

U.S. Consumer Product Safety Commission



***Draft Final Rule for Flammability
of Mattress Sets***

*Staff Briefing
February 1, 2006*

Mattress Rulemaking Progress

- ANPR published October 11, 2001
- NPR published January 13, 2005
- Draft final rule addresses
mattress/bedding fires initially ignited by
small open flame and similar scenarios

Reducing Mattress Set Flammability

- Research and test development were largely conducted at NIST
- Partners included industry (SPSC), CPSC, CBHFTI, USFA , with contributions from test laboratories
- Test method is basis for draft final standard and California TB 603 (similar standard)
- Longstanding industry support for mandatory standard

Final Standard's Performance Test

- Objectives:
 - Limit fire intensity
 - Provide time for discovery and escape by preventing or delaying flashover
- Performance criteria that limits the fire
 - Max. 15 MJ total heat release in 1st 10 min.
 - Max. 200 kW peak rate of heat release in 30 min test

Mattress Test Burner Exposure



Mattress Set with Conventional Materials

In 3 to 5 minutes, >2,000 kW



Improved Mattress Set Performance

Thirty minutes after exposure to burners



Under 100 kW



Under 50 kW

Updated Evaluations & Analyses

- Fire incidents and standard effectiveness
- Market information
- Additional evaluations
- Health assessments
- Environmental assessment
- Final regulatory and regulatory flexibility analyses

Fire Losses* and Standard Effectiveness

- *Minor changes in methodology from that used for previous estimates in the NPR
 - Updated fire incident data
 - Substantially revised data collection system

Fire Loss Estimates

- Annual national fire loss estimates for 1999-2002--mattress/bedding 1st items to ignite
 - 15,300 residential fires causing \$295.0 million property loss
 - 350 civilian deaths
 - 1,750 civilian injuries
- Fire losses addressable (based on characteristics of fire cause)
 - 14,300 fires causing \$281.5 million property loss
 - 330 deaths and 1,680 injuries

Estimates of Effectiveness

- Evaluated impact of improved mattress sets in CPSC IDI's from 1999-2004 (195 deaths, 205 injuries)
- Updated estimated reductions
 - Based on detailed information about occupants, fire cause, fire science, human behavior in fires, and other factors
 - Based on new tests of currently available complying mattress sets

Estimates of Effectiveness *continued*

- Adjusted projections by heat source/age group categories to obtain national estimates
- **Draft final standard could prevent annually:**
 - Estimated 240 to 270 deaths (69 - 78 %) and
 - 1,150 to 1,330 injuries (73 - 84%)

Market information

- 522 manufacturing firms
 - Only top 12 have >500 employees
 - Top 4 = 57% of total value of shipments
 - Top 15 = 83% of total value of shipments
- Product trends
 - 80% adult-size conventional sleep surfaces
 - Preference shift to larger (king/queen) sizes
 - 80% one-sided mattresses
 - 25% comply with California TB 603
- Imports are 4.8% of shipments

Additional Evaluations

Conducted additional technical evaluations to address comments and provide support for draft final standard

- Interlab study of NIST test protocol
 - Evaluated robustness and validity of test method
 - Found neither unreasonable sensitivities nor practical limitations
 - Test allows valid/realistic evaluation of performance
 - Ignition source is strong enough, and
 - Test duration is long enough

Additional Evaluations *continued*

- Burner hole size
 - Original NIST burner designed from bedclothes characterization; hole size specified in TB603 and CPSC proposed standard is 1.17 mm.
 - Commercial burners used ever since have larger holes of 1.50 mm
 - NIST compared both burners with heat flux scans.
 - New instrumentation made more accurate comparisons possible.
 - **Changed standard because larger burner holes do better job of producing target heat flux of bedding**

Additional Evaluations *continued*

- Temperature and humidity effects
 - Sample conditioning and test area
 - Moisture content of materials affects fire performance
 - NIST explored effects of changes in temperature and relative humidity
 - Humidity >75% and temperatures approaching 30°C (86°F)
 - Tightened sample conditioning requirements
 - New test room conditions and time to test

Additional Evaluations *continued*

- Updated estimates of effectiveness
 - Original estimates based on full-scale tests of experimental, “over-engineered” mattress set designs
 - Fires produced were used to estimate changes in deaths & injuries expected to result from standard

Additional Evaluations *continued*

- Production mattress sets, now available, are closely engineered to meet performance requirements
 - Staff reduced effectiveness estimates, adjusting for effect on some occupants (with limiting conditions, outside room of origin)
 - Standard's limit on early contribution of mattress set to fire will help maintain tenable conditions for discovery and escape

Additional Evaluations *continued*

- Durability of FR barrier fire performance
 - Some new barriers use water-soluble FR chemicals
 - CPSC staff and NIST studied two of these
 - Tests of mattress sets exposed to 10 cycles of bedwetting scenario
 - Most likely, possibly most severe, deeply penetrating water exposure in real life
 - Overall fire performance of these mattress sets did not change; they remained significantly better than traditional mattress sets.
 - **Additional durability requirements appear unnecessary.**

Additional Evaluations *continued*

- Test procedures for various products
 - Crib, foam-core, sofa bed, bunk bed, and air mattresses, futons, and flip chairs
 - Identified clarifications & changes to address
 - test procedures-eliminating air gaps
 - support frame size/construction, and
 - burner positioning, among others.

Health Assessments

- 2004 preliminary **qualitative** assessment of potential risk of health effects
 - Reviewed 5 FR chemicals/classes
 - Some FR chemicals/materials not likely to pose unacceptable health/environment risks
 - Exposure data did not exist for mattress applications
- 2005 **quantitative** risk assessment
 - Total of 6 chemicals/classes reviewed:
Antimony trioxide (AT), boric acid, melamine, decabromodiphenyl oxide (DBDPO), vinylidene chloride, and ammonium polyphosphate

Health Assessments *continued*

- Conducted migration/exposure assessment studies of FR barrier materials
- Quantitatively assessed all applicable routes of exposure (dermal, oral, and inhalation)
- Risk assessment was peer reviewed by outside scientists.
- No appreciable risk of health effects to consumers
 - AT, boric acid, and DBDPO—from risk assessment
 - Vinylidene chloride—no detectable concentrations in extreme extraction studies
 - Ammonium polyphosphate, melamine—not “toxic” under FHSA.

Environmental Assessment

- To evaluate potential environmental & health effects, staff considered:
 - Current technology in use by manufacturers to meet performance criteria (TB 603)—primarily FR barriers
 - Expected life cycle of mattress sets
 - Staff testing and other data
- Performance standard does not require use of FR chemicals
- Manufacturers have an increasing number of alternatives:
 - already in use to meet TB 603
 - not expected to result in unacceptable adverse impacts to environment or human health

Final Regulatory Analysis

- Evaluates significant alternatives
 - To meet objectives (reduced fire deaths & injuries)
 - To minimize significant economic impact on small businesses
- **Benefits:** reduction in societal costs from deaths and injuries prevented by the standard
- **Costs:** total resource costs for material, labor, testing, QA, and compliance efforts
- **Benefits – Costs = Net Benefits**

Final Regulatory Analysis *continued*

- Expected benefits of draft final standard are significantly greater than the costs.
 - Total net benefits are about \$36 per mattress set.
 - Aggregate net benefits of all mattress sets produced in first year are about \$823 million.

Final 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 final standard remain substantially positive

Final Regulatory Analysis *continued*

- Alternatives considered
 - Changing provisions of the draft standard
 - Varying test duration
 - Varying performance criteria
 - Requiring production testing
 - Requiring fire warning labels
 - Taking no action or relying on a voluntary standard
- None of these alternatives increased net benefits

Impact on Small Businesses

- Draft final standard minimizes impact while maintaining benefits
- Costs of testing, record keeping, & QA may be disproportionately higher per mattress set.
- Business cost reduction options:
 - Pooling prototype tests
 - Using “subordinate” prototypes (no test required because changed materials do not affect fire performance)
- **New provisions that reduce impact**
 - Effective date coinciding with model/style changes
 - Eliminated sample retention requirement

Public Comments on the NPR

- Over 544 written comments received
- March 3, 2005, public meeting
- Supporters provided comments on
 - Scope and definitions
 - Testing procedures
 - Recordkeeping requirements
 - Importer/renovator responsibilities
- Those opposed expressed concerns about health effects of FR chemical use

Staff Responses to Comments

- Comments addressed with further research and analysis:
- Health effects—exposure to FR chemicals
 - Risk assessment and other evaluations considered both toxicity and exposure.
 - Staff evaluated FR materials currently available.
 - No appreciable risk of health effects to consumers
- Durability of FR chemicals in barriers
 - Most likely, possibly most severe, deeply penetrating water exposure in real life (bedwetting)
 - Tested mattress sets maintained improved performance.
 - Additional durability requirements appear unnecessary.

Staff Responses/Standard Changes

- Other comments addressed through clarifications of standard or changes in requirements
 - **Definitions** clarified/added for mattress set, manufacturer, prototypes, pooling
 - **Test equipment and procedure refinements** for conditioning, bed frame, burner hole size, use of alternate apparatus
 - Clarified requirements (tests and records) for relying upon **tests conducted prior to the effective date**

Staff Responses/Standard Changes

- Changes continued
 - Effective date now coincides with introduction of new models/styles.
 - Importer/renovator responsibilities clarified
 - Same requirements as domestic manufacturer
 - Recordkeeping requirements
 - Records maintained in U.S., in English
 - No physical samples required
 - Labeling—separate with specific statements
 - More complete information about manufacturer/importer
 - Safety information—with/without foundation(s), which ones to use

Conclusions

- Standard is designed to minimize possibility of or delay flashover
- Could eliminate 240-270 deaths and 1,150-1,330 injuries annually
- Standard changes/clarifications made in response to comments
- In-depth study of FR chemicals used indicates no appreciable risk of health effects
- Expected benefits substantially greater than costs; least burdensome alternative
- Effective date coincides with market cycles.

Staff Recommendation

- Issue a final mandatory flammability standard for mattress sets
- Effective date:
 - July 1 (2007) or
 - January 1
 - Whichever comes first, 12 months after publication of final standard