or space of fire origin, especially in cases where the flames have spread beyond the room of origin.
 - Thus, the percentage of all in-scope mattress/bedding fire deaths that would certainly be addressable by an open flame standard is 63% (300 deaths/year) and the percentage of injuries is also 63% (1,460 injuries/year).
 - The total percentage of the in-scope mattress/bedding fire deaths to children younger than five years that would definitely be impacted by an open flame standard is 71% (60 deaths/year) and the percentage of injuries is 58% (130 injuries/year).
- CPSC field staff investigated 431 mattress and/or bedding fires from October 1994 through August 2000.
 - Of the cases in which the first item ignited was known, a mattress was found to be the first item ignited in 92 (33%) of these cases. Bedding was established as the first item ignited in 146 (52%) of the cases investigated. Electric blankets ignited first in 28 (10%) of the cases and a boxspring was the item first ignited in 17 (6%) of the cases. Whether the bedding, mattress, electric blanket, or boxspring ignited first was unknown in 148 of the investigations.
 - Among the 92 fires in which the mattress was determined by CPSC investigators to be the first item ignited, the location of ignition was identified for 41 of these fires. The top surface was reported as the most common surface for ignition. Mattress fires caused by smoking materials began on the top surface, while the fires due to open flame and other ignition sources occurred in a variety of locations on the mattress.

Definition of Terms

"In-scope mattress/bedding" refers to mattress and bedding fires that have the potential to be affected by an open flame standard; a subset of these fires will definitely be addressable by an open flame standard.

"Addressable mattress/bedding" refers to mattress and bedding fire casualties that will certainly be addressable by an open flame standard.

"Not addressable mattress/bedding" refers to mattress and bedding fires that are definitely not within the scope of an open flame standard.

"Open flame standard" or "standard" refers to a standard designed to prevent flashover in mattress and bedding fires. Under such a standard, the mattress may still ignite, but the heat released by the mattress will not be enough to cause flashover conditions.

"Flashover" occurs when a fire reaches such a level of intensity that it causes all exposed surfaces to ignite, nearly simultaneously.

I. Introduction

The Federal Standard for the Flammability of Mattresses (and Mattress Pads), 16 CFR 1632, was enacted to reduce ignition of mattresses by cigarettes. All mattresses manufactured for introduction into interstate commerce after 1973 were required to conform to the standard and be resistant to ignition via smoldering smoking materials. In addition to conformance testing on a bare mattress, the performance tests require that the mattress and mattress pad be covered by two 100 percent cotton sheets during the test. No other bedding material is present during the test.

Despite the current standard, mattress and bedding fires remain one of the biggest contributors to residential fire deaths among products within the CPSC's jurisdiction, second only to upholstered furniture. Civilian injuries due to mattress and bedding fires are also a big problem, second only to range fires.

The CPSC held a Chairman's Roundtable in February of 1998 to bring together experts and interested parties to discuss the mattress/bedding fire problem. In April 2000, the CPSC received a petition for rulemaking to modify the current flammability standard for mattresses to reduce open flame ignitions.

Since the enactment of the current standard, the number of fires due to cigarette ignition has been reduced, but smoking materials and other ignition sources, such as open flame sources, continue to cause a large number of fires and civilian casualties. An example of an open flame ignition scenario, a child playing with a lighter and igniting the bedclothes, creates an intense burden of heat on the mattress and may lead to flashover if the mattress catches fire and burns rapidly. The NFPA definition of flashover is when a fire reaches such a level of intensity that it causes all exposed surfaces to ignite, nearly simultaneously (2). Although victims intimate with ignition may still be at risk due to their direct contact with the bed and burning bedclothes, prevention of flashover may reduce the number of casualties located outside the room of fire origin and a portion of the victims inside the room of fire origin.

Current research on mattress ignition due to burning bedding is being conducted at the National Institute of Standards and Technology (NIST). A residential bed is typically a system of materials consisting of any number or combination of bedding items rather than simply a bare mattress. The amount of heat released to a mattress during a bedding fire is more intense and complex than a small open flame source placed directly upon a mattress. An appropriate open flame standard for the ignition of mattresses should account for this heat release to a mattress. NIST has developed a large burner system that simulates the threat that burning bedding poses to the top surface and side of a mattress. Hence, this large open flame, if it becomes a standard, could address many different ignition sources that mimic the heat release created by burning bedding. This larger flame standard could address not only traditional small open flame sources such as matches, candles, and lighters, but also a broader range of fires including those ignited by heat or arcing from electrical equipment, heat produced by fuel-fired equipment, hot embers, or molten, hot material.

CPSC staff released reports on mattress and bedding fires in 1984 (3) and 1997 (4). The largest proportion of mattress and bedding fire deaths in this 2000 report were attributed to cigarette ignition, similar to the findings of the 1997 report and the previous mattress and bedding fire study report released in 1984. Unlike the 1984 report, the most common ignition source in mattress and bedding fires in this report as well as the 1997 report was ignition by traditional small open flame sources (e.g., lighters, matches, candles). This result is in contrast with the findings of the 1984 mattress and bedding fire study in which CPSC staff found cigarettes to be the primary ignition source for bed fires.

II. Methodology

A. National Estimates

National estimates of fires and fire losses in which a mattress or bedding article was the first item to ignite were developed using data from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA) annual survey of fire departments. The NFIRS is a data collection system in which participating fire departments voluntarily report detailed characteristics of the fires that they attend. Examples of some of the information reported through the NFIRS include the form of the first material to ignite, the type of material of the first item to ignite, the area of fire origin, whether some type of equipment was involved in the incident, and the cause of the fire (or ignition factor). Each year, approximately one-third to one-half of U.S. fire departments participate in the NFIRS.

National data are presented from 1980, the first year for which the NFIRS was considered fully operational in its present form, to 1998, the most recent year for which data is available. In 1998 the NFIRS contained reports of 156,661 residential structure fires from 39 states and the District of Columbia that resulted in 1,229 civilian deaths, 7,379 civilian injuries, and over \$1.8 billion in property loss. Although the system is not a random sample of fire departments, the NFIRS is believed to be reasonably representative of all fire departments in the United States. Table 1A in Appendix A reveals the NFIRS residential structure fire loss case counts for the years 1980 to 1998.

The NFPA survey is based on a stratified random sample of fire departments in the U.S. The stratification scheme for the sample is based on the size of the community protected by the department. The NFPA generates national projections by weighting sample results according to the proportion of total U.S. population accounted for by communities of each size. Table 2A in Appendix A depicts the NFPA annual estimates for residential structure fires, deaths, injuries and property loss for the years 1980 to 1998.

The steps required for this procedure entail grouping the NFIRS database by specific variables, editing the NFIRS database, allocating unknown values, and projecting

NFIRS counts to national estimates. The subsequent sections give a comprehensive description of the estimation method.

Grouping the NFIRS Database for Mattress and Bedding Fire Losses

Within the NFIRS database, all residential structure fire losses were grouped according to certain variables of interest in analysis. The form of material ignited, form of heat of ignition, and ignition factor variables were used for grouping. Table 1B in Appendix B shows the variable groupings using the NFPA 901 fire reporting codes (5).

The categories used for form of material first ignited were mattress, bedding, not mattress/bedding, and unknown form of material ignited. The forms of heat of ignition categories were smoking materials, traditional small open flame heat sources (candles, matches, lighters), additional small open flame sources, other in-scope heat sources, out-of-scope ignition sources, and unknown heat sources. Fire losses that were associated with incendiary and suspicious ignition factors were excluded because these fire losses are less likely to be influenced by a standard.

Editing the NFIRS Database

At the initial phase of the estimation procedure, the NFIRS database was assessed in order to classify incidents that were likely to be impacted by an open flame standard for mattresses. Within the NFIRS database, some incidents were re-classified from "mattress" or "bedding" to "not mattress/bedding" when it was believed that, because of inconsistencies in the reported area of fire origin and/or type of material ignited, a mattress or bedding item may not have been the first item ignited. For example, a fire that originated in a light shaft or that ignited linoleum first was not considered a mattress/bedding fire even if mattress or bedding was reported as the first item to ignite.

Based upon the information reported for each NFIRS incident, cases were classified as to whether or not they potentially fell within the scope of an open flame standard. In order for a case to be considered an "in-scope" fire, a fire that is likely to be addressable by a standard, it had to meet certain criteria. An "in-scope" mattress / bedding fire case is one in which the values of certain variables are considered "in-scope" (see Table 2B in Appendix B for the definition of "in-scope" values for these variables). An "in-scope" case would have the first item ignited coded as a mattress or bedding item, the type of material ignited as some type of fabric or material that could be used as a component of mattress or bedding construction, the area of origin consistent with a location where a mattress could be placed, the heat release of the ignition source consistent with that of burning bedclothes, and an ignition factor that was not incendiary or suspicious in nature. The editing/coding scheme (summarized in Table 1) is described as follows:

- Fire losses where the form of material ignited was reported as mattress or bedding and where "in-scope" values were reported (see Table B2 in Appendix B) for type of material ignited, area of origin, ignition factor, and equipment involved in ignition

were considered mattress/bedding fire losses potentially within the scope of a standard. (For example, a mattress was the first item to ignite, man-made fabric, fiber, finished goods was specified as the type of material first ignited, the area of origin was a sleeping room for under 5 persons, the ignition factor was described as combustible too close to heat, and the equipment involved in ignition was an indoor fireplace.)

- Fire losses where the form of material first ignited was reported as mattress or bedding and where an "out-of-scope" value was reported for type of material first ignited, area of origin, ignition factor, or equipment involved in ignition were considered to be mattress/bedding fire losses not addressable by a standard. (For example, a mattress was the first item to ignite, but natural gas was specified as the type of material first ignited, the area of origin was a sleeping room for under 5 persons, the ignition factor was fuel spilled, released accidentally, and the equipment involved in ignition was an indoor fireplace.)
- Fire losses where the form of material ignited was reported as mattress or bedding and where values for type of material ignited, area of origin, ignition factor, or equipment involved in ignition were inconsistent with mattress or bedclothing ignition (possible coding errors) were considered not to be mattress/bedding fire losses. (For example, mattress was reported as the form of material first ignited and linoleum was reported as the type of material first ignited.)
- Fire losses where the form of material first ignited was reported as unknown and "in-scope" values were reported for type of material first ignited, area of origin, ignition factor, and equipment involved in ignition were considered to be unknown form of material ignited fires losses. (For example, the form of material first ignited was not reported, but the type of material first ignited was consistent with a material used in mattress/bedding construction and the area of origin was consistent with a location where a mattress could be placed.)
- Fire losses where the form of material first ignited was reported as unknown and "out-of-scope" values were reported for type of material first ignited, area of origin, ignition factor, or equipment involved in ignition were considered not to be mattress/bedding fire losses. (For example, the form of material first ignited was not reported, and the type of material first ignited was not consistent with materials used in mattress/bedding construction.)

Table 1 summarizes this coding scheme. As shown in Table B2 in Appendix B, "in-scope" and "out-of-scope" values varied among different form of heat of ignition categories.

Table 1
Grouping Decision Table for Editing

Form Of Material 1st Ignited	Type Of Material 1st Ignited	Area Of Origin	Ignition Factor	Equipment Involved	Coding Result
Mattress / Bedding	"In-Scope"	"In-Scope"	"In-Scope"	"In-Scope"	"In-Scope" Mattress / Bedding
Mattress / Bedding	At Least One "Out-of-Scope"				Not Addressable Mattress / Bedding
Mattress / Bedding	At Least One Inconsistent With Mattress or Bedding Ignition				Not Mattress / Bedding
Unknown	"In-Scope"	"In-Scope"	"In-Scope"	"In-Scope"	Unknown Form of Material Ignited
Unknown	At Least One "Out-of-Scope"				Not Mattress / Bedding

Allocation of Unknowns

The next step in the methodology used to generate national estimates of mattress and bedding fires and fire losses for this report involves allocating unknown values for the relevant variables in this analysis. Since a significant number of NFIRS cases contain unknown values for one or more of the variables of interest, an iterative mathematical procedure known as raking was used to allocate these unknown values. The raking procedure adjusts a cross-tabulation of the data so that the resulting table, without unknowns, maintains the same proportional relationship (odds ratio) as the original cross-tabulation. Izrael, Hoaglin, and Battaglia (6) describe the raking algorithm and provide the Statistical Analysis Software (SAS version 6.12; SAS Institute, Inc., Cary, NC) code for the raking procedure.

Two applications of the raking procedure were applied to the NFIRS data. In the first application, the unknowns (NFPA 901 codes 00, ??, and missing, as shown in Table 1B in Appendix B) for the form of material first ignited, the form of heat of ignition, and ignition factor were allocated. Once the first level of unknowns, or complete unknowns, are allocated, another level of unknowns remain. Within the form of material and form of heat of ignition variables there are some cases where there was insufficient information to use a detailed code, but enough information is known to give the variable a general classification. In such situations, the codes used are of the form k0 (e.g. 10, 20, 30). These codes mean that the form of material ignited or the form of heat of ignition was known at a general level, but not at a specific level. Hence, in the second application, those fire cases with some information available but not enough to distinguish it within a particular subcategory were allocated. For example, the code for unknown type of soft goods, the classification that mattress and bedding items fall under, is 30. The cases in this category were allocated among all other soft goods categories (codes 31 – 39) including mattresses (code 31) and bedding (code 32). The

allocation of these "within level" cases was done similarly for the form of heat of ignition categories described in Table 1B in Appendix B.

The raking algorithm was also used to generate estimates by victim age and location corresponding to the extent of the fire damage and was expanded to include additional variables. The unknowns (NFPA 901 codes 00, ??, and missing) for age, location of casualty at time of ignition, and extent of flame damage variables were allocated along with the form of material first ignited, form of heat of ignition, and ignition factor variables.

Estimation Procedure

The final step in this process involves applying an estimation procedure to the edited and allocated data. National fire loss estimates were derived by computing percentages of the various NFIRS code groups described above. These percentages were then multiplied by the total number of U.S. fires, deaths, injuries, and dollar loss estimated from the NFPA survey. Hall and Harwood (7) document this scaling procedure, although their system of allocating unknowns is done differently.

B. Investigations

In-depth investigations were conducted by CPSC field staff to provide detailed information on mattress and bedding fires. Data collection on mattress and bedding fires began in October 1994 to identify factors related to continued cigarette ignition of mattress and bedding fires and to characterize open flame-ignited mattress/bedding fires. It is noted that while the cases investigated were limited in number and were not from a national sample with a known selection probability, they provided useful information about the hazard scenarios associated with mattress and bedding fires.

CPSC Regional Field Offices and Satellite Offices were involved in the data collection effort. Investigation data in this report include the 156 cases collected during the special study on mattress and bedding fires between October 1994 and December 1995 found in the 1997 report as well as 275 additional cases investigated after the completion of that special study, January 1996 through August 2000. Hence, between October 1994 and August 2000, CPSC staff investigated 431 fires in which a mattress and/or bedding item ignited. In the case collection that occurred between October 1994 and December 1995, investigators were assigned the responsibility of case *identification and follow-up investigations of in-scope incidents. Contacts were developed with the local fire departments to arrange for rapid identification of fires that were in-scope, i.e., non-arson residential structure fires in which the first item to ignite was either a mattress or bedding. In addition to the fire department contacts, other fires were identified through news reports. If the mattress and/or bedding items were still available, an on-site investigation was attempted.*

After December 1995, CPSC headquarters staff identified in-scope fires for follow-up through its other case-identification sources, such as newspaper clippings, medical

examiner reports, and consumer complaints. Case selection criteria for data collection during this time period included cigarette ignitions to post-standard mattresses. During the period from November 1997 to February 1999, CPSC also conducted data collection on lighter child play fires. As a result, mattress fire investigations involving lighters dominate the data collection during this time period and may be over-represented in the distribution of the sources of ignition.

III. National Data

A. Estimates

In 1998, mattress or bedding items were the first to ignite in about 18,100 residential fires that resulted in 390 deaths, 2,160 injuries, and \$208.3 million in property damage. Of these fire losses, CPSC estimates that 17,300 fires, 390 deaths, 2,090 injuries, and \$199.1 million in property damage are in-scope and could potentially be impacted by an open flame standard. Table 2 presents these estimates.

Smoking material ignition sources, which include cigarettes, cigars, and pipes, accounted for 5,300 of the in-scope fires (31% of such fires), 230 deaths (59%), 660 injuries (32%), and \$61.3 million in property damage (31%). Candles, matches, and lighters (i.e., the traditional small open flame sources) accounted for 6,400 in-scope fires (37%), 90 deaths (23%), 950 injuries (45%), and \$73.2 million in property damage (37%). Other small open flame heat sources that mimic the heat release of burning bedclothes, including sparks, embers, or flames escaping from fueled equipment, arcs or sparks from electrical equipment, small torches, hot embers, and fireworks, accounted for 400 fires (2%), 10 deaths (3%), 30 injuries (1%), and \$4.2 million in property damage (2%). If the two small open flame categories are combined, they account for 6,700 fires (39%), 100 deaths (26%), 980 injuries (47%), and \$77.4 million in property damage (39%). Other heat sources that emulate burning bedclothes, including heat escaping from fueled equipment, molten material, short circuit arc, and heat from overloaded equipment, accounted for 5,200 fires (30%), 70 deaths (18%), 450 injuries (22%), and \$60.4 million in property damage (30%). Ignition sources beyond the scope of an open flame standard include explosives, lightning, heat spreading from another hostile fire, and multiple forms of heat of ignition.

Table 2
1998 Mattress / Bedding Fire Loss Estimates

1998 Fire Losses	Fires	Deaths	Injuries	Property Loss in Millions
Total Mattress / Bedding	18,100	390	2,160	\$208.3
Total In-Scope Fire Losses	17,300	390	2,090	\$199.1
Smoking Material – In-Scope	5,300	230	660	\$61.3
Smoking Material – Not Addressable	100	--	10	\$0.8
Candles, Matches, Lighters – In-Scope	6,400	90	950	\$73.2
Candles, Matches, Lighters – Not Addressable	100	--	30	\$1.7
Additional Small Open Flame – In-Scope	400	10	30	\$4.2
Additional Small Open Flame – Not Addressable	*	--	--	\$0.4
Other In-Scope Ignition – In-Scope	5,200	70	450	\$60.4
Other In-Scope Ignition – Not Addressable	100	--	10	\$1.5
Out-of-Scope Ignition Sources – Not addressable	400	**	20	\$4.7

Source: U.S. Consumer Product Safety Commission / EPHA, U.S. Fire Administration's National Fire Incident Reporting System, and National Fire Protection Association's annual survey of fire departments.

Notes: Detail may not add to total due to rounding. Estimated fires are rounded to the nearest 100. Fire estimates less than 100 are denoted by an asterisk (*). Estimated deaths and injuries are rounded to the nearest 10. Fire death and injury estimates less than 10 are denoted by a double asterisk (**). A value of (–) indicates that no NFIRS reports were received.

B. Trends

Table 3 presents **in-scope** mattress and bedding fire loss estimates by the various ignition sources from 1980 to 1998. Tables 1C and 2C, located in Appendix C, show estimates separately for mattresses and bedding, respectively. The tables include separate estimates for all the in-scope ignition categories summarized in Table 2 above. Table 4 shows **total** mattress and bedding fire loss estimates by the various heat ignition sources.

Total residential fires, deaths, and injuries have decreased since 1980. Consistent with that trend, fires, fire deaths, and fire injuries associated with mattresses and bedding have also decreased; nevertheless, such fires continue to account for a large portion of the fire-related death and injury toll within the jurisdiction of CPSC. Smoking material fires accounted for the vast majority of the decrease. In-scope mattress and bedding fires ignited by smoking materials experienced a decline of 81% from 1980 to 1998 (Table 5). (Tables 3C and 4C in Appendix C represent the percent changes for mattress and bedding separately). Regression analysis verified that this decreasing trend is significant ($p < 0.05$). Mattress and bedding fires ignited by all small open flame sources (candles, matches, and lighters as well as additional small open flame sources) have also significantly declined (a 58% decrease, $p < 0.05$). Figure 1 illustrates the decreasing trend in in-scope mattress and bedding fires associated with the three categories of in-scope ignition sources, smoking materials, all small open flame sources, and other in-scope heat sources from 1980 to 1998. The totals shown in Figure 1 for small open flame ignitions are the sum of the estimates for fires labeled "candles, matches, lighters" and "additional small open flame sources" presented in Table 3.

Table 3
National Estimates of Residential Fires, Civilian Casualties, and Property Loss
Associated With In-Scope Mattress / Bedding Fires by Ignition Source 1980 - 1998

	YEAR									
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
<u>Total In-Scope Mattress and Bedding</u>	830	840	690	620	630	820	660	690	840	560
Smoking Material	490	590	470	440	370	490	370	390	450	320
Candles, Matches, Lighters	150	120	100	80	130	180	120	160	220	120
Additional Small Open Flame Sources	--	--	20	10	10	10	--	10	10	10
Other In-Scope Ignition Sources	180	130	100	90	130	140	160	120	160	110
	FIRE DEATHS									
<u>Total In-Scope Mattress and Bedding</u>	2,940	2,680	2,780	2,910	2,780	2,690	2,540	3,040	3,010	2,820
Smoking Material	1,550	1,440	1,330	1,440	1,280	1,210	1,150	1,270	1,310	1,060
Candles, Matches, Lighters	770	680	840	800	880	880	810	1,090	1,050	990
Additional Small Open Flame Sources	20	30	20	50	10	50	40	40	40	50
Other In-Scope Ignition Sources	610	540	590	610	600	550	550	630	610	710
	FIRE INJURIES									
<u>Total In-Scope Mattress and Bedding</u>	57,000	48,500	41,300	38,600	37,200	36,700	34,500	32,000	31,100	28,500
Smoking Material	27,500	23,100	18,500	16,800	16,000	15,700	14,700	13,300	12,500	11,200
Candles, Matches, Lighters	15,300	12,900	11,100	10,900	10,600	10,700	10,300	9,900	9,800	9,100
Additional Small Open Flame Sources	700	700	500	600	500	600	600	600	600	600
Other In-Scope Ignition Sources	13,500	11,900	11,200	10,300	10,000	9,600	8,800	8,200	8,200	7,600
	PROPERTY LOSS (MILLIONS)									
<u>Total In-Scope Mattress and Bedding</u>	\$229.1	\$215.7	\$198.6	\$198.8	\$205.2	\$222.6	\$210.7	\$213.2	\$226.4	\$221.7
Smoking Material	\$110.5	\$102.8	\$88.9	\$86.4	\$88.4	\$95.4	\$89.9	\$88.6	\$91.3	\$87.1
Candles, Matches, Lighters	\$61.5	\$57.3	\$53.5	\$56.1	\$58.7	\$65.1	\$63.1	\$65.7	\$71.1	\$71.1
Additional Small Open Flame Sources	\$3.0	\$2.9	\$2.5	\$3.1	\$3.0	\$3.9	\$3.6	\$4.1	\$4.3	\$4.4
Other In-Scope Ignition Sources	\$54.1	\$52.7	\$53.7	\$53.2	\$55.1	\$58.1	\$54.0	\$54.8	\$59.7	\$59.0

Notes: Smoking materials are cigarettes (primarily), cigars, and pipes. Estimates were derived by applying proportions observed in national fire incident data (NFIRS), obtained from the U.S. Fire Administration, to aggregate national estimates conducted by the National Fire Protection Association (NFPA). Due to rounding, column detail may not add to total. Fire estimates are rounded to the nearest 100, deaths and injuries to the nearest 10, property loss to the nearest tenth of a million. Fire estimates less than 100 are denoted by an asterisk (*), death and injury estimates less than 10 by a double asterisk (**). A value of () indicates that no NFIRS reports were received. Source: U.S. Consumer Product Safety Commission, data obtained from the National Fire Protection Association and the U.S. Fire Administration.

Table 3
National Estimates of Residential Fires, Civilian Casualties, and Property Loss
Associated With In-Scope Mattress / Bedding Fires by Ignition Source 1980 - 1998

	YEAR									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Total In-Scope Mattress and Bedding	500	570	560	560	450	490	610	490	390	
Smoking Material	280	250	300	310	210	260	300	230	230	
Candles, Matches, Lighters	120	180	170	180	180	130	120	120	90	
Additional Small Open Flame Sources	20	20	20	**	10	10	30	20	10	
Other In-Scope Ignition Sources	90	120	70	70	60	90	160	130	70	
					FIRE DEATHS					
Total In-Scope Mattress and Bedding	2,610	2,820	3,030	3,080	2,660	2,410	2,250	2,180	2,090	
Smoking Material	1,070	980	1,130	1,000	770	740	750	720	660	
Candles, Matches, Lighters	980	1,120	1,290	1,320	1,350	1,120	1,020	920	950	
Additional Small Open Flame Sources	20	50	60	80	20	40	50	40	30	
Other In-Scope Ignition Sources	540	660	560	680	520	500	430	500	450	
					FIRE INJURIES					
Total In-Scope Mattress and Bedding	24,700	24,900	24,800	24,600	23,700	20,500	20,100	18,500	17,300	
Smoking Material	9,300	8,900	8,400	7,800	7,200	6,400	6,300	5,300	5,300	
Candles, Matches, Lighters	8,200	8,700	9,300	9,600	9,800	7,800	7,400	6,700	6,400	
Additional Small Open Flame Sources	400	500	500	400	500	400	500	400	400	
Other In-Scope Ignition Sources	6,700	6,800	6,600	6,800	6,100	5,900	6,000	6,100	5,200	
					FIRES					
Total In-Scope Mattress and Bedding	\$224.6	\$289.2	\$203.6	\$253.1	\$226.4	\$210.7	\$233.2	\$208.8	\$199.1	
Smoking Material	\$84.9	\$103.5	\$69.2	\$80.6	\$69.1	\$65.1	\$73.1	\$60.0	\$61.3	
Candles, Matches, Lighters	\$74.4	\$100.6	\$76.7	\$98.5	\$93.8	\$80.3	\$85.4	\$76.0	\$73.2	
Additional Small Open Flame Sources	\$4.0	\$5.8	\$3.8	\$4.2	\$4.8	\$4.5	\$5.4	\$4.5	\$4.2	
Other In-Scope Ignition Sources	\$61.2	\$79.3	\$53.9	\$69.8	\$58.7	\$60.9	\$69.4	\$68.3	\$60.4	
					PROPERTY LOSS (MILLIONS)					

Notes. Smoking materials are cigarettes (primarily), cigars, and pipes.
 Estimates were derived by applying proportions observed in national fire incident data (NFIRS), obtained from the U.S. Fire Administration, to aggregate national estimates conducted by the National Fire Protection Association (NFPA).
 Due to rounding, column detail may not add to total. Fire estimates are rounded to the nearest 100, deaths and injuries to the nearest 10, property loss to the nearest tenth of a million. Fire estimates less than 100 are denoted by an asterisk (*), death and injury estimates less than 10 by a double asterisk (**). A value of () indicates that no NFIRS reports were received.
 Source: U.S. Consumer Product Safety Commission, data obtained from the National Fire Protection Association and the U.S. Fire Administration

Table 4
National Estimates of Residential Fires, Civilian Casualties, and Property Loss
Associated With All Mattress / Bedding Fires by Ignition Source 1980 - 1998

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total Mattress and Bedding	840	840	690	650	640	840	690	700	840	560
Smoking Material	490	590	480	440	370	490	370	400	450	320
Candles, Matches, Lighters	160	120	100	80	130	190	130	160	220	130
Additional Small Open Flame Sources	--	--	20	20	10	10	--	10	10	10
Other In-Scope Ignition Sources	180	130	100	90	130	140	160	120	160	110
Out-of-Scope Ignition Sources	10	--	--	10	**	10	30	--	--	**
FIRE DEATHS										
Total Mattress and Bedding	3,090	2,730	2,960	2,970	2,840	2,750	2,600	3,090	3,040	2,890
Smoking Material	1,570	1,440	1,340	1,450	1,300	1,220	1,150	1,280	1,310	1,070
Candles, Matches, Lighters	830	680	860	830	900	890	810	1,100	1,060	1,010
Additional Small Open Flame Sources	30	30	30	60	20	50	40	40	40	50
Other In-Scope Ignition Sources	620	550	590	610	610	570	560	640	620	720
Out-of-Scope Ignition Sources	30	20	40	10	10	20	40	20	10	40
FIRE INJURIES										
Total Mattress and Bedding	58,600	49,900	42,700	39,800	38,500	38,200	35,900	33,100	32,200	29,600
Smoking Material	27,700	23,200	18,600	16,900	16,200	15,900	14,800	13,400	12,600	11,300
Candles, Matches, Lighters	15,600	13,100	11,400	11,100	10,800	11,000	10,600	10,100	9,900	9,300
Additional Small Open Flame Sources	800	700	600	700	600	700	600	600	600	600
Other In-Scope Ignition Sources	13,700	12,100	11,400	10,500	10,200	9,800	9,000	8,400	8,400	7,700
Out-of-Scope Ignition Sources	800	800	700	600	700	800	800	600	600	700
FIRES										
Total Mattress and Bedding	\$235.4	\$222.0	\$205.1	\$205.1	\$212.3	\$231.7	\$219.4	\$219.9	\$234.1	\$230.3
Smoking Material	\$111.2	\$103.4	\$89.6	\$87.0	\$89.3	\$96.6	\$90.7	\$89.3	\$91.8	\$87.9
Candles, Matches, Lighters	\$62.6	\$58.4	\$54.6	\$57.3	\$59.7	\$66.6	\$64.5	\$66.9	\$72.3	\$72.4
Additional Small Open Flame Sources	\$3.2	\$3.0	\$2.8	\$3.4	\$3.2	\$4.1	\$3.9	\$4.3	\$4.4	\$4.6
Other In-Scope Ignition Sources	\$55.2	\$53.8	\$54.8	\$54.2	\$56.2	\$59.4	\$55.1	\$55.6	\$60.9	\$60.1
Out-of-Scope Ignition Sources	\$3.2	\$3.4	\$3.2	\$3.2	\$3.9	\$5.1	\$5.1	\$3.8	\$4.6	\$5.3
PROPERTY LOSS (MILLIONS)										
Total Mattress and Bedding	\$235.4	\$222.0	\$205.1	\$205.1	\$212.3	\$231.7	\$219.4	\$219.9	\$234.1	\$230.3
Smoking Material	\$111.2	\$103.4	\$89.6	\$87.0	\$89.3	\$96.6	\$90.7	\$89.3	\$91.8	\$87.9
Candles, Matches, Lighters	\$62.6	\$58.4	\$54.6	\$57.3	\$59.7	\$66.6	\$64.5	\$66.9	\$72.3	\$72.4
Additional Small Open Flame Sources	\$3.2	\$3.0	\$2.8	\$3.4	\$3.2	\$4.1	\$3.9	\$4.3	\$4.4	\$4.6
Other In-Scope Ignition Sources	\$55.2	\$53.8	\$54.8	\$54.2	\$56.2	\$59.4	\$55.1	\$55.6	\$60.9	\$60.1
Out-of-Scope Ignition Sources	\$3.2	\$3.4	\$3.2	\$3.2	\$3.9	\$5.1	\$5.1	\$3.8	\$4.6	\$5.3

Notes: Smoking materials are cigarettes (primarily), cigars, and pipes.
Estimates were derived by applying proportions observed in national fire incident data (NFIRS), obtained from the U.S. Fire Administration, to aggregate national estimates conducted by the National Fire Protection Association (NFPA).
Due to rounding, column detail may not add to total. Fire estimates are rounded to the nearest 100, deaths and injuries to the nearest 10, property loss to the nearest tenth of a million. Fire estimates less than 100 are denoted by an asterisk (*), death and injury estimates less than 10 by a double asterisk (**). A value of (--) indicates that no NFIRS reports were received.
Source: U.S. Consumer Product Safety Commission, data obtained from the National Fire Protection Association and the U.S. Fire Administration.