

3. Place screens around both burners.
4. Open pilot ball valves one at a time and ignite pilots with hand-held flame; adjust flame size if necessary being very careful to avoid a jet flame that could prematurely ignite the test specimen (Beware: after a long interval between tests the low pilot flow rate will require a long time to displace air in the line and achieve the steady-state flame size.)
5. Open both burner ball valves.
6. *Start test exposure* by simultaneously turning on power to both timers (timers will turn off burners at appropriate times).
7. Check/adjust propane flow rates (DO THIS ESSENTIAL TASK IMMEDIATELY. Experience shows the flow will not remain the same from test-to-test in spite of fixed valve positions so adjustment is essential.)
8. *After burners are out:*
  - a. Lift top burner and back assembly away from specimen.
  - b. Turn off power to both timers.
  - c. Remove screens.
  - d. Turn off pilots at their ball valves.

Dated: December 22, 2004.

**Todd Stevenson,**

Secretary, Consumer Product Safety Commission.

**List of Relevant Documents**

1. Briefing memorandum from Margaret Neily, Project Manager, Directorate for Engineering Sciences, to the Commission, "Notice of Proposed Rulemaking for Mattress Flammability (Open Flame) and Options for Addressing Bedclothes Involvement in Mattress/Bedding Fires," November 1, 2004.
2. Memorandum from Allyson Tenney, ES, to Margaret Neily, Engineering Sciences, "Background and Technical Rationale for Draft Proposed Standard for Open Flame Mattress Flammability," October 29, 2004.
3. Memorandum from Linda Smith and David Miller, EPI, "Residential Fires Involving Mattresses and Bedding," October 2004.
4. Memorandum from Carolyn Meiers, ESHF, to Margaret Neily, Project Manager, "Criteria for Judging Effectiveness of Proposed Mattress Standard," October 14, 2004.
5. Memorandum from Carolyn Meiers, ESHF, to Margaret Neily, Project Manager, "Human Behavior in Fire," October 7, 2004.
6. Memorandum from Treye Thomas and Patricia Brundage, HS, "Qualitative Assessment of Potential Risk from the Use of Flame Retardant Chemicals in Mattresses," October 25, 2004.
7. Memorandum from Robert Franklin, EC, to Margaret L. Neily, ES, "Preliminary Environmental Assessment of a Draft Proposed Open-Flame Ignition Resistance Standard for Mattresses," October 21, 2004.
8. Memorandum from Soumaya Tohamy, EC, to Margaret Neily, Project Manager, "Preliminary Regulatory Analysis of a Draft Proposed Standard to Address Open Flame Ignitions of Mattresses," October 27, 2004.
9. Memorandum from Soumaya Tohamy, EC, to Margaret Neily, Project Manager, "Initial Regulatory Flexibility Analysis of a Draft Proposed Standard to Address Open Flame Ignitions of Mattresses," October 27, 2004.

10. Terrance R. Karels, EC, to Margaret L. Neily, ES, "Updated Mattress Market Information," October 5, 2004.

11. Memorandum from Linda Smith EPI, "Involvement of Bedclothes in Residential Mattress Fires," May 2004.

12. Terrance R. Karels, EC, to Margaret L. Neily, ES, "Bedding Market Information," October 5, 2004.

13. Memorandum from Allyson Tenney, ES, to Margaret Neily, Engineering Sciences, "Bedclothes Flammability," October 29, 2004.

14. Memorandum from Martha A. Kosh, OS, to ES, "Standard to Address Open Flame Ignition of Mattresses/Bedding; ANPR," List of comments on CF 02-1, December 13, 2001.

15. Memorandum from Martha A. Kosh, OS, to ES, "Standard to Address Open Flame Ignition of Mattresses/Bedding; ANPR (Revised)," List of comments on CF 02-1, September 27, 2004.

16. National Research Council (2000). Toxicological Risks of Selected Flame-Retardant Chemicals (Washington, DC, National Academy Press).

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**CONSUMER PRODUCT SAFETY COMMISSION**

**16 CFR Part 1634**

**Standard To Address Open Flame Ignition of Bedclothes; Advance Notice of Proposed Rulemaking**

**AGENCY:** Consumer Product Safety Commission.

**ACTION:** Advance Notice of proposed rulemaking.

**SUMMARY:** The Commission is considering issuing a flammability standard that would address open flame ignition of bedclothes. (Commissioner Thomas H. Moore issued a statement, a copy of which is available from the Commission's Office of the Secretary or from the Commission's Web site, <http://www.cpsc.gov>.) Elsewhere in today's **Federal Register**, the Commission is proposing a flammability standard that addresses open flame ignition of mattresses/foundations. Research indicates that in mattress fires the mattress and bedclothes operate together as a system. Thus, the Commission believes that a flammability standard for bedclothes in addition to one for mattresses may be appropriate. The Commission invites comments concerning the risk of injury identified in this notice, the regulatory alternatives being considered, and other possible alternatives. The Commission also invites submission of any existing standard or statement of intention to modify or develop a voluntary standard

to address small open flame ignition of bedclothes.

**DATES:** Comments and submissions must be received by March 14, 2005.

**ADDRESSES:** Comments should be mailed, preferably in five copies, to the Office of the Secretary, Consumer Product Safety Commission, Washington, DC 20207-0001, or delivered to the Office of the Secretary, Consumer Product Safety Commission, Room 502, 4330 East-West Highway, Bethesda, Maryland; telephone (301) 504-0800. Comments also may be filed by telefacsimile to (301) 504-0127 or by email to [cpsc-os@cpsc.gov](mailto:cpsc-os@cpsc.gov). Comments should be captioned "Bedclothes ANPR."

**FOR FURTHER INFORMATION CONTACT:**

Margaret Neily, Directorate for Engineering Sciences, Consumer Product Safety Commission, Washington, DC 20207; telephone (301) 504-0508, extension 1293.

**SUPPLEMENTARY INFORMATION:**

**A. Background**

An existing flammability standard for mattresses addresses ignition of mattresses and mattress pads by cigarettes. 16 CFR Part 1632. On October 11, 2001, the Commission published an advance notice of proposed rulemaking ("ANPR") addressing open flame ignition of mattresses. 66 FR 51886. That ANPR was the result of several years of evaluation by Commission staff and petitions on mattress flammability submitted by Whitney Davis, Director of the Children's Coalition for Fire-safe Mattresses. As explained in the ANPR, the 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"). The NIST research program has provided a great deal of technical information about mattress fires, including the role of bedclothes in such fires.

As noted in the mattress ANPR, mattresses generally are not used alone, but are covered by bedding or bedclothes, whose presence significantly affects the character of the fire. In most incidents a small open flame initially ignites the bedding, and these materials serve as a larger ignition source for the mattress. Because few materials can resist such a large ignition source, the typical approach of preventing ignition of a mattress through a product performance standard may not be fully adequate for an open flame mattress standard. Therefore, the Commission has taken the approach in

its proposed mattress standard of limiting the fire intensity in order to minimize the possibility of or delay flashover for a period of time in mattress/bedding fires. Flashover occurs when a fire becomes so intense that all exposed surfaces ignite nearly simultaneously, and the fire quickly spreads through the structure.

In response to the mattress ANPR, the Commission received comments both in favor of the Commission regulating bedclothes and against such regulation. Those opposed to regulating bedclothes argued that bedclothes are an uncontrolled variable and there is no way to predict the type of bedclothes that may become involved in a fire incident. They also stated that there would be no objective method to determine if consumers were using regulated bedclothes, there is little data indicating that regulating some bedding items would have an impact on the hazard, and flammability performance should not be based on what consumers may (or may not) use as bedclothes. Those in favor of regulating bedclothes argued that bedclothes are a significant ignition source for mattress fires and significantly affect the burning characteristics of the mattress and foundation. They also asserted that bedclothes can generate a fire large enough to pose a hazard on their own, and that improving the flammability of certain bedclothes, such as filled items, is economically feasible.

As discussed below, the Commission believes that regulating bedclothes may be appropriate. Bedclothes contribute substantially to the complexity and magnitude of the mattress fire hazard. The NIST research has shown that, even with mattresses that would meet the Commission's proposed open flame mattress standard, certain bedclothes have produced near flashover conditions in laboratory tests.

#### **B. The Products**

The term "bedclothes" can include a variety of products, such as sheets, blankets, mattress pads, pillows, comforters, and similar products that are used as covering on a bed. Products that contain fibrous or other materials are called "filled" bedding. Because of their greater mass or fuel load, filled products are likely to contribute more significantly to a mattress fire than unfilled products, such as sheets and blankets. California's Bureau of Home Furnishings and Thermal Insulation ("CBHF") has issued a draft Technical Bulletin 604 that specifies an open flame standard for filled bedding products. The draft TB 604 does not cover textiles, such as sheets,

pillowcases and blankets. CBHF only regulates filled bedclothing.

At the present time, the Commission is not limiting this rulemaking to any particular bedclothes. The Commission intends that during the course of rulemaking it will evaluate continuing research to determine which bedclothes have the greatest impact on mattress fires. The Commission requests comments on particular bedclothes that should be included in or excluded from a proposed bedclothes standard.

At the request of CBHF, the American Textiles Manufacturers Institute ("ATMI") conducted a survey in 2003 of its members about the U.S. market for filled bedding products. The 12 firms surveyed reportedly account for 80% of the U.S. market for these products. Although these firms are located in the U.S., many of their products are manufactured outside the U.S. According to U.S. Department of Commerce 2002 import statistics, perhaps 90% of all quilts and comforters, and perhaps 20% of all bed pillows are imported. According to the ATMI survey, the most common fill material for bedclothes is polyester (not flame-resistant). Some of the improved fill materials being developed for mattresses could also be used for bedclothes. Use of barrier fabrics or flame resistant outer fabrics are other approaches that could be used to improve fire performance of bedclothes.

A trade publication, "Home Textiles Today," reported in its 2003 annual business issue that the top five firms marketing comforters and bedspreads sold about \$1.1 billion in the U.S. in 2002, essentially unchanged from 2001. The top five makers of down comforters reported sales of about \$303 million in 2002.

Mattress pads are constructed of the same types of foam used in mattresses and filled bedding products. They can also contribute significantly to mattress/bedding fires. Foam mattress pads may be made with a flat surface, an "egg crate" design, or with "memory foam" that contours to the body. Egg crate pads retail for \$10 to \$50 each. Industry sources estimate that perhaps 4 to 5 million egg crate pads are sold annually. Memory pads, which retail for \$100 or more, sell about 3 million units annually.

#### **C. Risk of Injury**

The most recent national fire loss estimates indicated that mattresses and bedding were the first items to ignite in 19,400 residential fires attended by the fire service annually during 1995-1999 (based on data from the U.S. Fire Administration's National Fire Incident

Reporting System data and the National Fire Protection Association's annual survey). These fires resulted in 440 deaths, 2,230 injuries and \$273.9 million in property loss each year. Open flame ignition sources accounted for 35 percent of these fires and smoking material sources accounted for 30 percent of the fires. The remaining fires included a variety of ignition sources including heat sources too close to the bed. Based on these data alone, it is very difficult to determine whether the first item ignited was a mattress or an item of bedclothes.

The primary source for information on the involvement of various bedclothes items in mattress fires is CPSC's in-depth investigations. Staff analyzed 241 investigated fire incidents that occurred between January 2000 and June 2003. These investigations were based on a variety of initial sources, NEISS hospital emergency room reports, newspaper clippings, and fire department reports.

Unless someone witnessed the fire ignition, it was often difficult to determine whether the mattress or a bedclothes item, such as a pillow or blanket, ignited first. When the initial ignition was not observed and reported, staff determined what ignited first based on the reported scenario. For example, if a lamp fell on a blanket on the top surface of the bed, the incident was classified as igniting the blanket first. Based on this evaluation, it was determined that a non-electric bedclothes item ignited first in 190 of 235 fires (81 percent). However, in 75 percent of those bedclothes' ignitions it was not possible to determine the type of bedclothes involved. Among incidents for which a specific item was reported, sheets, blankets, and comforters/quilts were the items cited most frequently. Ignition sources included cigarette lighters (primarily children playing), candles, smoking materials, and other nearby heat sources. Although the investigations could not provide information on which types of bedclothes were more likely to ignite, they did show that most bedclothes items that were present did ignite at some point during the fire.

#### **D. Statutory Provisions**

Section 4 of the Flammable Fabrics Act ("FFA") authorizes the Commission to initiate proceedings for a flammability standard when it finds that such a standard is "needed to protect the public against unreasonable risk of the occurrence of fire leading to death or personal injury, or significant property damage." 15 U.S.C. 1193(a). That section also sets forth the process

by which the Commission can issue a flammability standard. The Commission first must issue an advance notice of proposed rulemaking (“ANPR”) which: (1) Identifies the fabric or product and the nature of the risk associated with the fabric or product; (2) summarizes the regulatory alternatives under consideration; (3) provides information about existing relevant standards and reasons why the Commission does not preliminarily believe that these standards are adequate; (4) invites interested persons to submit comments concerning the identified risk of injury, regulatory alternatives being considered, and other possible alternatives; (5) invites submission of an existing standard or portion of a standard as a proposed regulation; and (6) invites submission of a statement of intention to modify or develop a voluntary standard to address the risk of injury. 15 U.S.C. 1193(g).

If, after reviewing comments and submissions responding to the ANPR, the Commission determines to continue the rulemaking proceeding, it will issue a notice of proposed rulemaking. This notice must contain the text of the proposed rule along with alternatives the Commission has considered and a preliminary regulatory analysis. 15 U.S.C. 1193(i). Before issuing a final rule, the Commission must prepare a final regulatory analysis, and it must make certain findings concerning any relevant voluntary standard, the relationship of costs and benefits of the rule, and the burden imposed by the regulation. *Id.* 1193(j). The Commission also must provide an opportunity for interested persons to make an oral presentation before the Commission issues a final rule. *Id.* 1193(d).

#### E. Existing Open Flame Standards

Currently, there are no mandatory flammability requirements for residential bedclothes in the United States. A few voluntary standards apply to bedding items. ASTM D4151–92 (2001) measures ease of ignition and surface flame spread of blankets. Underwriters Laboratories (“UL”) has a standard for electric blankets. A European standard, ISO 12952—Textiles—Burning behaviour of bedding items, Parts 1–4, specifies a general test method for assessing the ignitability of bedding items. The test method calls for observation of progressive smoldering and/or flaming when a bedding specimen is exposed to a small propane burner. The test relates only to ignitability of the bedding material under the specific conditions of the test. None of these tests appears adequate to measure or address the specific hazard

posed by a bedclothes item or its contribution to a residential mattress/bedding fire.

#### F. California’s Rulemaking

In 2001, the California legislature passed Assembly Bill 603 (“AB 603”), which mandated that CBHF issue regulations by January 2004 that would require that mattresses and box springs meet a test for open-flame resistance. AB 603 also stated: “If the bureau [CBHF] concludes that other bedding contributes to mattress fires, the regulations shall require the other bedding to be flame retardant under the resistance to open-flame test.” Based on their own research and that conducted by NIST, CBHF determined that regulation of filled bedding products—such as comforters, pillows, and mattress pads—is necessary. CBHF has been working with a multi-disciplinary task force to develop a proposed standard for these bedding items. CBHF prepared a draft standard (TB 604) that was discussed in the Task Force in 2003. However, it was withdrawn because of technical problems with the test method. CBHF issued a new draft of the TB 604 standard on October 1, 2004, and scheduled a Task Force meeting for November 18, 2004, to discuss it. CBHF has stated that it expects to open formal rulemaking at the end of the year and hold hearings on the proposal in January or February 2005.

#### G. Technical Research on Bedclothes

As discussed in the mattress ANPR, several research projects have examined open-flame ignited mattress and bedding fires. Some of this research provides a better understanding of the contribution of bedclothes to these fires.

The Sleep Product Safety Council (“SPSC”) sponsored several phases of research at NIST. One of the focuses during Phase 1 was to evaluate the fire behavior of various combinations of bedclothes. Twelve different combinations of bedclothes sets ranging from very light (two sheets and a pillow) to heavy (two sheets, a pillow, a mattress pad, one blanket, and one heavy weight filled comforter) were burned on an inert, twin-size mattress made of fiberglass. The peak heat release rates varied from 50kW to 200kW. Combinations without a comforter were typically under 100kW. Peak heat release rate is basically a measure of the intensity of the fire produced by these items. Further tests were conducted on a range of combinations of bedclothes.

Part of Phase 2 of the NIST work included a limited assessment of bedclothes and their contribution to

mattress fire hazards. The same set of bedclothes was used on mattresses of varying heat release rate performance. The bedclothes were tested with a king sized mattress that had contributed very little heat release rate in prior testing without bedclothes. The result was a peak heat release rate of 400kW, primarily from the bedclothes. While this scenario would not readily cause flashover, it is important to note that this result assumes little involvement from the mattress.

SPSC expanded its research at NIST to examine filled bedclothes (such as comforters, pillows, and mattress pads). This research tested bedclothes constructed of a variety of filling and cover materials to assess the effect of material changes on the flammability behavior. The study evaluated two design changes: One involved replacing polyester fiberfill with a modified, lower heat release fiber of a comparable loft; the other involved using a barrier-type cover to protect the polyester fiberfill. These design changes were examined using three different mattress and foundation designs: One representing current mattress/foundation construction and the other two using experimental, improved designs.

The report on this bedclothes study was published in February 2003, NIST Technical Note 1449. According to the NIST report, for a mattress standard to be most effective, the performance of the entire bedding system (that is, the mattress/foundation and the bedclothes) must be taken into consideration. The study showed that the bedclothes and the mattress/foundation function as a system and that the improved mattress pads, pillows and comforters resulted in major improvements in the performance of the system. This was indicated by a lower peak heat release rate or a longer time to peak.

A related research project conducted for CPSC by NIST reinforced one of the conclusions of the bedclothes study discussed above. A portion of the tests using conventional bedclothes showed that, as mattress designs improve, two separate peak heat release rates occur. The first observed peak appears to be dominated by the bedclothes, while the second is dominated by the mattress/foundation. Good mattress designs tended to have a peak heat release rate appreciably later in the test and comparable to or less than the peak dominated by the bedclothes.

A more recent study conducted for CPSC by NIST included a series of tests using the same bedclothes combination on twin, queen, and king size mattresses. The tests were conducted in

a room environment to evaluate any resulting room effects, which generally begin to occur at heat release rates of about 300 to 400kW. The early heat release rate peaks, driven primarily by burning bedclothes, tripled from twin size to king size. Larger size bedclothes combinations on good performing mattress designs (those with peak heat release rates less than 50kW when tested with burners and no bedclothes) showed heat release rate peaks up to 800 kW, occurring 7 to 8 minutes after ignition. This is much higher than rates allowed for mattresses/foundations under CPSC's proposed mattress standard. On mattress designs that yielded a moderate heat release rate peak with burners, the bedclothes resulted in more serious fires. This study shows that a combination of some bedclothes with even a well performing mattress/foundation (that would meet CPSC's proposed mattress standard) could still cause flashover in a room.

#### H. Invitation To Comment

In accordance with section 4(g) of the FFA, the Commission invites comments on this notice. Specifically, the Commission invites the following types of comments.

1. Comments concerning the risk of injury identified in this notice, the regulatory alternatives discussed above, and other alternatives to address the risk of injury;

2. The submission of an existing standard or portion of a standard as a proposed rule;

3. The submission of a statement of intention to modify or develop a voluntary standard to address the risk of injury identified in the notice along with a description of a plan to modify or develop the standard.

In addition, the Commission is interested in obtaining further information about the following issues that may influence the flammability of bedclothes.

1. Cleaning and laundering methods of bedclothes;

2. Frequency of cleaning or laundering of various bedclothes items over their useful lives.

Dated: December 22, 2004.

**Todd Stevenson,**

*Secretary, Consumer Product Safety Commission.*

#### List of Relevant Documents

1. Briefing memorandum from Margaret Neily, Project Manager, Directorate for Engineering Sciences, to the Commission, "Notice of Proposed Rulemaking for Mattress Flammability (Open Flame) and Options for Addressing Bedclothes Involvement in Mattress/Bedding Fires," November 1, 2004.

2. Memorandum from Linda Smith, EPHA, to Margaret Neily, Engineering Sciences, "Involvement of Bedclothes in Residential Fires Mattress Fires," May 2004.

3. Memorandum from Terrance R. Karels, EC, to Margaret L. Neily, ES, "Bedding Market Information," October 5, 2004.

4. Memorandum from Allyson Tenney, ES, to Margaret Neily, Project Manager, "Bedclothes Flammability," October 29, 2004.

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