U.S. Consumer Product Safety Commission

NPR for Flammability of Mattresses and Foundations and Options for Bedclothes

Staff Briefing
December 9, 2004
Mattress/bedding Rulemaking

- ANPR published October 11, 2001
- Address mattress/bedding fires initially ignited by small open flame
- Comments supported NIST mattress test development in progress; test is now part of California TB 603
- Comments for and against need to address bedclothes as well
Mattress Flammability
Possible NPR
Reducing Mattress Flammability

- Research and test development were largely conducted by NIST

- Sponsored by industry (SPSC), CPSC, CBHF, USFA, with contributions from laboratories participating in the precision & bias study of the NIST test method

- Longstanding industry support for mandatory standard
Fire Loss Estimates

• Annual national fire loss estimates for 1995-1999--mattress/bedding 1st items to ignite
  – 19,400 residential fires causing $273.9 million property loss
  – 440 civilian deaths
  – 2,230 civilian injuries

• Draft proposed standard potentially addresses (based on characteristics of fire cause)
  – 18,500 fires causing $259.5 million property loss
  – 440 deaths and 2,160 injuries
Basis for the Performance Test

• NIST full-scale test method provides
  
  – Measure of hazard from mattress/bedding fire (heat release rate)
  
  – Way to reduce deaths & injuries by limiting fire size over specified time
  
  – Basis for draft proposed standard and TB 603
Mattress Test Burner Exposure
Basis for the Performance Test continued

• Heat release of 1,000 kW = flashover conditions

• More than 2/3 of all fatalities attributed to mattress/bedding fires resulting in flashover

• Traditional twin size mattress--2,000 kW in less than 5 minutes
Mattresses with Conventional Materials

> 1,000 kW fire at 5 minutes
Performance to Reduce Deaths and Injuries

- Objectives of the standard:
  - Keep fire size below 1,000 kW,
  - Reduce likelihood of involving other items, and
  - Provide time for discovery and escape by preventing or delaying flashover
Two Performance Measures

• Early total heat release limit (15 MJ)
  – Accounts for bedclothes contribution to the fire
  – Minimizes early involvement of mattress
  – Preserves tenable conditions for egress from room for first 10-15 minutes

• Peak rate of heat release criteria (200 kW)
  – Takes into account many contributing factors
  – Ensures less flammable mattress design
  – Ensures effectiveness in reducing deaths & injuries
Improved Mattress Performance

Peak rate of heat release after exposure to burners

Under 100 kW

Under 50 kW
Test Duration

• Related to, but not equivalent to escape time
  – 30 minute test
    • Many mattress designs perform well
    • Test variability is minimized
    • Substantial reduction in deaths & injuries
    • Mattress performing well in 30 minute test gives max. net benefits
    • Least burdensome alternative
Test Duration continued

- 60 minute test
  - Substantially limits material/design choices
  - Performance becomes variable
  - Higher costs
  - Additional death & injury reductions are uncertain and unpredictable
    - Presence of household member or
    - Timely emergency response for rescue
Draft Proposed Standard

• Scope includes *all* mattresses, foundations, futons, multi-purpose items, and mattresses in upholstered furniture, including renovated and imported products

• Mattress/foundation performance requirements
  – Full-scale, 30 minute fire test with gas burners
  – Three replicates
  – Max. 15 MJ in first 10 minutes of test
  – Max. 200 kW peak rate of heat release
• **Testing requirements**
  – All mattress/foundation prototypes (designs) must be tested and meet performance criteria

  – Exceptions:
    • differences in size (twin, queen, king)
    • ticking (except fire barriers)
    • other component, material, construction (demonstration required)

  – Producers may pool or share prototype tests if a confirmation test is successful
Draft Proposed Standard continued

- Quality assurance requirements
  - To ensure production mattresses are the same as the prototype
  - Control incoming components and materials
  - Assign production lots
  - Control assembly, inspect finished products

- Production testing is encouraged
Draft Proposed Standard continued

• Permanent label required
  – Manufacturer
  – Location of manufacture
  – Date of manufacture
  – Model
  – Prototype identification number
  – Certification of compliance with standard
Estimates of Effectiveness

• Evaluated impact of improved mattresses on CPSC IDI’s from 1999-2004 (195 deaths, 205 injuries)

• Estimated reductions
  – Based on detailed information about occupants, fire cause, fire science, human behavior in fires, and other factors.
Estimates of Effectiveness continued

• Adjusted projections by heat source/age group categories to obtain national estimates

• Draft proposed standard could prevent annually:
  – Estimated 310 to 330 deaths (80 - 86 %) and
  – 1,660 to 1,780 injuries (86 - 92%)
Potential Health and Environmental Issues

• Expect use of flame resistant materials to protect interior mattress components
  – Ticking and interior barriers (sheet and high-loft types)
  – Inherently flame resistant materials
  – Materials treated with flame retardant chemicals
Potential Health and Environmental Issues

continued

• Toxicity review and environmental assessment
  – Extent of usage is uncertain
  – Some FR chemicals and flame resistant materials
    • Widely used in other applications
    • Expect only negligible risk of adverse effects to health or environment
  – Exposure data needed for some FR chemicals
Preliminary Regulatory Analysis

- **Benefits**: reduction in societal costs from deaths and injuries prevented

- **Costs**: total resource costs for material, labor, testing, QA, and compliance efforts

- **Benefits – Costs = Net Benefits**
Preliminary Regulatory Analysis continued

- Expected benefits of draft proposed standard are greater than the costs.

  - Total net benefits per mattress are $18 - 62.

  - Aggregate net benefits of all mattresses produced in first year are about $450 million - $1.56 billion.
Preliminary Regulatory Analysis continued

• Sensitivity analysis with varied assumptions
  – Expected mattress life
  – Discount rate
  – Effectiveness in preventing deaths & injuries
  – Value of life estimates

• Net benefits of draft proposed standard remain positive
Alternatives considered

- Relying on voluntary standards
- Changing effective date
- Requiring fire warning or FR content labels
- Taking no action
- Changing provisions of the draft standard
  - Varying test duration
  - Varying performance criteria
  - Requiring production testing

None of the alternatives increased net benefits
**Impact on Small Businesses**

- Draft proposed standard minimizes impact while maintaining benefits
- Costs of testing, record keeping, & QA will be disproportionately higher
- Businesses may reduce costs by:
  - Pooling prototype tests
  - Produce prototype for >1 year
  - Test worst case prototype to minimize tests
  - Supplier and test laboratory QA services
Staff Recommendation

• Issue an NPR for a mandatory flammability standard for mattresses and foundations

• Effective date 12 months after publication of final standard
Bedclothes Flammability
Possible ANPR
**Bedclothes: Top of the Bed Products**

- Sheets, blankets, pillows, mattress pads, foam pads, comforters, quilts

- “Filled” bedclothes contain fibrous or other materials within a cover
  - High % produced outside U.S.
  - Most common filling is conventional polyester

- CBHF regulatory authority is limited to filled items; CPSC authority is not
Bedclothes Flammability

- Bedclothes are 1st to ignite in about 80% of mattress/bedding fires

- Major contributor to mattress ignition
  - Burners in mattress test approximate bedclothes

- Laboratory fire tests needed to distinguish bedclothes contribution from mattress
**Bedclothes/Mattress Fire**

Heat Release Rate of Improved Twin Mattress/Foundation Subsequent to Ignition of Bedclothes by Match-Size Flame

![Heat Release Rate Graph](image_url)
Bedclothes Flammability continued

- Laboratory test results
  - NIST bedclothes combinations: <200 kW; many <100 kW (sheets, pillow, blanket, mattress pad)
  - CBHF heavier twin comforter: 400 kW
  - NIST larger size combinations: up to 800 kW
Existing Standards

• ASTM D 4151 measures ease of ignition, flame spread of blankets

• UL 964 standard for electric blankets

• ISO 12952 allows observation of smoldering and/or flaming after ignition by small gas burner

• None appears to measure or address the specific hazard or contribution to residential mattress/bedding fire
California State Activities

• AB 603 requires open flame standard for bedclothes if they contribute to mattress fires
• Test method for filled items
• Industry assisting; CPSC staff attend meetings
• 10/04 draft TB 604 uses component tests
• Weight loss approximates heat release rate
• New technologies can significantly reduce heat release rate of bedding items
• Expect rulemaking after P&B study is completed in 2005
Bedclothes Summary

• Burning bedclothes contribute to the mattress/bedding fire hazard

• Some bedclothes can produce fires larger than 200 kW allowed of a mattress

• Tests suggest that fire hazard of filled items may be reduced
Bedclothes Summary continued

• Effectiveness of performance measures, alternatives, practicality, costs TBD

• Extent of FR chemical use and potential health risks TBD
Staff Recommendation

Begin rulemaking by publishing ANPR for a standard to address the open flame ignition of bedclothes

– Consider alternatives to reduce remaining mattress/bedding fire losses
– Consider limiting size of fire produced by some of largest (fuel load) products
– Preserve egress time by preventing or delaying flashover conditions
For Further Information:

Margaret Neily
Project Manager, Mattresses/Bedding
301-504-7530; mneily@cpsc.gov

U.S. Consumer Product Safety Commission
4330 East-West Highway
Bethesda, MD USA 20814-4408