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

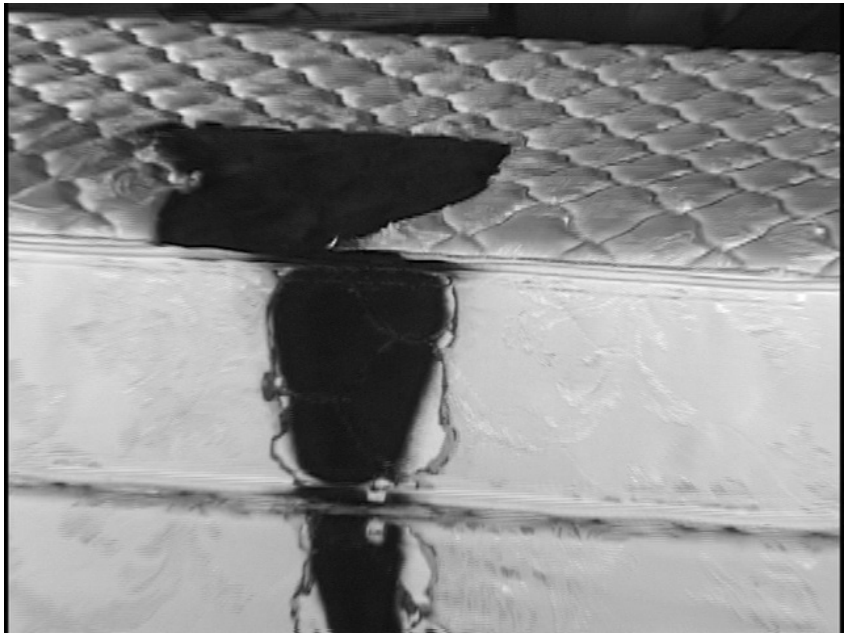
Two Performance Measures

- 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

Draft Proposed Standard continued

- **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

Preliminary Regulatory Analysis *continued*

- 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

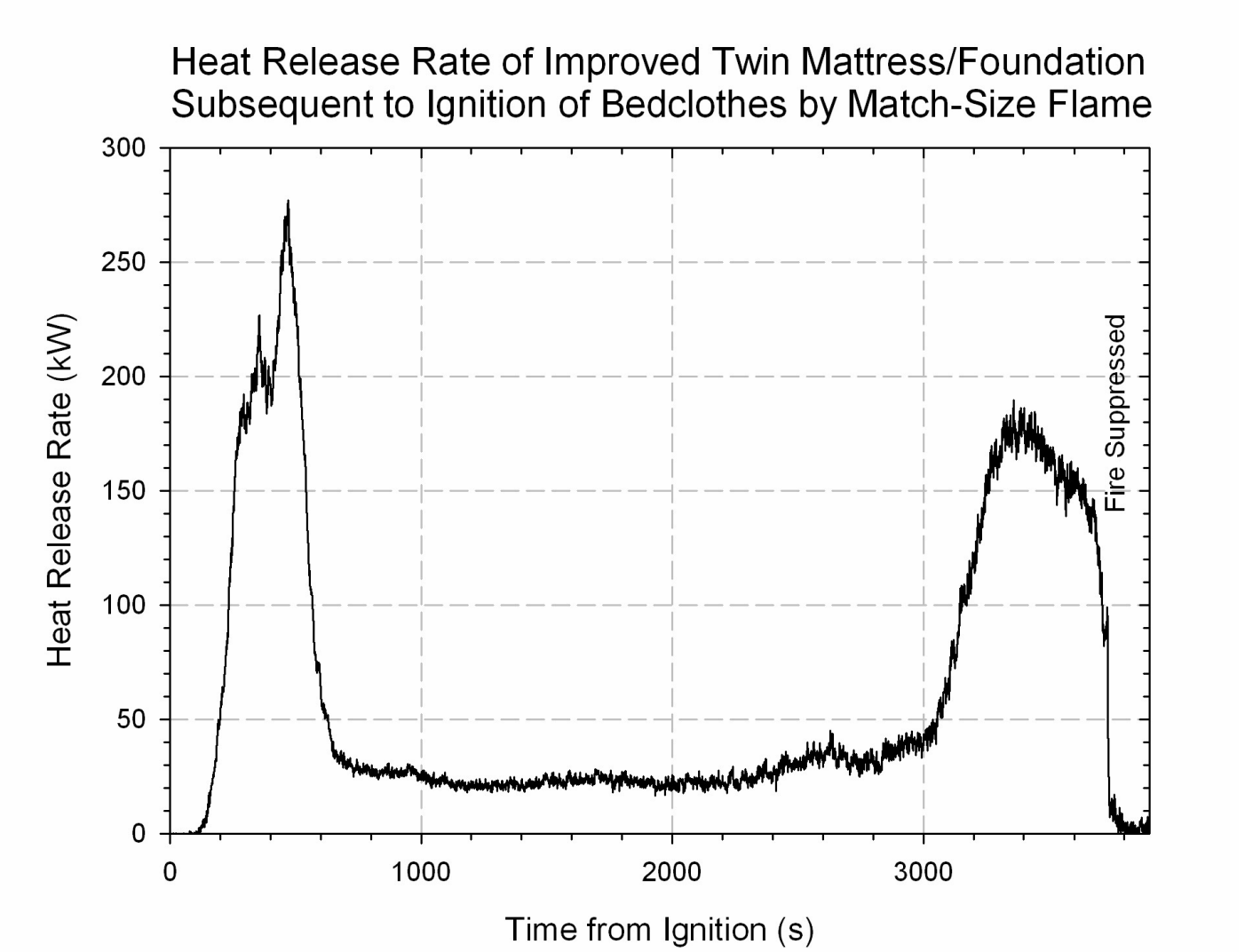
- “Filled” bedclothes contain fibrous or other materials within a cover
  - High % produced outside U.S.
  - Most common filling is conventional polyester

- 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



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

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