



## Investigation Guideline

Appendix 15  
September 2006

### **MATTRESS AND BEDDING FIRES**

#### **I. INTRODUCTION**

The purpose of this investigation is to learn more about the characteristics of the mattresses and bedding that are ignited in fires and the circumstances under which mattress/bedding fires occur. We are interested in any features or situations that are relevant to understanding the cause of the fire and how the mattress and bedding behaved in the fire. We are now particularly interested in the role that the ignition of bedding played in the fire.

Please remember that no guideline can cover all the pertinent factors that may apply to a particular incident. Include an explanation of any relevant factors in your narrative, even when these factors have not been specifically mentioned in the guideline.

#### **A. Background Information**

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. In the early 1970s CPSC issued a mandatory standard intended to address cigarette ignition (Title 16 CFR 1632). The standard became effective in 1973. Still, as recently as 2002, there remained about 220 lives lost in such fires. Another 220 fire deaths were associated with open flame and other ignition sources. Among the categories of consumer products within the jurisdiction of the CPSC, mattress and bedding fires were one of the leading causes of civilian injuries and deaths as of 2002.

The sleep products industry recently has funded extensive testing on mattresses and bedding. One of the results of that testing has been a change in focus from prevention of ignition to limitation of the fuel load, the amount of combustible material present, which is thought to reduce the most severe effects of a fire. This change has resulted in renewed emphasis on learning the role of the bedding being used.

CPSC published a mandatory standard to address fires ignited by small open flames (Title 16 CFR1633) on March 15, 2006. The standard goes into effect on July 1, 2007. Also on January 13, 2005 an Advance Notice of Proposed Rulemaking was published to address open flame ignition of bedclothes. We are interested in obtaining information on all mattress and bedding fires regardless of ignition source.



## **B. Product Descriptions**

The cigarette-ignition standard (1632) defines a mattress as ticking that is filled with a resilient material used alone or in combination with other products intended for sleeping upon. This definition includes, but is not limited to, adult mattresses, youth mattresses, crib mattresses including portable crib mattresses, bunk bed mattresses, futons, waterbeds and air mattresses which contain upholstery material between the ticking and the mattress core, and any detachable mattresses used in any item of upholstered furniture such as convertible sofa bed mattresses, corner group mattresses, day bed mattresses, roll away bed mattresses, high risers, and trundle bed mattresses. Mattress foundations are excluded from 1632 but included in the open-flame standard (1633). 1633 also includes flip chairs. The term "bedding" includes items such as pillows, sheets, blankets, comforters, bedspreads, etc. A mattress pad is a thin, flat mat or cushion, and/or ticking filled with resilient material for use on top of a mattress and must meet Standard 1632. This definition includes, but is not limited to, absorbent mattress pads, flat decubitus pads, and convoluted foam pads that are totally enclosed in ticking.

The following are common terms used to describe mattress and mattress pad construction:

- Ticking – the outermost layer of fabric or related material that encloses the core and upholstery materials of a mattress or mattress pad. A mattress ticking may consist of several layers of fabric or related materials quilted together.
- Core – the main support system that may be present in a mattress, such as springs, foam, hair block, water bladder, air bladder, or resilient filling.
- Upholstery material – all material, either loose or attached, between the mattress or mattress pad ticking and the core of a mattress, if a core is present.
- Tape edge (edge) – the seam or border edge of a mattress or mattress pad.
- Quilted – stitched with thread or by fusion through the ticking and one or more layers of upholstery material.
- Tufted – buttoned or laced through the ticking and upholstery material and/or core, or having the ticking and upholstery material and/or core drawn together at intervals by any other method which produces a series of depressions on the surface.
- Surface – one side of a mattress or mattress pad which is intended for sleeping upon.

## **C. Specific Items of Interest**

Investigators will need to establish and maintain a strong liaison with local fire departments to assure timely follow-up investigations. Inspection of products involved will be extremely



important. Samples will not be collected. However, it is essential that investigators thoroughly document the construction of the mattress involved if at all possible.

Issues of particular interest include:

- Identification of the major ignition sources in all mattress/bedding fires and the hazard scenarios involved
- The types and role of bedding in these fires; how and to what extent these items contributed to the fire (e.g., did burning bedclothes ignite the mattress? If so, how long was the bedding involved before the mattress ignited?)
- The geometry of the bedding (e.g., was the bed made or unmade? What items were where?)
- The size and type of mattress construction in which fires are occurring
- When the mattress was manufactured, specifically, before or after Standard 1632 went into effect and before or after 1633 went into effect (see page 6)
- Ignition sequence, specifically, what item or items ignited first

The specific involvement of bedding items has been very difficult to establish from past studies. Thorough identification of the products involved, sequence of ignition, and burning characteristics will be very important.

Also important is the extent of the flame and smoke damage beyond the room of origin as well as the victim location in relation to the origin of ignition. Be sure to obtain a copy of the fire incident report, and any other available reports of the incident (e.g., police).

Include an explanation of any relevant factors in your narrative, even if we have not specifically mentioned them in the guideline.

#### **D. Headquarters Contacts**

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## II. INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION

### A. Synopsis

Write a synopsis of the sequence of events that occurred prior to, during, and subsequent to the fire. Specify the source of the ignition, the products involved, the estimated property loss (dollar amount), and the nature of all injuries and deaths.

### B. Description of the Incident Environment

**PRE-INCIDENT:** Include in this portion of the narrative the sequence of events that occurred prior to the fire (events that led up to the fire). Describe the general activities of the household that day. Determine if there was any change in the household routine before the fire started. Specify activity and location of occupants, particularly each victim, and the person responsible for the fire, at the time of the incident.

**INCIDENT:** Describe in the narrative how the fire occurred. Describe the ignition source and sequence of ignition, as well as the sequence and extent of flame spread, flame damage, and extent of smoke damage. Describe extent of damage to mattress and all bedding items. Include a description of other major furnishings in the room that ignited.

**POST-INCIDENT:** Describe conditions that may have contributed to the fire ignition or spread (e.g., crowded or cluttered room, children playing, etc.). Indicate presence/absence of detectors (smoke, heat, or CO), location of smoke alarm closest to the fire, and whether it operated. If it did not operate (but was powered and smoke reached it), indicate manufacturer and model number.

### B. Description of Interaction Between Injured Person(s) and Product

Report the nature and extent of injury and treatment, as well as age, sex, and long term prognosis for the victim(s). Report the victim's location when he/she received the injury in relation to the area of the fire's origin as well as the activity of the victim(s) at the time of death or injury. Indicate any competence-reducing factors (e.g., impaired vision, physical handicaps, medication, narcotics, alcohol, perception of hazard, how victim was clothed, etc.) that would tend to contribute to the cause of, or hinder escape from, the fire.



Determine the source of ignition and describe in detail how ignition occurred (e.g., discarded smoking materials, victim falling asleep with a cigarette, heater left too close to the bed, children playing with matches, etc.). If the ignition source cannot be determined, indicate if anyone in the residence had smoked within several hours prior to the fire and where they had disposed of the cigarette. If a heater was involved, specify how close it was to the item first ignited.

If the fire resulted from child's play, describe the ignition source involved; e.g., multipurpose or cigarette lighter, wooden or book matches, etc. Report the age of the person involved in starting the fire, if appropriate. Determine whether there was an intermediate ignition source (e.g., a trash can or ashtray containing burning materials).

Report, if known, the amount of time that elapsed between ignition and discovery of the fire, and the approximate time of day or night that the fire was discovered. Determine if, and how, the occupants or victims became alerted to the fire (e.g., smoke alarm, visual clues such as smoke or flames, etc.). Determine what the victim(s) response was upon discovery of the fire, if incapacitation had not already occurred (e.g., victim(s) tried to fight the fire; victim(s) tried to carry mattress outside, etc.).

Determine whether the occupant was the homeowner, renter, visitor, etc. Obtain the education of the head of household, the approximate household income, and approximate home market value if a single-family residence (including manufactured housing).

#### **D. Description of Product**

##### **Mattress**

Identify the size (e.g. crib, twin, full, etc.) and type (e.g., innerspring, foam, fiber-stuffed, futon, etc.) of mattress involved in the fire. Note the approximate age of the mattress, whether the mattress was obtained new or used, and if obtained used, the length of time the present owners have had the mattress. The month and year of manufacture (or a date code) should be on a label. Report the contents of any labels on the mattress or mattress pad that provide information on the:

- name/location of the manufacturer
- date produced (or possible date codes used)
- materials of construction
- non-compliance with the mandatory standard (e.g., physician prescribed "one-of-a-kind" mattresses)



- previous use (e.g., renovated mattresses, purchased second hand)
- care necessary to prevent deterioration of chemical fire retardant treatments

Describe the ticking and surface construction of the mattress (e.g., quilted vs. smooth, etc.). Note the interior construction of the mattress, from the outer ticking through all layers of upholstery (filling) materials. It may be necessary to cut a cross section of the mattress, from the ticking to the inner core. Report the thickness of each layer and a thorough description of each material [color, texture, type of material (e.g., foam, cotton batting) resiliency, etc.]. Try to obtain close-up photographs or, at a minimum, provide a diagram illustrating the mattress construction. See page 9 for pictures of different types of mattress sets.

To the extent possible, judge whether the mattress appeared to be of pre- or post-standard **1632** construction. Also determine if it is of pre- or post-standard **1633** construction. Post-standard 1632 mattresses would generally have a layer of polyester fiberfill or polyurethane foam directly under the ticking (the outermost layer of fabric that encloses the core and upholstery materials of a mattress). This layer would probably be at least 1/4 inch thick, but more likely 1/2 inch. These mattresses may have an aluminum flange at the tape edge. They may also contain thermoplastic ticking or flame retardant-treated ticking, binding tape, and tufting cords. While thermoplastics may be difficult to identify on sight, such fabrics and blends may exhibit some "pilling" (to form small balls resembling pills). Post-standard mattresses may contain boric acid-treated cotton. If the boric acid was added as a powder, hands might feel "slippery" (similar to the feel of baby powder) after handling the batting.

Pre-standard 1632 mattresses would probably not have any of the above features. In addition, pre-standard 1632 mattresses would probably be made of cellulosic ticking, binding tape, and tufting cords that may show signs of wear (but no pilling) because they would be over 30 years old. Pre-standard 1632 mattresses would generally not have a layer of foam under the ticking. They were often filled with untreated cotton batting or similar materials (no slippery feel).

Determine where the mattress/foundation/bedding appeared to have ignited first, such as on the top, side or bottom of the mattress, bedding, or foundation. Describe the types of filling that burned or smoldered; e.g., fiber batting, flexible foam, etc. Also note the type of filling materials that did not burn or smolder. If bedding ignited, describe which bedding materials ignited and in what order if possible. Distinguish between filled and non-filled bedding items.



## **Bedding**

This includes such items as mattress pads, sheets, blankets, comforters, bedspreads, pillows, and other bedding. List and describe each of the bedding items that were on the bed. Indicate the order in which these items were used, e.g., next to mattress, second layer from mattress, etc. For each bedding item describe the extent of fire damage. Indicate whether these bedding items actually caught on fire and flamed, or if they just smoldered, as well as the order in which they ignited, if possible. Bedding items that are filled with upholstery material can contribute significantly to the open flame hazard. Indicate whether items were filled or non-filled. If possible, determine the sequence of ignition; i.e., what ignited first, second, etc. If possible, describe the geometry of the bedding? Was the bed made or unmade? Where were the different bedding items? If an electric blanket was on the bed, note whether it was turned on or off, and whether it was plugged into an outlet at the time of the fire.

See page 11 for pictures of bedding items.

## **Product Providing Heat of Ignition**

Describe the product that ignited, or may have ignited, the mattress or bedding, for example, a candle, cigarette lighter, electric blanket, or heater. If there is an investigation guideline for that product, refer to it to determine the level of detail that is needed.

## **Other**

State whether there were any non-bedding items on the bed and describe their involvement in the fire.

## **E. Product Safety Standards**

For information on mandatory flammability requirements, see 16 CFR Part 1632, Standard for the Flammability of Mattresses and Mattress Pads and 16 CFR Part 1633, Standard for the Flammability (Open Flame) of Mattress Sets.

## **III. PHOTOGRAPHS/DIAGRAMS OF INCIDENT SCENE**

Obtain close-up color photographs illustrating the interior construction of the mattress and filled bedding items (pillow, comforter, etc.), from the outer ticking through all layers of



upholstery (filling) materials. If that is not possible, provide a diagram illustrating the construction. Photographs or diagrams of the mattress/foundation/bedding should be included to illustrate where ignition first occurred. Photograph all labels present on the mattress and bedding items.

A diagram or sketch of the floor plan is important when indicating such things as room of origin, extent of damage, location of victims, escape routes, or where escape routes were blocked, detector/alarm locations, etc.

#### **IV. OBTAINING SAMPLES AND DOCUMENTS RELATED TO THE INVESTIGATION**

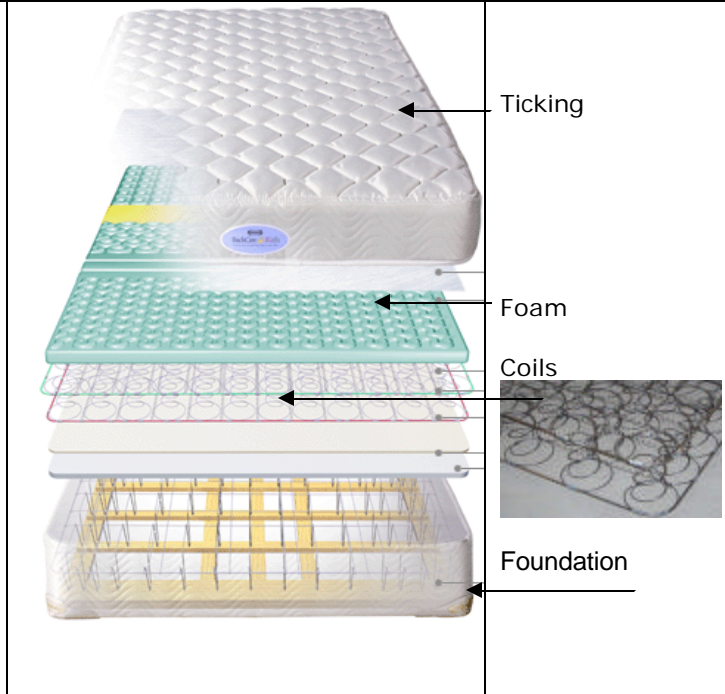
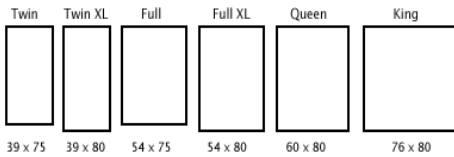
No sample collection from field investigation is required for this study.

Obtain copies of the fire incident report, casualty report(s), and investigation report, police report, medical reports, insurance reports, and any other available documentation of the incident. In cases that involve a death or deaths, procure the coroner's report and the death certificate.



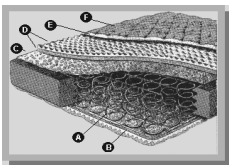


## Mattress and Bedclothes Pictures



### In-scope Items:

Innerspring



Foam



Mattress Used in Upholstered Furniture



Daybed/Trundle bed



Adjustable beds



Fabric-covered Airbed



Futon



Flip chair or sleeper chair





## **Construction Details:**

Quilted Surface



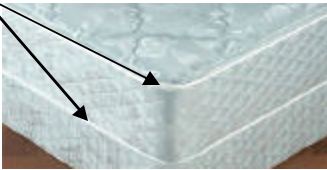
Tufted Pillowtop



Tufted Boxtop



Flat/Tight top (arrows point to tape edges)



Flexible Foam



Memory Foam



## **Foundation:**

Traditional boxspring



Bedboard



Low-profile foundation



Split foundation





## **Bedclothes:**

### **Filled:**

Mattress Pad



Mattress topper



Comforter



Bedsread



Pillows



Decorative pillows



### **Non-filled:**

Bedsread



Blankets & Throws



Bedskirt





## MATTRESS AND BEDDING FIRES

### DATA RECORD SHEET

Task number \_\_\_\_\_ Incident date \_\_\_\_\_

#### A. MATTRESS DESCRIPTION:

1. Material directly under surface ticking:

- Polyester fiberfill
- Polyurethane foam
- Cotton batting
- Other \_\_\_\_\_
- Unknown

2. Pre- or post-standard construction (estimate to the extent possible):

- Pre-standard
- Post-standard
- Other \_\_\_\_\_
- Unknown

3. Purchased:

- New
- Used. If used, specify how obtained (e.g., garage sale, etc.): \_\_\_\_\_
- Unknown

4. Date mattress purchased: \_\_\_\_\_ Mattress age: \_\_\_\_\_

5. Manufacturer/distributor/brand: \_\_\_\_\_

6. Mattress size:

- Crib
- Twin
- Double/full size
- Queen
- King
- Other \_\_\_\_\_
- Unknown



7. Mattress surface type:

- Quilted
- Smooth
- Tufted
- Other \_\_\_\_\_
- Unknown

8. Type of mattress (i.e. innerspring, foam, futon, etc.) \_\_\_\_\_

9. Foundation present

- Traditional boxspring
- Bed board (e.g. for bunk beds)
- Other (describe) \_\_\_\_\_
- No foundation present

**B. BEDDING:**

10. Bedding items on the bed at the time of the fire (mark all that apply and specify the type of filling used, i.e. polyester, cotton batting, down/feathers, etc.):

- Mattress pad – filling \_\_\_\_\_
- Sheet(s)- number \_\_\_\_\_
- Blanket(s)-number \_\_\_\_\_
- Comforter – filling \_\_\_\_\_
- Bedspread – filling \_\_\_\_\_
- Pillow(s) – filling \_\_\_\_\_
- Dust ruffle
- Other \_\_\_\_\_
- No bedding items involved
- Unknown

**C. FIRE DESCRIPTION**

11. Ignition sequence (what ignited first?):

- Mattress
- Bedding \_\_\_\_\_
- Other \_\_\_\_\_
- Unknown



12. Ignition source:

- Cigarette
- Lighter; cigarette \_\_\_ multipurpose \_\_\_ unknown \_\_\_
- Match; book \_\_\_ box \_\_\_ unknown \_\_\_
- Candle
- Heater; fuel type \_\_\_\_\_ distance from mattress \_\_\_\_\_
- Other \_\_\_\_\_
- Unknown

13. Location of mattress ignition (even if bedding ignited first):

- Smooth top surface
- Tape edge on top of mattress
- Quilted/tufted depression on top of mattress
- Side of mattress
- Underside of mattress
- Dust cover on box springs/foundation
- Other \_\_\_\_\_
- Unknown

14. Bedding items damaged by the fire (mark all that apply and specify the type of filling used, i.e. polyester, cotton batting, down/feathers, etc.):

- Mattress pad – filling \_\_\_\_\_
- Sheet(s)- number \_\_\_\_\_
- Blanket(s)-number \_\_\_\_\_
- Comforter – filling \_\_\_\_\_
- Bedspread – filling \_\_\_\_\_
- Pillow(s) – filling \_\_\_\_\_
- Dust ruffle
- Other \_\_\_\_\_
- No bedding items involved
- Unknown



15. Age of person involved in ignition (if appropriate):

- < 5 years
- 5 -14 years
- 15-24 years
- 25 - 64 years
- 65 -74 years
- 75+years
- Unknown

16. Extent of flame damage:

- Confined to the room of fire origin
- Beyond the room of fire origin
- Unknown

17. Extent of smoke damage:

- Confined to the room of fire origin
- Beyond the room of fire origin
- Unknown

#### **D. FIRE SAFETY DEVICES**

18. Fire Safety Devices Present

- Smoke Alarm, specify number \_\_\_\_\_
- Heat Detector
- Sprinkler
- CO Detector
- Other, specify type: \_\_\_\_\_
- None
- Unknown

19. Location of the nearest smoke alarm to point of origin

- In the room of origin
- Outside the room of origin but on the same floor
- Other \_\_\_\_\_
- Unknown



20. Smoke alarm operated (sounded) during fire?

- Yes
- No, smoke didn't reach alarm
- No, battery missing or inoperable
- No, other reason \_\_\_\_\_
- Unknown

21. Event that caused the occupant to investigate/recognize fire hazard

- Smoke alarm sounded
- Smelled/saw smoke
- Other safety device operated \_\_\_\_\_
- Present at ignition
- Alerted by another person
- Other \_\_\_\_\_

#### E. VICTIM(S)

22. Total Number of Deaths \_\_\_\_\_

Enter number for each diagnosis:

- Smoke inhalation only
- Burns only
- Smoke inhalation and burns
- Other \_\_\_\_\_
- Unknown

23. Total Number of Injuries \_\_\_\_\_

Enter number for each diagnosis:

- Smoke inhalation only
- Burns only
- Smoke inhalation and burns
- Other \_\_\_\_\_
- Unknown