



SURVEY OF FR FIBERS AND MATERIALS USED BY MATTRESS PRODUCERS TO MEET FEDERAL FLAMMABILITY STANDARDS

International Sleep Products Association



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Introduction

In 2018, California amended the Business and Professions Code (the Code) by enacting Assembly Bill 2998 (AB 2998) to prohibit the use of certain flame-retardant chemicals in several consumer products. See Appendix A for AB 2998 and related Code Sections.

In addition, AB 2998 added Section 19104(a) of the Code to require the International Sleep Products Association (ISPA)¹ to survey producers of new mattresses, including those registered with the California Bureau of Electronic and Appliance Repair, Home Furnishings, and Thermal Insulation (which has since been renamed the California Bureau of Household Goods and Services) (the Bureau) concerning the materials used to meet mattress flammability standards. The law provides that the term “mattress” has “the same definition as that term is defined in Section 1632.1 of Title 16 of the Code of Federal Regulations” for purposes of one of two federal mattress flammability standards (discussed further below) established and administered by the U.S. Consumer Product Safety Commission (CPSC). ISPA must submit a report summarizing the survey to the Bureau by January 31, 2020 and conduct a new survey every three years thereafter.

For each unique combination of “fibers or yarns, or both,” and other materials in components used for meeting flammability standards (such as “fire barriers or flame retardant chemical-treated batting or ticking or closing thread”), Section 19104(a) provides that the survey include the following information:

- (1) A list of the fibers or any other materials used in each component used for meeting flammability standards, other than a chemical described by Section 19100(c)(1)(A).²
- (2) The identity (including its Chemical Abstracts Service (CAS) number, if available) of any covered flame-retardant chemical described in Section 19100(c)(1)(A) contained in a mattress component in an amount over 1,000 parts per million (ppm),
- (3) The method for incorporating the chemical in each mattress component, such as additive, reactive, or other method.
- (4) The percentage of new mattress units in the United States that use the mattress component for meeting flammability standards.

¹ ISPA is the trade association for the mattress manufacturing industry. Our members are mattress manufacturers and suppliers of components, equipment and services used to assemble mattresses.

² Section 19100(c)(1)(A) defines the term “covered flame retardant chemical” to mean: any chemical that meets both of the following criteria:

(A) A functional use for the chemical is to resist or inhibit the spread of fire or as a synergist to chemicals that resist or inhibit the spread of fire, including, but not limited to, any chemical for which the term “flame retardant” appears on the Occupational Safety and Health Administration substance safety data sheet pursuant to subdivision (g) of Section 19100.1200 of Title 29 of the Code of Federal Regulations as it read on January 1, 2019.

(B) The chemical is one of the following:

- (i) A halogenated, organophosphorus, organonitrogen, or nanoscale chemical.
- (ii) A chemical defined as a “designated chemical” in Section 105440 of the Health and Safety Code.
- (iii) A chemical listed on the Washington State Department of Ecology’s list of Chemicals of High Concern to Children in Section 173-334-130 of Title 173 of the Washington Administrative Code as of January 1, 2019, and identified as a flame retardant or as a synergist to flame retardants in the rationale for inclusion in the list.

(5) The types of mattresses that the mattress component is used with, such as “innerspring, polyurethane foam, memory foam, gel foam, latex foam, fiber, air bladders, or the combination of those materials.”

Section 19104(b) requires that all producers of new mattresses registered with the Bureau respond to the survey, that ISPA submit to the bureau a list of any producers who fail to respond to the survey and that the Bureau post that list on its website.

Survey Preparation

ISPA began by consulting with the Sleep Products Safety Council (SPSC), a technically-oriented committee within ISPA comprised of mattress industry professionals that advise the Association on product safety issues, regarding the survey required by AB 2998. ISPA then convened two industry meetings, the first primarily with fire barrier suppliers and the second primarily with mattress manufacturers, to discuss the types of fire barriers in use today, the specific FR fibers and other materials used to make those barriers and how to conduct the survey. ISPA also introduced the third-party data collector that ISPA had retained to collect and compile the data and discussed the processes that would be followed to protect the confidentiality of the data provided by mattress manufacturers. ISPA compiled a list of the different types of FR fibers, barrier materials and other FR components based on input from the SPSC and the industry representatives. ISPA used this input to prepare the survey sent to mattress producers.

The next step was to identify which companies should be surveyed. ISPA consulted several sources.

The Bureau provided ISPA the current list of companies licensed by that office in the interior furnishings sector. Due to data limitations, however, it was not possible to distinguish between licensed mattress producers and other categories of companies operating in other segments of the interior furnishings sector. Therefore, ISPA could not use the Bureau’s licensee list to identify either mattress producers to survey or registered producers that did not respond to the survey.

We also consulted the CPSC for information regarding foreign mattress producer data since that federal agency enforces Parts 1632 and 1633 with regard to imported mattresses. The CPSC suggested ISPA request foreign producer data from the office of U.S. Customs and Border Protection (CBP) with which CPSC coordinates its actions. We contacted the CBP office identified by CPSC to request foreign mattress producer contact information but received no reply as of the date of this report.

As a result, ISPA decided to use its own databases to define the potential pool of survey respondents. These databases include information about current members, past members, as well as non-member companies that attend our events and that we otherwise are in contact with or know about. Based on the breadth of these data bases, we concluded that these contacts provide a good cross section of the mattress industry in the United States.

ISPA retained an independent third-party data analytics firm to issue the surveys, collect the data and aggregate the information for inclusion in this report.

Background

The Part 1632 and 1633 Federal Mattress Flammability Standards Were Designed to Address Mattress Fire Risks

Mattress fires that originate in the bedroom can kill or injure occupants within the bedroom and those in other parts of the residence if the fire “flashes over” from the room of origin.³ Flashover is the point at which the entire contents of a room are ignited simultaneously, making conditions in the room untenable and safe exit improbable.⁴ When flashover occurs, the fire forces large amounts of heat and toxic gases throughout the residence, threatening all the occupants.

Prior to Part 1633, about two-thirds of all mattress fire fatalities happened when flashover occurred. This accounted for nearly all fatalities that occurred outside the room where the fire originated and about half of the fatalities that occurred within the room of origin.⁵

To address mattress fire risks, the U.S. Consumer Product Safety Commission (CPSC) has established two federal flammability standards. These standards are codified at 16 CFR Parts 1632 and 1633 (cited as Parts 1632 and 1633, respectively).⁶ See Appendices B and C, respectively for copies of Parts 1632 and 1633.

Part 1632 requires a mattress to resist ignition from a smoldering heat source, like a smoldering cigarette. In the 1970s, when Part 1632 was promulgated, cotton was a common material in fabrics used to cover a mattress (called ticking) and upholstery materials used inside the mattress. Mattress manufacturers complied with Part 1632 by substituting materials that do not smolder when ignited for combustible cotton.

Part 1633 requires a mattress when ignited by a test burner designed to simulate burning bed clothes on or near the mattress (such as sheets, blankets, etc.) to release less than specified amounts of heat over a 30-minute period.⁷ During the first 10 minutes of the test, the total heat release may not exceed 15

³ Standard for the Flammability (Open Flame) of Mattress Sets (Final Rule), 71 Fed. Reg. at 13472.

⁴ 71 Fed. Reg. at 13472.

⁵ Id.

⁶ New mattresses sold in the United States for use in residential settings must meet Parts 1632 and 1633. In addition, procurement requirements set by some government and private purchasers (i.e., for products used in dormitories, hospitals, prisons, governmental or public occupancies, etc.) may require that the mattresses they buy meet other flammability standards, primarily California Technical Bulletin 129 (TB-129) (even for products procured for use outside California). In addition, mattresses used by hotels and other high-occupancy purchasers in Boston, Massachusetts must meet the Boston IX-11 mattress fire test. Finally, mattresses used in motorized vehicles (such as trucks and RVs) and recreational vessels must meet safety standards established by the U.S. Department of Transportation and the U.S. Coast Guard, respectively. The CPSC has no jurisdiction over mattresses used in motorized vehicles and recreational vessels. AB 2998 does not define the term “flammability standard” for these purposes. However, since AB 2998 does define the term “mattress” by express reference to the CPSC’s definition of that term in Part 1632, and Part 1632 does not cover mattresses manufactured for motorized vehicles and recreational vessels, we have concluded that nonresidential mattresses are outside the scope of this report.

⁷ Standard for the Flammability (Open Flame) of Mattress Sets, 16 C.F.R. § 1633.3(B)(1)(i).

megajoules (MJ).⁸ Over the full 30-minute test, the peak rate of heat release may not exceed 200 kilowatts (kW).⁹

Part 1633 is intended to accomplish several goals. First, mattresses that result in smaller real-world fires that grow less quickly will help save the lives of some occupants in the room that are on or near the burning bed. Second, others in the room are more likely to survive the fire because it is less intense and less likely to ignite other articles in the room (such as a second bed or an article of furniture). Third, a smaller and slower moving mattress fire will reduce the likelihood of flashover or increase the time before flashover occurs.¹⁰ The 10-minute 15 MJ limit on the mattress' early contribution to the fire is intended to maintain tenable bedroom conditions and allow time during which occupants of the residence can discover the fire and safely escape as conditions worsen.¹¹ The 200 kW limit for the full 30-minute test is intended to keep the fire below a given size to prevent or delay flashover from occurring.¹²

Mattress Materials

Most mattresses manufactured and sold today have an internal support core that is comprised of all foam (which may be polyurethane foam, latex foam or both), a steel innerspring, a fluid support system (which uses either an air or water chamber for support) or a combination of these support core materials (which is sometimes referred to as a hybrid mattress). For example, a mattress may have one or more foam layers (polyurethane and/or latex foam) on top of a spring or fluid support system. Many imported mattresses and mattresses sold and delivered in compressed form have an all foam support system. Mattresses also may contain other combustible materials, including polypropylene fabric, as well as layers of various interior fiber materials for use as upholstery material and to separate the steel innersprings from other components in the mattress.

The internal mattress materials are enclosed in a fabric outer cover called ticking. Ticking may be a woven, nonwoven¹³ or knit fabric made from natural or synthetic fibers.

Fundamentals of Mattress Fires and How Part 1633 Affects Ignition

Fire is a chemical reaction of a combustible (such as a mattress) with oxygen in the air that results in the release of heat, light and visible smoke. Large fires generate harmful quantities of toxic gases. Three ingredients are necessary for a fire: heat, fuel and oxygen. If one or more of these ingredients is missing, or if the ingredients are separated from each other, a fire cannot occur.¹⁴

⁸ 16 C.F.R. § 1633.3. (B)(1)(ii).

⁹ 16 C.F.R. § 1633.3(B)(1)(i).

¹⁰ 71 Fed. Reg. at 13472.

¹¹ 71 Fed. Reg. at 13477.

¹² 71 Fed. Reg. at 13475.

¹³ Nonwoven fabric denotes fabrics such as felt which are neither woven nor knit, but are made from fibers bonded together by mechanical, heat or other processes.

¹⁴ "Reporter's Guide: All about fire", National Fire Protection Association, <https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/Reporters-Guide-to-Fire-and-NFPA/All-about-fire>. Web. April 9, 2019.

Applying these fundamentals to mattresses, the Part 1633 test protocol was based on research that showed that the ignition source for most mattress fires is other items commonly found on or near a mattress (such as a comforter, pillow, sheet or blanket) that had been ignited by an open-flame heat source (such as a match, lighter or candle). After those other items are ignited, they become the heat source required to create the mattress fire. Turning to the second prerequisite for a fire, the fuel in a mattress is primarily in the form of the foam (polyurethane or latex foam) used in the product's interior to provide support. The final fire ingredient – oxygen – is in the air surrounding the mattress.

As the ignition source heats the fuel, the solid changes to a gas state. At the right temperature, the gas and the surrounding oxygen react chemically and combust.¹⁵

Part 1633 is designed so that mattress manufacturers may meet its stringent heat-release requirements by using barriers made from woven, nonwoven and knit fabrics (commonly called fire barriers) that surround or encase the fuel. Some of these fire barriers are made from a variety of fibers, while others are made by back coating fabric. The barriers are designed to prevent combustion from starting and slow the progression of any resulting fire, thereby allowing occupants of a residence time to discover the fire and safely escape as fire conditions worsen. The fire barriers are sewn together using closing thread designed to make the seam sufficiently strong and durable so that it can withstand the heat of a mattress fire, and not fail and separate, exposing the fuel in the core of the mattress to heat and/or oxygen.

Although flame-retardant foam (FR foam) can also be used to meet the requirements of Part 1633, few if any mattresses made in the United States use this material. Mattress producers have found that FR foams add cost and tend to provide a stiff or “boardy” feel. By contrast, fire barriers are made from various types of resilient fibers and can enhance sleep comfort. As a result, the comfort of mattresses that use FR foams tend to be inferior to those that use fire barriers to meet Parts 1632 and 1633.

In addition, when the CPSC was developing Part 1633 during the 2000-06 timeframe, some stakeholders urged the CPSC to require the use of FR foams to meet the new open-flame mattress standard. Some regulators had taken this proscriptive approach when writing other flammability standards. Mattress manufacturers, however, anticipated that consumers would not want mattresses that contain foams treated with FR chemicals, given press reports at that time that raised concerns about the safety of those chemicals.

Instead, the industry urged the CPSC to adopt pass/fail criteria in Part 1633 that set finished product performance requirements (for example, the peak heat release rate for an ignited mattress must not exceed a defined level), as opposed to require the use of specific flame-retardant components (such as FR foam). The CPSC adopted the mattress industry's proposed approach. As a result, it is our understanding that all or virtually all residential mattresses sold in the United States today comply with Part 1633 by using fire barriers.

¹⁵ “Reporter’s Guide: All about fire”, National Fire Protection Association, <https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/Reporters-Guide-to-Fire-and-NFPA/All-about-fire>. Web. April 9, 2019.

Mattress Fire Prevention Mechanisms

The basic mechanisms by which a material will limit the development and growth of a fire will vary, depending on the specific material being used and the fuel to be protected.¹⁶ In the case of mattresses, the fire barriers that mattress manufacturers use to meet Part 1633 can do one or more of the following:

- shield the fuel in the mattress interior from heat (called thermal shielding)
- dilute or displace the fuel gases prior to or during combustion
- interrupt the combustion chain reaction by using a gas-state active mechanism

Many fire barriers in use today employ a combination of two or more of these mechanisms.

Thermal shielding prevents or slows the combustion reaction by creating a thermal insulation barrier between the heat source and the fuel.¹⁷ By insulating the underlying material from heat exposure, the solid fuel does not decompose to gas that can be ignited. This mechanism can be accomplished in several ways. For example, fire barriers may contain intumescent additives that char when exposed to heat. The resulting char shields the fuel from the heat, slowing the heat transfer from outside the mattress to the fuel in the interior. Likewise, some fire barriers contain fiberglass, a thermally stable material that will not burn or decompose if a mattress is ignited. The fiberglass provides a form of scaffolding or support for char-forming fibers used with the fiberglass. Together, the fiberglass and the char-forming materials in the fire barrier create a thermal barrier that blocks a heat source on one side of the barrier from warming the fuel on the other side of the barrier. The charred materials can also limit oxygen flow into the burning mattress.

Gas dilution/displacement occurs when some materials are heated to produce inert gases (most often carbon dioxide and water). Those gases dilute and/or displace the combustible gases, thereby preventing or delaying their ignition.¹⁸ For example, boron-treated cotton and ammonium polyphosphate-treated fiber use this mechanism to prevent or slow combustion. (Fire barriers made with treated cotton fiber have the added advantage from a fire prevention perspective of creating a char thermal barrier when exposed to heat.)

Finally, a **gas-state active mechanism** interrupts the heat-producing chain reaction that occurs in the gas phase during combustion. During the combustion process, oxygen can react with volatile components from the burning substrate and form free radical intermediates. These free radical intermediates can quickly decompose materials, generating heat and further fueling combustion. A material like modacrylic fiber, although stable when used in a mattress, will release halides during combustion. These halide free radicals will combine with (or scavenge) oxygen-based free radical intermediates and interrupt the heat-generating chain reaction. The result of this mechanism helps to deprive the fire of the heat and oxygen necessary to support continued combustion.

¹⁶ "Flame retardant," Wikipedia, https://en.wikipedia.org/wiki/Flame_retardant, April 9, 2019.

¹⁷ Id.

¹⁸ Id.

What is a Flame-Retardant Chemical?

The term “flame-retardant chemical” in general refers to a diverse group of chemicals that undergo a chemical reaction with the effect of preventing or slowing the development of combustion.¹⁹ For purposes of this study, Section 19100(c)(1)(A) of the Code defines this term as a chemical whose:

... functional use ... is to resist or inhibit the spread of fire or as a synergist to chemicals that resist or inhibit the spread of fire, including, but not limited to, any chemical for which the term “flame retardant” appears on the Occupational Safety and Health Administration substance safety data sheet pursuant to subdivision (g) of Section 19100.1200 of Title 29 of the Code of Federal Regulations as it read on January 1, 2019.

Applying these concepts to the fire barriers used in mattresses, we differentiate between (1) barriers whose materials inherently produce thermal shielding or gas dilution/displacement effects without the addition of chemicals that undergo a chemical reaction when exposed to flame, from (2) barriers to which chemicals have been added to the fire barrier itself or its constituent fibers (or to polymers used to make such fibers) that do undergo such a chemical reaction in a fire ignition setting. We have considered only those chemicals falling in the latter category to be “flame-retardant chemicals” for purposes of this report.

Report Contents Required by Section 19104(a)

The Combinations of FR Fibers, Fire Barriers and Closing Thread Used to Meet Part 1633 Are Continually Changing

Section 19104(a) of the Code requires that this report include information about “each unique combination of fibers or yarns, or both, and other materials in components used for meeting flammability standards” and the “types of mattresses that the mattress component is used with, such as innerspring, polyurethane foam, memory foam, gel foam, latex foam, fiber, air bladders, or the combination of those materials.”

Fire barriers may take several forms. Most barriers consist of a blend of one or more FR fibers as well as other fibers that have no flame-retardant purpose. Furthermore, the specific type, composition and percentage blends of fire barriers are continually modified in response to changes in the mattress manufacturing and retailing sectors, consumer taste and a host of other factors. For example:

- The mattress market has undergone significant changes over the last five years as mattress compression technology has improved and producers now compress and pack increasing quantities of mattresses into boxes for sale via the internet and delivery to the consumer. This technological advancement has changed how many consumers buy mattresses, how the products are delivered to the consumer’s home and how mattresses are made, including changes in the materials needed to meet the Part 1632 and 1633 standards. These changes have required the industry to develop fire barriers that are appropriate for this use.

¹⁹ Id.

- The increased popularity of adjustable bases (which allow the consumer to raise and lower the upper and lower parts of the bed) has also required the industry to reengineer conventional mattresses to make them sufficiently flexible that they can be used with these bases. These changes have required manufacturers to develop fire barriers that are appropriate for this use.
- As prices for some FR fibers fluctuate, or the supply chains for those fibers are affected by international trade disputes, the mixes and uses of those fibers in fire barriers will likewise increase or decrease in response to these market changes.
- Depending on the support system used in each mattress model, some FR fibers will perform better than others in allowing that model to meet its fire performance requirements. For example, viscoelastic foam (so-called memory foam) is used in some mattresses because it softens when heated. As a result, a sleeper's body heat allows the foam to conform to her body shape and provide a different type of comfort and support. Since a barrier that uses FR fibers to shield the support system from heat transfer will defeat the product attributes that the viscoelastic foam provides, the industry has developed FR fiber blends and fire barrier types for these products that interrupt the ignition process using different fire prevention mechanisms.
- Other components change and new materials are introduced. For example, new components help dissipate heat from the sleeper or otherwise cool the sleep surface. These changes can affect how a given mattress model will perform when exposed to fire, which may necessitate the use of different FR fibers, different fiber blends or heavier or lighter weight fire barriers.
- Fire barrier technology continues to advance. FR fiber and barrier suppliers invest in research to develop more effective and comfortable fire barriers, resulting in new and lighter blends of fibers being introduced to the market each year.

When developing new fire barriers to respond to these changing demands and market trends, the mattress industry is cognizant of chemical safety concerns and carefully avoids ill-considered substitutions or insufficiently tested materials. As a result, mattress industry participants throughout the value chain carefully avoid introducing ill-considered substitutions or insufficiently tested materials into this process.

Given this ever-changing landscape and the infinite combinations of different FR (and non-FR) fiber, percentage blends, material form (woven, nonwoven, knit and back-coated fabrics) and fire barrier weights being considered and used, it is infeasible to identify every possible combination of fibers or yarns used in fire barriers for a given period of time. Instead, this report identifies each of the FR fiber types and fabric back-coating materials used to meet the standards, describes how these materials are used in different types of mattresses and the different manufacturing methods employed to make the fire barriers in use today.

FR Fiber and Component Types, Relevant Chemicals, CAS Numbers and Incorporation Method

Section 19104(a)(1)-(3) of the Code require that this report list the fibers and other materials used in mattresses to meet flammability standards, the identity of any flame retardant chemicals used in those components, their Chemical Abstracts Service (CAS) numbers and the method used to incorporate those chemicals in the components. In general, the fire prevention attributes of fire barriers are made possible by nine groups of FR fibers and one group of back-coating materials for fabrics. Some of these fibers are inherently flame-retardant without the addition of other chemicals, others are not.

The (1) names of these materials; (2) the FR chemicals (as defined in Section 19100(c)(1) of the Code) that are added to the fiber or fabric (if any)²⁰ and their CAS number; (3) whether the method for incorporating the chemical in the component is additive, reactive or other²¹ and (4) the primary fire prevention mechanism that the material enables are as follows:

FR Fibers			
Fiber Type	FR Chemical (if any) and CAS Number	Incorporation Method	Fire Prevention Mechanism
Ammonium salt-treated cellulosic fiber (cotton or rayon)	Ammonium phosphates (CAS Nos. 7722-76-1 and 7783-28-0) Ammonium polyphosphate (CAS No. 68333-79-9) Ammonium sulfate (CAS No. 7783-20-2)	Additive	Gas dilution/ Displacement Thermal shield
Boric acid-treated cotton fiber	Boric acid (CAS No. 10043-35-3)	Additive	Gas dilution/ Displacement Thermal shield
Fiberglass fiber		N/A	Thermal shield
High purity amorphous silica fiber (non-crystalline)		N/A	Thermal shield
Meta-aramid fiber		N/A	Thermal shield
Modacrylic fiber	Some types contain Antimony trioxide (CAS No. 1309-64-4) ²²	Reactive	Gas active mechanism
Para-aramid fiber		N/A	Thermal shield
Silica-embedded rayon fiber		N/A	Thermal shield
Wool/other animal fiber (including alpaca, silk, horsehair)		N/A	Thermal shield

²⁰ No chemical is listed for those FR fiber types that are inherently flame-retardant because they act as a thermal shield without the need for any added flame-retardant chemicals.

²¹ AB 2998 does not define the terms “additive” or “reactive.” Given the nature of these materials, we interpret the term “additive” to mean that the chemical is added after the fiber or fabric has been formed (such as, by means of a topical application) and the term “reactive” to mean that the chemical is part of the material that is extruded to make the fiber and as such is locked into the fiber’s polymer matrix, although no covalent bond between the chemical and the polymer exists.

²² Some modacrylic fiber is produced without the addition of antimony trioxide.

Back Coated Materials			
Material	FR Chemical and CAS Number (if any)	Incorporation Method	Fire Prevention Mechanism
Ammonium salt-treated fabric	Ammonium phosphate (CAS No. 7722-76-1) Ammonium sulfate (CAS No. 7783-20-2)	Additive	Gas dilution/ Displacement

Section 19104(a)(2) of the Code requires this report identifies those flame-retardant chemicals contained in a mattress component in an amount over 1,000 ppm. The law, however, does not define the term “mattress component.” Mattress producers purchase fire barriers from third parties. Therefore, for purposes of determining whether the chemicals listed above exceed 1,000 ppm in a mattress component, ISPA has interpreted this term to mean the fire barrier. Based on this assumption, each of the chemicals listed above can be present in a fire barrier in amounts that exceed 1,000 ppm.

Finally, closing threads fall into three general categories:

- Coated fiberglass sewing thread
- Meta-aramid fiber
- Para-aramid fiber

No flame-retardant chemicals are added to the closing threads.

Fire barriers may be made from woven, nonwoven or knit fabrics. These fabrics may contain one or more types of FR fibers, as well as other non-FR fibers (such as cotton, polyester, nylon and rayon) and may also be back coated. The fire barriers may be placed under the outer fabric cover of the mattress (called the ticking) or incorporated into the ticking itself. The barriers may be used in the following general manners:

- The outer cover of many mattresses consists of a multi-layered composite commonly called “a quilt panel.” A quilt panel typically covers at least the top and four vertical sides of the mattress. On mattresses designed to be flipped periodically (such that both the top and bottom surfaces are intended to be sleep surfaces), quilt panels are used on both the top and bottom. On so-called “no-flip” mattresses, the bottom is not intended as a sleep surface. On those products, a quilt panel is often used only on the top, and a different fire barrier is used on the bottom. A quilt panel typically includes at least the outer fabric (the ticking), a layer of fiber batting and/or foam and a thin backing fabric (called the scrim). A fire barrier is often one of the layers included in the composite. The layers are typically “quilted” to each other by a quilting machine using standard sewing thread,²³ or in some cases by using adhesives, heat or other means. The edges of the top and bottom quilt panel pieces are then sewn together with the side panels using closing thread. Since the quilt panel is a composite of several layers of material (including the fire barrier), the closing thread sews not only the pieces of the different fire barriers together, but also closes the ticking layer on the outside of the bed. In this application, the fire barrier used in quilt panels is usually a woven or nonwoven fabric, although knit fabric can also be used.

²³ Closing thread designed to sew the fire barriers together even when the mattress is ignited is not necessary for the quilting process.

Depending on the bed design, the barrier's fiber composition can be different for each surface of the mattress. More plush materials are typically used on the sleep surfaces, and not on the side panels. Furthermore, the vertical sides of a mattress tend to experience more stress when exposed to an ignition source, which may require some mattress designs to use more FR fiber in the side panels to provide a stronger heat shield function. As a result, it is possible that a single mattress could use different combinations of FR fibers and FR back-coated fabric on the top, bottom and sides of the product. All the FR fiber types listed above may be used in these applications. Back-coated fabric is not typically used in quilt panel applications (but can be used on the non-quilted bottom surface on no-flip beds; see below for further details). The quilt panel approach can also be used to make mattress covers that are placed over the mattress core and closed with a zipper.

- For some mattresses, a different approach may be required. For example, a mattress designed to be sold as a boxed bed must have a cover that can be compressed and boxed easily, yet be resilient enough to quickly recover its original shape when removed from the box weeks or months later without showing wrinkled, bunched or sagging fabric. Likewise, a mattress designed for use on an adjustable base must be flexible enough to stretch as the mattress head and foot are repeatedly raised and lowered, yet consistently be comfortable and look good when the base is placed in the flat horizontal position. In other cases, the mattress is designed to have an outer fabric with a stretchier feel than is possible with a quilt panel construction. The mattress industry has responded to these similar but different needs with knit fire barriers that have the long-term flexibility and resilience to be compressed or stretched yet recover their original shape easily. Most if not all the FR fibers listed above can be used in knit fire barriers, although the fiber thickness and other physical attributes of these materials may be different. The knitting process produces fabric in the form of a large tube. In some cases, the tube is used to in effect place an FR "sock" around the mattress core. The ends of the sock are either closed using closing thread or overlapped with no closing thread. The sock is usually covered by a fabric cover that is zipped over the sock. In other cases, the knit tubes are cut open and the knit fabric used as a fire barrier in quilt panels, discussed above. Finally, quilted fire barriers may be used as the outer layer of the mattress (for example, on the bottom (non-sleep) surface of a no-flip mattress).
- Some mattresses are designed with a cover (or at least part of the cover) that also serves as the fire barrier. As noted above, the cover may consist of a knit fabric fire barrier. In others, the outer fabric may be back coated with FR materials. For example, the bottom surface of a no-flip mattress is often made with back-coated fabric.

Types of Mattresses Used with Different FR Components and Materials

Section 19104(a)(5) of the Code requires that the report describe "[t]he types of mattresses that the mattress component is used with, such as innerspring, polyurethane foam, memory foam, gel foam, latex foam, fiber, air bladders, or the combination of these materials." The specific type of FR fiber or material to be used will be influenced to some extent by these different core materials as follows:

- Innersprings: Innersprings are made of steel, which will not burn in a mattress fire. Innersprings are always used with upholstery materials, including foam or fiber. The type and quantity of

upholstery material used with an innerspring will influence the types of FR fibers and fire barriers that will be used. See below for further discussion of these different materials.

- **Polyurethane foam**: Foam (either polyurethane or latex) is used in a mattress' internal support system. All FR fibers and FR back-coated fabrics that promote heat shielding, gas dilution/displacement and gas active fire prevention mechanisms are appropriate to prevent or delay ignition of the polyurethane foam.
- **Memory foam**: Memory foam (also called viscoelastic foam) is a type of polyurethane foam that will soften when warmed. When a sleeper lies on a mattress made with memory foam, her body heat softens the material so that it conforms to her body. Fire barriers that serve as a heat shield will defeat this important softening product attribute. As a result, manufacturers of mattresses made with memory or viscoelastic foam will employ fire barriers that have gas dilution/displacement and gas active fire prevention mechanisms instead.
- **Gel foam**: Some mattresses contain gel foam (as well as gel components) to provide a cool feel. Gel foam usually refers to a polyurethane foam which has a polyurethane-based gel material either mixed with the foam or applied to the outer surface of polyurethane foam. In some cases, the gel is applied to layers of latex foam. Some mattresses also have components made from gel material alone. As with memory or viscoelastic foams, fire barriers that do not interrupt heat transfer (such as those that have gas dilution/displacement and gas active fire prevention mechanisms) are preferred for use on mattresses with gel foam or gel materials.
- **Latex foam**: Latex foam is used alone or with polyurethane foam in a mattress' internal support system. Like polyurethane foam, all FR fibers and FR back-coated fabrics that promote heat shielding, gas dilution/displacement and gas active fire prevention mechanisms are appropriate to prevent or delay ignition of the latex foam.
- **Fiber**: Fiber core materials may be cotton, rayon, polyester, wool and other animal or vegetable fibers. Each of these fibers will burn but will behave differently when exposed to heat. Depending on the amounts of the different fibers used in the core of a mattress, and the other materials used in the product, all FR fibers and FR back-coated fabrics that promote heat shielding, gas dilution/displacement and gas active fire prevention mechanisms are appropriate for use with these materials.
- **Air bladders**: Some mattresses contain air bladders in the product's support system. By adjusting the amount of air in the bladder, consumers may adjust the firmness of the mattress. In residential mattresses, a mattress with an air bladder core typically will also contain layers of foam around the core. If those foam layers are polyurethane or latex foam, all FR fibers and FR back-coated fabrics that promote heat shielding, gas dilution/displacement and gas active fire prevention mechanisms are appropriate. If the foam layer is memory or viscoelastic foam or a gel foam or gel component, then the preferred fire barriers will tend not to include heat shielding materials but will instead promote gas dilution/displacement and gas active fire prevention mechanisms.

Survey Results

Section 19104(a)(4) of the Code requires that this survey report indicate the percentage of new mattress units in the United States that use the identified mattress component to meet the flammability standards.

Based on the above considerations, ISPA's survey differentiated between three basic types of fiber-based FR materials. These were:

- Fire barriers that contain FR fibers used either in the mattress' interior or exterior
- FR back-coated material applied to the back of fabrics used on the mattress exterior
- Closing thread

For the interior and exterior fire barrier categories, ISPA collected data on the nine groups of FR fibers listed above that are currently used to make it possible for a fire barrier to interrupt the mattress ignition process. A given fire barrier may contain a blend of one or more of these FR fibers, since different FR fibers may promote different fire prevention mechanisms; may have different strength, char, cost and comfort characteristics; may be easier to weave, knit or use in a nonwoven manufacturing process, etc. Other non-FR fibers (such as cotton, polyester, nylon and rayon) may also be blended with the FR fibers to give the resulting fire barrier other performance characteristics (such as provide dimensional consistency, strength, a more comfortable feel or "hand," etc.).

We identified one group of chemicals being used to produce FR back-coated fabrics. For closing thread, we identified three types of fiber used for these purposes.

The survey asked mattress manufacturers to report the number of total mattresses that they assembled during the first calendar quarter of 2019 (that is, January 1 to March 31, 2019) and the number of mattresses that they produced that contained each type of FR fiber, closing thread or FR back-coated fabric. Therefore, since a single fire barrier material may consist of a blend of two or more types of FR fibers, and a single mattress design may require different fire barriers for different sides of the product (see above discussion regarding the use of different fire barriers on a mattress' top, bottom and vertical sides), the total percentage of mattress units reported for all FR fibers and FR back-coating materials will necessarily exceed 100% of the total units produced by the responding companies during the survey period.

Based on quarterly wholesale market data that ISPA publishes for mattresses, the survey participants accounted for approximately 56% of the total new mattresses that ISPA estimates were manufactured by U.S. producers during the first calendar quarter of 2019. The survey responses show that of the total

units reported, the different FR fiber types, back-coating materials and closing threads were used on the following percentages of mattress units:

Fibers Used in FR Barriers	Exterior Barrier	Interior Barrier
Ammonium salt-treated cellulosic fiber (cotton or rayon)	0.2%	30.1%
Boric-acid-treated cotton fiber	0.2%	0.1%
Fiberglass fiber	2.0%	13.1%
High purity amorphous silica fiber (non-crystalline)	--	--
Meta-aramid fiber	--	0.0%
Modacrylic fiber - FR Chemical Input - Antimony trioxide	1.4%	13.6%
Para-aramid fiber	22.1%	1.7%
Silica-embedded rayon fiber	42.3%	67.6%
Wool/other animal fiber	0.1%	0.1%

Fabric Back coating FR Material	
Ammonium salt	5.0%

FR Closing Thread	
Coated fiberglass sewing thread	--
Meta-aramid fiber	--
Para-aramid fiber	94.7%

NOTE: To protect the confidentiality of the participants' business proprietary data, and to comply with restrictions imposed by the antitrust laws on publishing competitive business proprietary data, ISPA will publish aggregate market data only if three or more respondents provide data used to calculate the aggregate number. In several instances, two or fewer respondents reported data for specific types of fire barriers or closing thread. For these reasons, ISPA has not reported aggregate market data in those instances, and has reported "--" instead.

For example, the survey respondents reported that 30.1% of the units that they produced used ammonium salt-treated cellulosic fiber in an interior fire barrier, 42.3% of the units used silica-imbedded rayon as an FR fiber in an exterior fire barrier, etc.

* * *

We are pleased to submit this report to the Bureau. The mattress industry is committed to making products that consumers may use to enjoy a safe and restful night's sleep. The industry fulfills this commitment by not only meeting our obligations under the federal mattress flammability standards, but also in the materials we use to meet those standards.

Please contact us should you require any further information in this regard.

International Sleep Products Association
January 31, 2020

APPENDIX A

Relevant provisions of AB 2998 (2018) regarding ISPA FR survey

§ 19104

(a) The International Sleep Products Association shall conduct a survey of mattress producers, including those that are registered with the bureau as of January 1, 2019, and shall submit a survey report to the bureau on or before January 31, 2020. The International Sleep Products Association shall conduct a new survey of mattress producers, including, but not limited to, registered mattress producers, and submit a survey report to the bureau on or before January 31, 2023, and every three years thereafter. A survey report shall include the following information for each unique combination of fibers or yarns, or both, and other materials in components used for meeting flammability standards, including, but not limited to, mattress components such as fire barriers or flame retardant chemical-treated batting or ticking or closing thread, used in the manufacture of new mattresses:

(1) A list of the fibers or any other materials used in each component used for meeting flammability standards other than chemicals identified under paragraph (2). The specific brand name or producer of the fire barrier need not be identified.

(2) The identity of any covered flame retardant chemical, as described in subparagraph (A) of paragraph (1) of subdivision (c) of Section 19100, contained in each mattress component in an amount over 1000 parts per million, including, but not limited to, the Chemical Abstracts Service (CAS) number, if available.

(3) The method for incorporating the chemical in each mattress component used for meeting flammability standards, such as additive, reactive, or other method.

(4) The percentage of new mattress units in the United States that use the mattress component for meeting flammability standards.

(5) The types of mattresses that the mattress component is used with, such as innerspring, polyurethane foam, memory foam, gel foam, latex foam, fiber, air bladders, or the combination of those materials.

(b) All mattress producers of new mattresses that are registered with the bureau, commencing January 1, 2019, and thereafter, shall respond to the survey conducted by the International Sleep Products Association pursuant to subdivision (a). The International Sleep Products Association shall submit to the bureau a list of any producers who fail to respond to the survey. The bureau shall post the list of nonresponders on its Internet Web site.

(c) The bureau shall post the reports on its Internet Web site.

Definitions of “chemical” and “covered flame retardant chemical”:

§ 19100(a)

“Chemical” has the same meaning as in subdivision (a) of Section 19094.

§ 19100(c)

(1) "Covered flame retardant chemical" means any chemical that meets both of the following criteria:

(A) A functional use for the chemical is to resist or inhibit the spread of fire or as a synergist to chemicals that resist or inhibit the spread of fire, including, but not limited to, any chemical for which the term "flame retardant" appears on the Occupational Safety and Health Administration substance safety data sheet pursuant to subdivision (g) of Section 19100.1200 of Title 29 of the Code of Federal Regulations as it read on January 1, 2019.

(B) The chemical is one of the following:

(i) A halogenated, organophosphorus, organonitrogen, or nanoscale chemical.

(ii) A chemical defined as a "designated chemical" in Section 105440 of the Health and Safety Code.

(iii) A chemical listed on the Washington State Department of Ecology's list of Chemicals of High Concern to Children in Section 173-334-130 of Title 173 of the Washington Administrative Code as of January 1, 2019, and identified as a flame retardant or as a synergist to flame retardants in the rationale for inclusion in the list.

(2) As used in this subdivision:

(A) "Halogenated chemical" means any chemical that contains one or more halogen elements, including fluorine, chlorine, bromine, or iodine.

(B) "Organophosphorus chemical" is any chemical that contains one or more carbon elements and one or more phosphorus elements.

(C) "Organonitrogen chemical" is any chemical that contains one or more carbon elements and one or more nitrogen elements.

APPENDIX B

Pt. 1632

(1) Cut test specimens to an oversize 12" × 12" before the procedure is initiated.

(2) Vacuum specimens or shake vigorously to remove any loose fibers, dust or possible accumulated debris.

(3) Place individual specimen face down in a shallow pan which has been filled to a depth of 2" with a wash solution of 1.1 grams of AATCC (American Association of Textile Chemists and Colorists) Standard Detergent as specified in AATCC Method 124-1996 (or equivalent) per liter of water preheated to 105 °F. Knead the back of the specimen with hand for 1 minute. Water level and temperature should be maintained for each specimen.

(4) Thoroughly rinse specimen face down with warm water at 105 °F. for 1 minute under a faucet with strong pressure.

(5) Remove excess liquor by use of a wringer, hydroextractor or gentle hand squeezing and dry in circulating air oven at 200 °F. until dry.

(6) Repeat the above procedure 10 times using fresh detergent and fresh water for each set of eight specimens.

(7) Subject the dry specimens to the test procedures in FF 2-70.

(e) This washing procedure and labeling provisions are subject to revocation should it be determined that such procedure is inadequate to fully protect the public.

[40 FR 59935, Dec. 30, 1975, as amended at 65 FR 12934, Mar. 10, 2000]

PART 1632—STANDARD FOR THE FLAMMABILITY OF MATTRESSES AND MATTRESS PADS (FF 4-72, AMENDED)

Subpart A—The Standard

Sec.

- 1632.1 Definitions.
- 1632.2 Purpose, scope and applicability.
- 1632.3 General requirements.
- 1632.4 Mattress test procedure.
- 1632.5 Mattress pad test procedure.
- 1632.6 Ticking substitution procedure.
- 1632.7 Tape edge substitution procedure.
- 1632.8 Glossary of terms.

Subpart B—Rules and Regulations

- 1632.31 Mattresses/mattress pads—labeling, recordkeeping, guaranties and "one of a kind" exemption.

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Subpart C—Interpretations and Policies

1632.61-1632.62 [Reserved]

1632.63 Policy clarification on renovation of mattress.

AUTHORITY: 15 U.S.C. 1193, 1194; 15 U.S.C. 2079(b).

SOURCE: 49 FR 39796, Oct. 10, 1984, unless otherwise noted.

Subpart A—The Standard

§ 1632.1 Definitions.

In addition to the definitions given in section 2 of the Flammable Fabrics Act as amended (15 U.S.C. 1191), the following definitions apply for the purpose of the standard.

(a) *Mattress* means a ticking filled with a resilient material used alone or in combination with other products intended or promoted for sleeping upon.

(1) This definition includes, but is not limited to, adult mattresses, youth mattresses, crib mattresses including portable crib mattresses, bunk bed mattresses, futons, water beds 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-a-way bed mattresses, high risers, and trundle bed mattresses. See § 1632.8 Glossary of terms, for definitions of these items.

(2) This definition excludes sleeping bags, pillows, mattress foundations, liquid and gaseous filled tickings such as water beds and air mattresses which do not contain upholstery material between the ticking and the mattress core, upholstered furniture which does not contain a detachable mattress such as chaise lounges, drop-arm love seats, press-back lounges, push-back sofas, sleep lounges, sofa beds (including jackknife sofa beds), sofa lounges (including glide-outs), studio couches and studio divans (including twin studio divans and studio beds), and juvenile product pads such as car bed pads, carriage pads, basket pads, infant carrier and lounge pads, dressing table pads, stroller pads, crib bumpers, and playpen pads. See § 1632.8 Glossary of terms, for definitions of these items.

(b) *Mattress Pad* means a thin, flat mat or cushion, and/or ticking filled with resilient material for use on top of a mattress. This definition includes, but is not limited to, absorbent mattress pads, flat decubitus pads, and convoluted foam pads which are totally enclosed in ticking. This definition excludes convoluted foam pads which are not totally encased in ticking.

(c) *Ticking* means 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.

(d) *Core* means the main support system that may be present in a mattress, such as springs, foam, hair block, water bladder, air bladder, or resilient filling.

(e) *Upholstery material* means all material, either loose or attached, between the mattress or mattress pad ticking and the core of a mattress, if a core is present.

(f) *Tape edge* (edge) means the seam or border edge of a mattress or mattress pad.

(g) *Quilted* means stitched with thread or by fusion through the ticking and one or more layers of upholstery material.

(h) *Tufted* means 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.

(i) *Manufacturer* means an individual plant or factory at which mattresses and/or mattress pads are produced or assembled.

(j) *Mattress prototype* means mattresses of a particular design, sharing all materials and methods of assembly, but excluding differences in mattress size. If it has been shown as a result of prototype qualification testing that an upholstery material or core will not reduce the ignition resistance of the mattress prototype, substitution of another material for such material shall not be deemed a difference in materials for prototype definition. (See §1632.31(c)(4) for records required to demonstrate that a change of materials

has not reduced ignition resistance of a mattress prototype.) If it is determined or suspected that a material has influenced the ignition resistance of the mattress prototype, a change in that material, excluding an increase in thickness, shall be deemed a difference in materials for purposes of prototype definition unless it is previously shown to the satisfaction of the Consumer Product Safety Commission that such change will not reduce the ignition resistance of the mattress prototype. Ticking materials may be substituted in accordance with §1632.6. Tape edge materials may be substituted in accordance with §1632.7.

(k) *Mattress pad prototype* means mattress pads of a particular design, sharing all materials and methods of assembly, but excluding differences in mattress pad size. A change in existing material, except an increase in thickness, shall be deemed a difference in materials for purposes of prototype definition unless it is previously shown to the satisfaction of the Consumer Product Safety Commission that such change will not reduce the ignition resistance of the mattress pad prototype. Ticking materials may be substituted in accordance with §1632.6. Tape edge materials may be substituted in accordance with §1632.7.

(1) *Surface* means one side of a mattress or mattress pad which is intended for sleeping upon and which can be tested.

§ 1632.2 Purpose, scope, and applicability.

(a) *Purpose.* (1) This standard prescribes requirements for testing of prototype designs of mattresses and mattress pads before the sale in commerce or the introduction in commerce of any mattress or mattress pad which is subject to the standard. The standard prescribes a test to determine the ignition resistance of a mattress or a mattress pad when exposed to a lighted cigarette.

(2) The standard sets forth a test at §1632.6 which may be used to classify ticking materials for resistance to cigarette ignition.

(3) The standard sets forth a test at §1632.7 which may be used to demonstrate that the substitution of tape

§ 1632.3

edge materials will not reduce the ignition resistance of a mattress prototype or a mattress pad prototype.

(b) *Scope.* (1) All mattresses, as defined in §1632.1(a), and all mattress pads, as defined in §1632.1(b), manufactured or imported after the effective date of this amendment are subject to the requirements of the standard as amended.

(2) All mattresses, as defined in §1632.1(a), and all mattress pads, as defined in §1632.1(b), manufactured or imported after June 22, 1973, and before the effective date of this amendment are subject to those requirements of the Standard for the Flammability of Mattresses (and Mattress Pads) (16 CFR part 1632) which were in effect before the effective date of this amendment.

(3) Manufacturers or importers desiring to use the ticking substitution procedure provided in §1632.6 may classify the ticking being used on each mattress prototype before or after the effective date of this amendment using the test procedure set forth in that section.

(4) One-of-a-kind mattresses and mattress pads may be excluded from testing under this standard in accordance with rules established by the Consumer Product Safety Commission. (See §1632.31(f): exemption for mattresses and mattress pads prescribed by a physician.)

(c) *Applicability.* (1) The requirements for prototype testing prescribed by this standard are applicable to each "manufacturer" (as that term is defined in §1632.1(i)) of mattresses or mattress pads subject to the standard which are manufactured for sale in commerce. The requirements of this standard for prototype testing are also applicable to all other persons or firms initially introducing mattresses or mattress pads into commerce, including importers; each such firm shall be deemed to be a "manufacturer" for purposes of this standard.

(2) The test at §1632.6 for classification of ticking materials may be used by manufacturers of mattresses or mattress pads and by manufacturers of ticking materials. The test at §1632.7 may be used by manufacturers of mattresses to demonstrate that substi-

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tution of tape edge materials will not reduce ignition resistance of a mattress prototype or a mattress pad prototype. Use of the tests in §§1632.6 and 1632.7 is optional.

§ 1632.3 General requirements.

(a) *Summary of test method.* The method measures the ignition resistance of a mattress or mattress pad by exposing the surface to lighted cigarettes in a draft-protected environment. The surfaces to be tested include smooth, tape edge, and quilted or tufted locations, if they exist on the mattress or mattress pad surface. A two-sheet test is also conducted on similar surface locations. In the latter test, the burning cigarettes are placed between the sheets.

(b) *Test criterion.* When testing the mattress or mattress pad surface in accordance with the testing procedure set forth in §1632.4 *Mattress test procedure*, individual cigarette test locations pass the test if the char length is not more than 2 inches (5.1 cm) in any direction from the nearest point of the cigarette. In the interest of safety, the test operator should discontinue the test and record a failure before reaching the 2 inch char length if an obvious ignition has occurred.

(c) *Pre-market testing.* Each manufacturer required to perform prototype testing by the standard shall perform the testing required by the standard with acceptable results before selling in commerce or introducing in commerce any mattress or mattress pad which is subject to the standard.

(d) *Specimen selection and qualification.* (1) Each manufacturer required to perform prototype testing by the standard shall construct or select enough units of each proposed mattress prototype or proposed mattress pad prototype to provide six surfaces for testing. A minimum of three mattresses or mattress pads are required if both sides can be tested; six mattresses or mattress pads are required if only one side can be tested. Test each of the six surfaces according to §1632.4(d). If all the cigarette test locations on all six mattress surfaces yield passing results using the criterion specified in §1632.3(b), accept the mattress prototype. If all six surfaces of a mattress

pad yield passing results using the criterion in §1632.3(b), and all other applicable requirements prescribed by §1632.5 are met, accept the mattress pad prototype. If one or more of the cigarette test locations on any of the six surfaces fail to meet the test criterion of §1632.3(b), reject the mattress prototype or the mattress pad prototype.

(2) Prototype qualification testing may be repeated after action has been taken to improve the resistance of the mattress prototype or the mattress pad prototype to cigarette ignition by changes in design, construction methods, materials selection, or other means. When prototype qualification is repeated after rejection of a prototype, such qualification testing shall be conducted in the same manner as original qualification testing.

(3) Each mattress prototype and each mattress pad prototype must be accepted in prototype qualification before any mattress or mattress pad manufactured in accordance with such mattress prototype or mattress pad prototype is sold in commerce or introduced in commerce. Any manufacturer required to perform testing by the standard may rely on prototype tests performed before the effective date of this amended standard, provided that such tests were conducted in accordance with all requirements of §§1632.1(i), 1632.3(d), and 1632.4, and yield passing results when the test criterion of §1632.3(b) is applied. If the ticking classification test at §1632.6 is to be used when relying on prototype tests performed before the effective date of the standard, the ticking currently used on that mattress prototype must be classified before substitution of ticking using §1632.6.

(4) Rejected prototype mattresses or prototype mattress pads shall not be retested, offered for sale, sold, or promoted for use as a mattress (as defined in §1632.1(a)) or for use as a mattress pad (as defined in §1632.1(b)) except after reworking to improve the resistance to ignition by cigarettes, and subsequent retesting and acceptance of the mattress prototype (as defined in §1632.1(j)) or the mattress pad prototype (as defined in §1632.1(k)).

§ 1632.4 Mattress test procedure.

(a) *Apparatus and Test Materials*—(1) Testroom. The testroom shall be large enough to accommodate a full-scale mattress in a horizontal position and to allow for free movement of personnel and air around the test mattress. The test area shall be draft-protected and equipped with a suitable system for exhausting smoke and/or noxious gases produced by testing. The testroom atmospheric conditions shall be greater than 18 °C (65 °F) and at less than 55 percent relative humidity.

(i) The room shall be equipped with a support system (e.g. platform, bench) upon which a mattress may be placed flat in a horizontal position at a reasonable height for making observations.

(ii) If thin flexible mattresses or mattress pads are being tested the room shall also be equipped with a glass fiberboard test surface. The glass fiberboard shall be approximately 1 inch (2.5 cm) thick and have a thermal conductivity of 0.30 ± 0.05 cal (g) / hr cm² °C/cm (0.24 ± 0.04 Btu/hr ft² °F/in) at 23.9 °C (75 °F).¹

(2) *Ignition source*. The ignition source shall be cigarettes without filter tips made from natural tobacco, 85±2 mm long with a tobacco packing density of 0.270±0.02 g/cm³ and a total weight of 1.1±gm.

(3) *Fire extinguisher*. A pressurized water fire extinguisher, or other suitable fire extinguishing equipment, shall be immediately available.

(4) *Water bottle*. A water bottle fitted with a spray nozzle shall be used to extinguish the ignited portions of the mattress.

(5) *Scale*. A linear scale graduated in millimeters, 0.1 inch, or 1/16 inch divisions shall be used to measure char length.

(6) *Sheets or Sheeting Material*. White, 100 percent cotton sheets or sheeting material shall be used. It shall not be treated with a chemical finish which

¹Glass fiberboard that meets Federal Specification HH-I-558B is acceptable. Under this specification, the board must be Form A, Class 1, and plain faced. Copies of the specifications may be obtained from the Business Service Centers of the General Services Administration Regional Offices.

imparts a characteristic such as permanent press or flame resistance. It shall have 120-210 threads per square inch and fabric weight of 3.7 ± 0.8 oz/yd² (125 ± 28 gm/m²). The size of the sheet or sheeting material shall be appropriate for the mattress being tested.

(7) *Other apparatus.* In addition to the above, a thermometer, a relative humidity measuring instrument, a thin rod, straight pins, a knife or scissors, and tongs are required to carry out the testing.

(b) *Test Preparation*—(1) *Mattress samples.* The mattress shall be removed from any packaging prior to conditioning. The mattress surface shall be divided laterally into two sections (see fig. 1), one section for the bare mattress tests and the other for the two-sheet tests.

(2) *Sheets or sheeting material.* The sheets or sheeting material shall be laundered once before use in an automatic home washer using the hot water setting and longest normal cycle with the manufacturer's recommended quantity of a commercial detergent, and dried in an automatic home tumble dryer.

(i) The sheet shall be cut across the width into two equal parts after washing.

(ii) Sheeting material shall be cut in lengths to cover $\frac{1}{2}$ of a mattress as described in § 1632.4(d)(3).

(3) *Cigarettes.* Unopened packages of cigarettes shall be selected for each series of tests. The cigarettes shall be removed from packaging prior to conditioning.

(c) *Conditioning.* The mattresses, laundered sheets or sheeting material, and loose cigarettes shall be conditioned in air at a temperature greater than 18 °C (65 °F) and a relative humidity less than 55 percent for at least 48 continuous hours prior to test. The mattresses, laundered sheets or sheeting material, and cigarettes shall be supported in a suitable manner to permit free movement of air around them during conditioning. The mattress meets this conditioning requirement if the mattress and/or all its component materials, except the metallic core, if present, have been exposed only to the above temperature and humidity condi-

tions for at least 48 continuous hours prior to testing the mattress.

(d) *Testing*—(1) *General.* Mattress specimens shall be tested in a testroom with atmospheric conditions of a temperature greater than 18 °C (65 °F) and a relative humidity less than 55 percent. If the test is not performed in the conditioning room, at least one lit cigarette shall be placed on the mattress surface within 10 minutes of removal from the conditioning room. The other side of the mattress shall be tested immediately after completion of the first side.

(i) At least 18 cigarettes shall be burned on each mattress test surface, 9 in the bare mattress tests and 9 in the 2-sheet tests. If three or more mattress surface locations (smooth surface, tape edge, quilted, or tufted areas) exist in the particular mattress surface under test, three cigarettes shall be burned on each different surface location. If only two mattress surface locations exist in the particular mattress surface under test (tape edge and smooth surface), four cigarettes shall be burned on the smooth surface and five cigarettes shall be burned on the tape edge.

(ii) Light and place one cigarette at a time on the mattress surface. (If previous experience with a similar type of mattress has indicated that ignition is not likely, the number of cigarettes which may be lighted and placed on the mattress at one time is left to the test operator's judgment. The number of cigarettes must be carefully considered because a smoldering or burning mattress is extremely hazardous and difficult to extinguish.) The cigarettes must be positioned no less than 6 inches apart on the mattress surface. Each cigarette used as an ignition source shall be well lighted but not burned more than 4 mm (0.16 inch) when placed on the mattress. (Fire extinguishing equipment must be readily available at all times.)

(iii) If a cigarette extinguishes before burning its full length on any mattress surface location, pops out of position when tested on a tuft, or rolls off a test location, the test must be repeated with a freshly lit cigarette on a different portion of the same type of location on the mattress surface until either: the number of cigarettes specified

in §1632.4(d)(1)(i) have burned their full lengths; the number of cigarettes specified in §1632.4(d)(1)(i) have extinguished before burning their full lengths; or failure has occurred according to §1632.3(b) *Test criterion*.

(2) *Bare mattress tests*—(i) *Smooth surface*. Each burning cigarette shall be placed directly on a smooth surface location on the test surface on the half reserved for bare mattress tests. The cigarettes should burn their full lengths on a smooth surface without burning across a tuft, or stitching of a quilted area. However, if this is not possible because of mattress design, then the cigarettes shall be positioned on the mattress in a manner which will allow as much of the butt ends as possible to burn on smooth surfaces. Report results for each cigarette as pass or fail as defined in the test criterion (see §1632.3(b)). **CAUTION:** Even under the most carefully observed conditions, smoldering combustion can progress to the point where it cannot be readily extinguished. It is imperative that a test be discontinued as soon as ignition has definitely occurred. Immediately wet the exposed area with a water spray (from water bottle), cut around the burning material with a knife or scissors and pull the material out of the mattress with tongs. Make sure that all charred or burned material is removed. Ventilate the room.

(ii) *Tape edge*. Each burning cigarette shall be placed in the depression between the mattress top surface and the tape edge, parallel to the tape edge of the half of the test surface reserved for bare mattress tests. If there is only a seam or no depression at the edge, support the cigarettes in place along the edge and parallel to the edge with straight pins. Three straight pins may be inserted through the edge at a 45° angle such that one pin supports the cigarette at the burned end, one at the center, and one at the butt. The heads of the pins must be below the upper surface of the cigarette (see fig. 2). Report results for each cigarette as pass or fail as defined in the test criterion (see §1632.3(b)).

MATTRESS PREPARATION

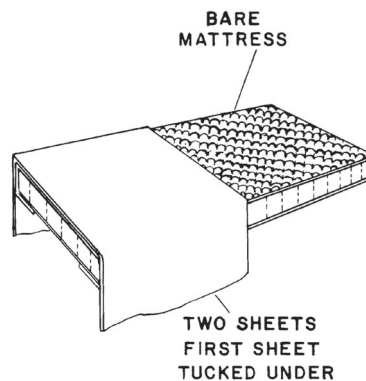
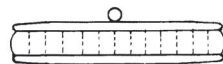
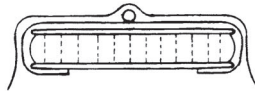


FIGURE 1

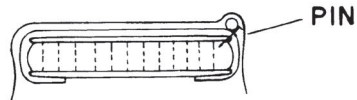
CIGARETTE LOCATION



BARE



TWO SHEETS



TAP E

FIGURE 2

(iii) *Quilted location.* If quilting exists on the test surface, each burning cigarette shall be placed on quilted locations of the test surface. The cigarettes shall be positioned directly over the thread or in the depression created by the quilting process on the half of the test surface reserved for bare mattress tests. If the quilt design is such that the cigarettes cannot burn their full lengths over the thread or depression, then the cigarettes shall be positioned in a manner which will allow as much of the butt ends as possible to burn on the thread or depression. Report results for each cigarette as pass or fail as defined in the test criterion (see § 1632.3(b)).

(iv) *Tufted location.* If tufting exists on the test surface, each burning cigarette shall be placed on tufted locations of the test surface. The cigarettes shall be positioned so that they burn down into the depression caused by the tufts and so that the butt ends of the cigarettes burn out over the buttons or laces used in the tufts or the depressions made by the tufts on the half of the test surface reserved for bare mattress tests. Report results for each cigarette as pass or fail as defined in the test criterion (see § 1632.3(b)).

(3) *Two-sheet tests.* Spread a section of sheet or sheeting material smoothly over the mattress surface which has been reserved for the two-sheet test and tuck under the mattress. Care must be taken that hems or any other portion of the sheet which is more than one fabric thickness, is neither directly under nor directly over the test cigarette in the two-sheet test.

(i) *Smooth surfaces.* Each burning cigarette shall be placed directly on the sheet covered mattress in a smooth surface location as defined in the bare mattress test. Immediately cover the first sheet and the burning cigarette loosely with a second, or top sheet (see fig. 2). Do not raise or lift the top sheet during testing unless obvious ignition has occurred or until the cigarette has burned out. Whether a cigarette has extinguished may be determined by holding the hand near the surface of the top sheet over the test location. If no heat is felt or smoke observed, the cigarette has burned out. If ignition occurs, immediately remove the sheets and cigarette and follow the cautionary procedures outlined in the bare mattress test. Report results for each cigarette as pass or fail as defined in the test criterion (see § 1632.3(b)).

(ii) *Tape edge.* (A) Each burning cigarette shall be placed in the depression between the top surface and the tape edge on top of the sheet, and immediately covered with a second sheet. It is important the air space be eliminated, as much as possible, between the mattress and the bottom sheet at the test location before testing. Depress the bottom sheet into the depression using a thin rod or other suitable instrument.

(B) In most cases, the cigarettes will remain in place throughout the test. However, if the cigarettes show a marked tendency to roll off the tape edge location, they may be supported with straight pins. Three straight pins may be inserted through the bottom sheet and tape at a 45° angle such that one pin supports the cigarette at the burning end, one at the center, and one at the butt. The heads of the pins must be below the upper surface of the cigarette (see fig. 2). Report results for each cigarette as pass or fail as defined in the test criterion (see § 1632.3(b)).

(iii) *Quilted locations.* If quilting exists on the test surface, each burning cigarette shall be placed in a depression caused by quilting, directly over the thread and on the bottom sheet, and immediately covered with the top sheet. It is important that the air space be eliminated, as much as possible, between the mattress and the bottom sheet at the test location before testing. Depress the bottom sheet into the depression using a thin rod or other suitable instrument. If the quilt design is such that the cigarettes cannot burn their full lengths over the thread or depression, then the cigarettes shall be positioned in a manner which will allow as much of the butt ends as possible to burn on the thread or depression. Report results for each cigarette as pass or fail as defined in the test criterion (see § 1632.3(b)).

(iv) *Tufted locations.* If tufting exists on the test surface, each burning cigarette shall be placed in the depression caused by tufting, directly over the tuft and on the bottom sheet, and immediately covered with the top sheet. It is important that the air space be eliminated, as much as possible, between the mattress and the bottom sheet at the test location before testing. Depress the bottom sheet into the depression using a thin rod or other suitable instrument. The cigarettes shall be positioned so that they burn down into the depression caused by the tuft and so that the butt ends of the cigarettes burn out over the buttons or laces, if used in the tufts. Report results for each cigarette as pass or fail as defined in the test criterion (see § 1632.3(b)).

(e) *Records.* Records of all prototype test results, and the disposition of rejected prototypes shall be maintained by the person or firm required to perform testing by the standard in accordance with § 1632.31(c).

EFFECTIVE DATE NOTE: At 76 FR 59023, Sept. 23, 2011, § 1632.4 was amended by revising (a)(2), effective Sept. 23, 2012. For the convenience of the user, the revised text is set forth as follows:

§ 1632.4 Mattress test procedure.

(a) * * *

(2) *Ignition source.* The ignition source shall be a Standard Reference Material cigarette (SRM 1196), available for purchase from the National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD 20899.

* * * * *

§ 1632.5 Mattress pad test procedure.

(a) *Testing.* All mattress pads shall be tested, in the condition in which they are intended to be sold, according to § 1632.4 Mattress test procedure, using the glass fiberboard substrate.

(b) *Flame resistant mattress pads.* The following additional requirements shall be applicable to mattress pads which contain a chemical fire retardant.

(1) These mattress pads shall be tested in accordance with § 1632.4 Mattress test procedure after they have been washed and dried 10 times as described in § 1632.5(b)(2).

(i) Such laundering is not required of mattress pads which are intended for one time use and/or are not intended to be laundered, as determined by the Consumer Product Safety Commission.

(ii) Mattress pads which are not susceptible to being laundered and are labeled “dryclean only” shall be drycleaned by a procedure which has previously been found acceptable by the Consumer Product Safety Commission.

(2) *Laundering procedure.* (i) Washing shall be performed in accordance with sections 8.2.2 and 8.2.3 of AATCC Test Method 124–1996, using wash temperature V (60° ±3 °C, 140° ±5 °F) specified in Table II of that method, and the water level, agitator speed, washing time, spin speed and final spin cycle specified for “Normal/Cotton Sturdy” in Table III.

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(ii) Drying shall be performed in accordance with section 8.3.1(A) of AATCC Test Method 124-1996 "Appearance of Fabrics after Repeated Home Laundering," Tumble Dry, using the exhaust temperature ($66^{\circ} \pm 5^{\circ} \text{C}$, $150^{\circ} \pm 10^{\circ} \text{F}$) and cool down time of 10 minutes specified in the "Durable Press" conditions of Table IV.

(iii) Maximum washer load shall be 3.64 Kg (8 pounds) and may consist of any combination of test samples and dummy pieces.

(iv) AATCC Test Method 124-1996 "Appearance of Fabrics after Repeated Home Laundering," is found in Technical Manual of the American Association of Textile Chemists and Colorists, vol. 73, 1997, which is incorporated by reference. Copies of this document are available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, North Carolina 27709. This document is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51.

(v) A different number of wash and dry cycles using another procedure may be specified and used, if that procedure has previously been found to be equivalent by the Consumer Product Safety Commission.

(3) *Labeling*—(i) *Treatment label*. If a mattress pad contains a chemical fire retardant, it shall be labeled with the letter "T" pursuant to rules and regulations established by the Consumer Product Safety Commission.

(ii) *Care label*. All mattress pads which contain a chemical fire retardant treatment shall be labeled with precautionary instructions to protect the pads from agents or treatments which are known to cause deterioration of their flame resistance. Such labels shall be permanent and otherwise in accordance with rules and regulations established by the Consumer

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Product Safety Commission in § 1632.31(b).

(iii) *Exception*. One time use products as defined in § 1632.5(b)(1)(i) are not subject to these labeling requirements.

[49 FR 39796, Oct. 10, 1984, as amended at 65 FR 12938, Mar. 10, 2000]

§ 1632.6 Ticking substitution procedure.

(a) This procedure may be used to verify acceptable equivalency if a mattress or mattress pad manufacturer wishes to change the ticking used on a particular mattress or mattress pad prototype without conducting a prototype test as specified in § 1632.4 or § 1632.5. The procedure includes a ticking classification test that may be used by a ticking, mattress or mattress pad manufacturer or by a distributor of ticking.

(b) *Definitions*. For the purpose of this section the following definitions apply in addition to those in § 1632.1.

(1) *Mattress ticking prototype*. Means a ticking of a specific construction, color, or combination of colors or color pattern, weave pattern design, finish application, fiber content, and weight per unit area. With respect to film-coated ticking, a mattress ticking prototype means in addition to the factors listed above, a given method of application, chemical formula, and thickness of application of film coating. With respect to a quilted ticking, a mattress ticking prototype means the combination of a specific ticking as described above; a specific filling, thickness, density, and chemical composition; a specific thread; a specific method of quilting; and a specific backing fabric construction, weave, finish, fiber content, and weight.

(2) *Mattress pad ticking prototype* (i) Means a ticking of a specific construction, color, or combination of colors or color pattern, weave pattern design, finish application, fiber content, and weight per unit area. With respect to film-coated ticking, a mattress pad ticking prototype means in addition to the factors listed above, a given method of application, chemical formula, and thickness of application of film coating.

(ii) Quilted ticking is excluded from this definition. Therefore, the following procedures may not be used to substitute quilted ticking used on or as a mattress pad.

(c) *Scope and application.* (1) This procedure provides an independent evaluation of the cigarette ignition characteristics of ticking and for the classification of ticking into one of three performance classes. Class A represents tickings evaluated as acting as barriers against cigarette ignition; Class B represents tickings evaluated as having no effect on cigarette ignition; and Class C represents tickings evaluated as having the potential, in some manner, to act as a contributor to cigarette ignition.

(2) Substitution of any ticking which has been evaluated as Class A using the procedure in this §1632.6 for any other ticking material shall not be a “difference in materials” as that phrase is used in §§1632.1 (j) and (k). Consequently, any ticking material evaluated as Class A under this test procedure may be used on any qualified mattress prototype or on any qualified mattress pad prototype without conducting new prototype tests.

(3) Substitution of any ticking which has been evaluated as Class B using the procedure in this §1632.6 for the ticking material used on any mattress prototype or on any mattress pad prototype which was qualified in prototype testing with a testing material evaluated as Class B or a Class C shall not be a “difference in materials” as that phrase is used in §§1632.1 (j) and (k). Consequently, any ticking material evaluated as Class B under this test procedure may be used on any mattress or mattress pad which was qualified in prototype testing with a Class B or Class C ticking material without conducting new prototype tests. However, if Class B ticking material is to be used on any mattress or mattress pad which was qualified in prototype testing with a Class A ticking material, the mattress prototype or mattress pad prototype must be requalified, using a Class B ticking.

(4) A ticking material which has been evaluated as Class C using the procedure in this §1632.6 may be used only on a mattress or mattress pad which was

qualified in prototype testing with that particular Class C ticking material. Consequently, a ticking material evaluated as Class C under this test procedure may not be used on any mattress or mattress pad which was qualified in prototype testing using another Class C ticking material, or a Class A or Class B ticking material, without conducting new prototype tests.

(d) *General requirements.* (1) This procedure is a ticking prototype performance classification test. Ticking not classified according to this procedure may be used on mattresses or mattress pads if the mattress prototype or mattress pad prototype has been qualified utilizing the unclassified ticking in question.

(2) *Test criterion.* (i) Cigarette—An individual cigarette test location passes the test if the char length is not more than 1 inch (2.54 cm) in any direction from the nearest point of the cigarette, and the cotton felt is not ignited.

CAUTION: In the interest of safety, the test operator should discontinue the test and record a failure before reaching the 1 inch (2.54 cm) char length if, in his opinion, an obvious ignition has occurred.

(ii) Test Specimen—An individual test specimen passes the test if all three cigarette test locations meet the cigarette test criterion of this paragraph.

(3) *Specimen selection.* Three specimens shall be used for each ticking prototype classification test, with each specimen measuring no less than 20 inches by 20 inches (50.8 cm × 50.8 cm) square. The three specimens shall be selected from any fabric piece taken from a ticking prototype. The specimens shall be representative of the ticking prototype.

(4) *Ticking classification.* A ticking prototype is classified as Class A, Class B, or Class C, in accordance with the following schedules.

(i) Class A—A ticking prototype is classified as Class A when three specimens, tested in accordance with §1632.6(e), meet the test criterion in §1632.6(d)(2) when the ticking is tested directly over the cotton felt on the test box.

(ii) Class B—A ticking prototype is classified as Class B when three specimens, tested according to §1632.6(e), meet the test criterion in §1632.6(d)(2)

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when the ticking is tested on a $\frac{1}{4}$ inch $\pm\frac{1}{32}$ inch (6.3 mm \pm .8 mm) thick urethane foam pad covering the cotton felt on the test box.

(iii) Class C—A ticking prototype is classified as Class C when any specimen tested according to §1632.6(e), fails to meet the test criterion in §1632.6(d)(2) when the ticking is tested on a $\frac{1}{4}$ inch $\pm\frac{1}{32}$ inch (6.3 mm \pm .8 mm) thick urethane foam pad covering the cotton felt on the test box.

(e) *Test procedure*—(1) *Apparatus*. For the purpose of this section the following apparatus and materials are required in addition to that which is listed in §1632.4 (a) and (b).

(i) *Sheet and sheeting material*. Test covers made from sheets or sheeting material shall not be less than 12 inches by 12 inches (30.48 cm by 30.48 cm) square.

(ii) *Template*. Designed to allow for a one inch marking around the placement of the cigarette (see figure 3). Use of this template is optional.

(iii) *Stapler or masking tape* or other means of attachment to secure fabric to test box.

(iv) *Mounting box*. A 6 inch deep, 12 inch square plywood box. The box contains two $\frac{1}{2}$ inch in diameter ventilation holes. (See figure 4.)

(v) *Cotton felt*. (A) The cotton felt shall be a thoroughly-garnetted mixture of all new material consisting of not less than 67% linters and of not more than 33% clean picker blend or equivalent binder and not more than 5% non-cellulosic total content. The felt shall not be bleached, moistened or chemically treated in any way.

(B) The felt may be re-used repeatedly after completion of each test by removing all of the smoldering, charred, heat-discolored fibers, or fibers exposed to water as a result of extinguishing the cotton ignited by previous test.

(vi) *Urethane foam*. The urethane foam shall have a density of 1.2 to 1.5 pounds per cubic foot, an indentation load deflection of 22 to 35 pounds, with each test specimen measuring no less than 12 inches by 12 inches (30.48 cm by 30.48 cm) square, having a thickness of $\frac{1}{4}$ inch $\pm\frac{1}{32}$ inch (6.3 mm \pm .8 mm). The foam shall not be treated with a flame retardant chemical.

(2) *Conditioning*. The test specimens, cigarettes, laundered sheets or sheeting material, foam and felt shall be conditioned as described in §1632.4(c).

(3) *Specimen preparation*. (i) Place 907.2 \pm 4 grams (two pounds) of cotton felt in the test box, allowing the felt to protrude above the opening of the box to a height of up to 3 inches (7.62 cm) at the crown.

(ii) For the first part of this test, place a 12 inches by 12 inches (30.48 cm by 30.48 cm) square urethane foam pad on top of the cotton felt. Stretch the ticking specimen over the foam pad and fasten it to the sides of the test box using a stapler or tape. Be careful to avoid wrinkles in the fabric and have sufficient tautness to assure firm contact between the fabric and the filling materials in the test box.

(4) *Testing*. (i) Ticking specimens shall be tested in a testroom with atmospheric conditions of a temperature greater than 18 °C (65 °F) and a relative humidity less than 55%.

(ii) Three cigarettes shall be burned on each ticking specimen, with no more than one cigarette burning at any time. At least one cigarette shall be placed on the most prominent part of the color and weave pattern design in the ticking. If the ticking is quilted, one cigarette shall be placed over the thread or in the depression created by the quilting process. Each cigarette must be positioned no less than two inches (5.08 cm) from any other cigarette or the edge of the box.

(iii) Light and place one cigarette on the test specimen. Immediately cover the burning cigarette with a sheet test cover. The cigarette shall be well lighted but not burned more than 4 mm (0.16 inch) when placed on the test specimen. The cigarette may be supported by three straight pins such that one pin supports the cigarette at the burning end, one at the center and one at the butt. The heads of the pins must be below the upper surface of the cigarette. Upon completion of the three cigarette burns and removal of the fabric and foam specimens, remove all of the char or heat discoloration on the cotton felt as stated in §1632.6(e)(v)(B). Fresh new felt shall be added to replace the discarded fibers in the amount necessary to maintain the full 907.2 \pm 4

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grams (two pounds) of felt for each test.

(iv) If the cigarette extinguishes before burning its full length, the test must be repeated with a freshly lit cigarette on a different portion of the ticking specimen until either three cigarettes have burned their full lengths or three cigarettes have extinguished. Report result for each cigarette as pass or fail as defined in Test Criterion §1632.6(d)(2). An obvious ignition is recorded as a failure.

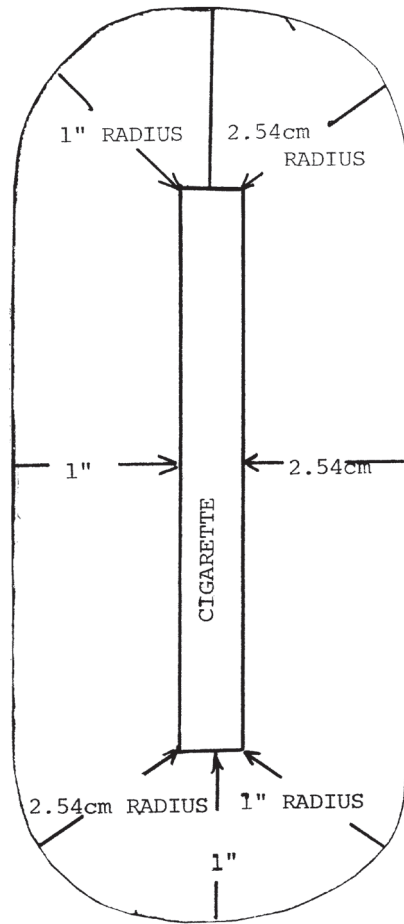
(v) If ignition occurs with any of the three cigarette burns on the ticking specimen, terminate testing of that specimen and classify according to §1632.6(d)(4).

(vi) If all cigarette test locations meet the Test Criterion in §1632.6(d)(2), repeat procedure outlined in §1632.6(e)(4)(iii) for the second part of the test with new ticking specimens that will be retested directly over the cotton felt, without the urethane foam pad. Remove the urethane foam pad and charred or heat discolored area from the cotton felt as specified in

§1632.6(e)(v)(B) prior to testing. Record the test results as pass or fail as defined in *Test Criterion* §1632.6(d)(2) and classify according to §1632.6(d)(4).

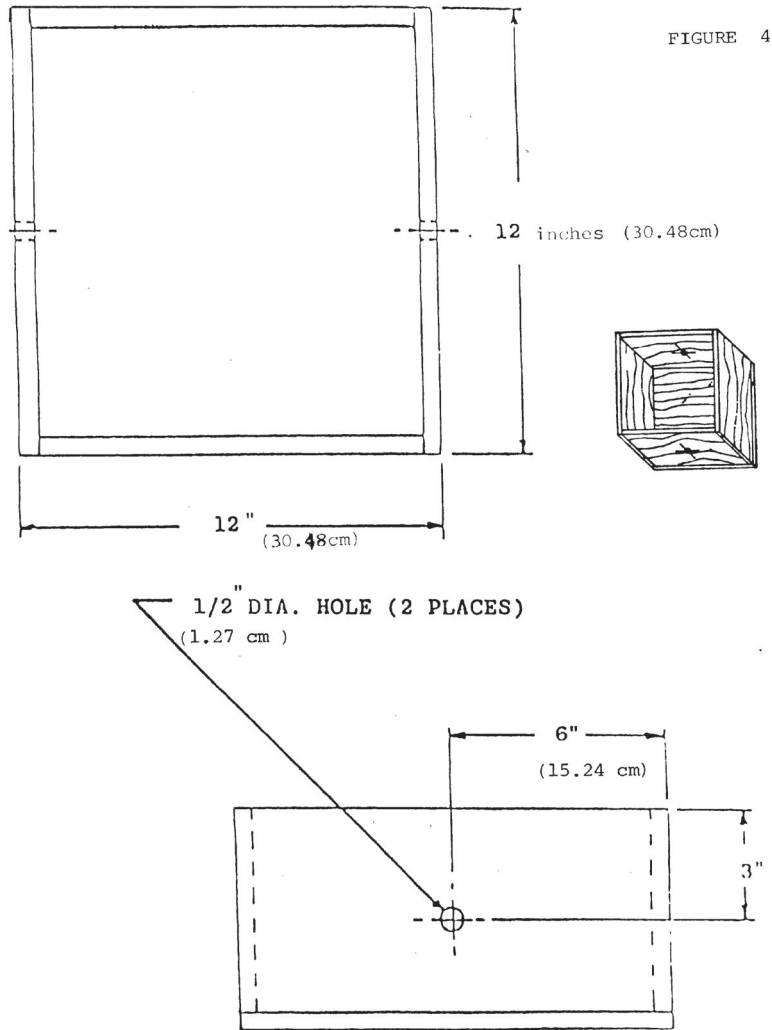
(5) *Records.* Records of any ticking classification test results relied upon by the mattress or mattress pad manufacturer or importer shall be maintained in accordance with rules and regulations established by the Consumer Product Safety Commission in §1632.31(c). As provided by §1632.31(c)(6), manufacturers or importers of mattresses or mattress pads may rely on a certification of compliance with this section of the standard provided by the ticking manufacturer or distributor; however, if a mattress or mattress pad fails to comply with the standard, the mattress or mattress pad manufacturer or importer must assume full responsibility under the standard. The Commission has no authority under this standard to compel ticking manufacturers or distributors to comply with this section or to establish, maintain and provide upon request, the records specified in §1632.31(c).

FIGURE 3



1 INCH (2.54cm) TEMPLATE

TOLERANCES + 1/32" - 0"



TEST BOX

MATERIAL 1/2" PLYWOOD

TOLERANCES + 1/32 " - 0"

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§ 1632.7 Tape edge substitution procedure.

(a) Sections 1632.1 (j) and (k) provide in part that “a change in existing material shall be deemed a difference in materials for purposes of prototype definition unless it is shown to the satisfaction of the Consumer Product Safety Commission that such change will not reduce the ignition resistance” of the mattress prototype or the mattress pad prototype.

(b) The Commission will regard a showing “to the satisfaction of the Consumer Product Safety Commission” to have been made with respect to materials substitution of items such as flange materials and tapes at the tape edge under the following circumstances:

(1) The mattress or mattress pad prototype has been qualified previously under the provisions of § 1632.3; and

(2) A substitution of materials involving only tape edge construction is contemplated; and

(3) A prototype mattress or mattress pad incorporating the substitute materials has been tested in accordance with applicable procedures in § 1632.4 by placing 36 cigarettes (18 per surface—9 bare and 9 two-sheet) at tape edge locations with no test failure as determined by applying the test criterion of § 1632.3(b); and

(4) Records are maintained setting forth the details of the materials substitution and showing the results of the testing referred to in paragraph (b)(3) of this section. The records are to be maintained in accordance with regulations established by the Consumer Product Safety Commission (see § 1632.31).

§ 1632.8 Glossary of terms.

(a) *Absorbent pads.* Pad used on top of mattress. Designed to absorb urine thereby reducing skin irritation, can be one time use.

(b) *Basket pad.* Cushion for use in an infant basket.

(c) *Bunk beds.* A tier of beds, usually two or three, in a high frame complete with mattresses (see fig. 5).

(d) *Car bed.* Portable bed used to carry a baby in an automobile.

(e) *Carriage pad.* Cushion to go into a baby carriage.

(f) *Chaise lounge.* An upholstered couch chair or a couch with a chair back. It has a permanent back rest, no arms, and sleeps one (see fig. 5).

(g) *Convertible sofa.* An upholstered sofa that converts into an adult sized bed. Mattress unfolds out and up from under the seat cushioning (see fig. 5).

(h) *Convoluting foam pad.* A bed pad made of foam in an egg-crate configuration not encased in ticking.

(i) *Corner groups.* Two twin size bedding sets on frames, usually slipcovered, and abutted to a corner table. They also usually have loose bolsters slipcovered (see fig. 5).

(j) *Crib bumper.* Padded cushion which goes around three or four sides inside a crib to protect the baby. Can also be used in a playpen.

(k) *Daybed.* Daybed has foundation, usually supported by coil or flat springs, mounted between arms on which mattress is placed. It has permanent arms, no backrest, and sleeps one (see fig. 5).

(l) *Decubitus pad.* Designed to prevent or assist in the healing of decubitus ulcers (bed sores). Flat decubitus pads are covered by the standard. Convoluting decubitus pads made entirely from foam are not covered by the standard.

(m) *Dressing table pad.* Pad to cushion a baby on top of a dressing table.

(n) *Drop-arm loveseat.* When side arms are in vertical position, this piece is a loveseat. The adjustable arms can be lowered to one of four positions for a chaise lounge effect or a single sleeper. The vertical back support always remains upright and stationary (see fig. 5).

(o) *Futon.* A flexible mattress generally used on the floor that can be folded or rolled up for storage. It usually consists of resilient material covered by ticking.

(p) *High riser.* This is a frame of sofa seating height with two equal size mattresses without a backrest. The frame slides out with the lower bed and rises to form a double or two single beds (see fig. 5).

(q) *Infant carrier and lounge pad.* Pad to cushion a baby in an infant carrier.

(r) *Mattress foundation.* Consists of any surface such as foam, box springs or other, upon which a mattress is

placed to lend it support for use in sleeping upon.

(s) *Pillow*. Cloth bag filled with resilient material such as feathers, down, sponge rubber, urethane, or fiber used as the support for the head of a person.

(t) *Playpen pad*. Cushion used on the bottom of a playpen.

(u) *Portable crib*. Smaller size than a conventional crib. Can usually be converted into a playpen.

(v) *Press-back lounges*. Longer and wider than conventional sofa beds. When the lounge seat is pressed lightly, it levels off to form, with the seat, a flat sleeping surface. The seat slopes, in the sitting position, for added comfort (see fig. 5).

(w) *Push-back sofa*. When pressure is exerted on the back of the sofa, it becomes a bed. When the back is lifted, it becomes a sofa again. Styled in tight or loose cushions (see fig. 5).

(x) *Roll-away-bed*. Portable bed which has frame which folds in half with the mattress for compact storage.

(y) *Sleep lounge*. Upholstered seating section is mounted on a sturdy frame. May have bolster pillows along the wall as backrests or may have attached headrests (see fig. 5).

(z) *Stroller pad*. Cushion used in a baby stroller.

(aa) *Sofa bed*. These are pieces in which the back of the sofa swings down flat with the seat to form the sleeping surface. All upholstered. Some sofa

beds have bedding boxes for storage of bedding. There are two types: the one-piece, where the back and seat are upholstered as a unit, supplying an unbroken sleeping surface; and the two-piece, where back and seat are upholstered separately (see fig. 5).

(bb) *Sofa lounge*—(includes glideouts). Upholstered seating section is mounted on springs and in a special frame that permit it to be pulled out for sleeping. Has upholstered backrest bedding box that is hinged. Glideouts are single sleepers with sloping seats and backrests. Seat pulls out from beneath back and evens up to supply level sleeping surface (see fig. 5).

(cc) *Studio couch*. Consists of upholstered seating section on upholstered foundation. Many types convert to twin beds (see fig. 5).

(dd) *Studio divan*. Twin size upholstered seating section with foundation is mounted on metal bed frame. Has no arms or backrest, and sleeps one (see fig. 5).

(ee) *Trundle bed*. A low bed which is rolled under a larger bed. In some lines, the lower bed springs up to form a double or two single beds as in a high riser (see fig. 5).

(ff) *Twin studio divan*. Frames which glide out (but not up) and use seat cushions, in addition to upholstered foundation to sleep two. Has neither arms nor back rest (see fig. 5).

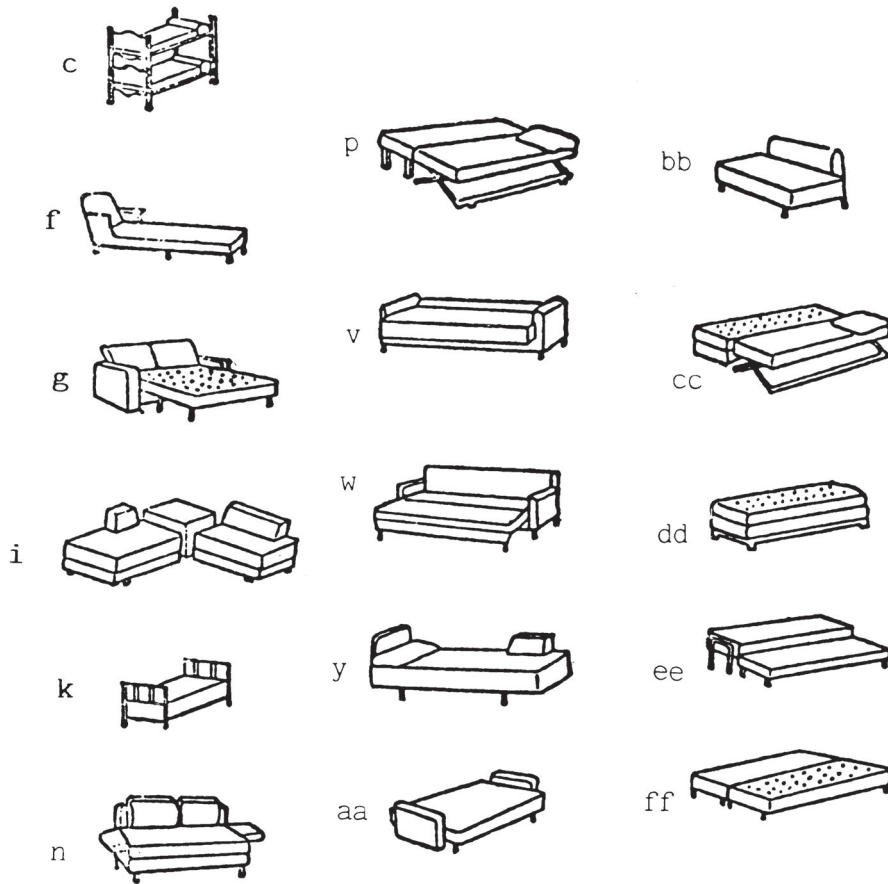


Figure 5

Effective date: The amended standard shall become effective on April 10, 1985. As required by section 4(b) of the Flammable Fabrics Act (15 U.S.C. 1193(b)), mattresses and mattress pads which are in inventory or with the trade on the effective date of the amended standard are exempt from its requirements, but must comply with all applicable requirements of the original standard.

Subpart B—Rules and Regulations

§ 1632.31 Mattresses/mattress pads—labeling, recordkeeping, guaranties and “one of a kind” exemption.

(a) *Definitions.* For the purposes of this section, the following definitions apply:

(1) *Standard for the Flammability of Mattresses or Standard* means the Standard for the Flammability of Mattresses and Mattress Pads (FF 4-72, amended), (16 CFR part 1632, subpart A).

(2) The definition of terms set forth in the §1632.1 of the Standard shall also apply to this section.

(b) *Labeling.* (1) All mattress pads which contain a chemical fire retardant shall be labeled with precautionary instructions to protect the pads from agents or treatments which are known to cause deterioration of their flame resistance. Such labels shall be permanent, prominent, conspicuous, and legible.

(2) If a mattress pad contains a chemical fire retardant, it shall be prominently, conspicuously, and legibly labeled with the letter "T".

(3) Each mattress or mattress pad subject to the Standard shall bear a permanent, accessible, and legible label containing the month and year of manufacture and the location of the manufacturer. (See §1632.1(i) of the Amended Standard.)

(4) The information required on labels by this section shall be set forth separately from any other information appearing on such label. Other information, representations, or disclosures, appearing on labels required by this section or elsewhere on the item, shall not interfere with, minimize, detract from, or conflict with the required information.

(5) No person, other than the ultimate consumer, shall remove or mutilate, or cause or participate in the removal or mutilation of, any label required by this section to be affixed to any item.

(6) Products intended for one time use (see §1632.5(b)(1)(i)) are not subject to the requirements of paragraphs (1) and (2) of this §1632.31(b).

(c) *Records—manufacturers, importers, or persons initially introducing items into commerce.* Every manufacturer, importer, or other person initially introducing into commerce mattresses or mattress pads subject to the standard, irrespective of whether guarantees are issued relative thereto, shall maintain the records hereinafter specified.

(1) Manufacturing specifications and description of each mattress or mattress pad prototype with an assigned prototype identification number.

(2) Test results and details of each prototype test performed in accordance with §1632.4 or §1632.5, including proto-

type identification number, ticking classification if known, test room condition, cigarette locations, number of relights for each location, whether each cigarette location passed or failed, name and signature of person conducting the test and date of test. These records shall include a certification by the person overseeing the testing as to the test results and that the test was carried out in accordance with the Standard.

(3) Photograph (color or black and white) of the bare surface of each mattress or mattress pad tested, in accordance with §1632.4 or §1632.5, with the prototype identification number of the mattress or mattress pad and a clear designation as to which part of the mattress or mattress pad was sheeted and which part was tested bare.

(4) Records to support any determination that a particular material, other than the ticking or tape edge material used in a mattress or mattress pad prototype, did not influence the ignition resistance of the prototype and could be substituted by another material. Such record should include photographs or physical specimens.

(5) Manufacturing specifications and description of any new ticking or tape edge material substituted in accordance with §1632.6 or §1632.7, with the identification number of the prototype involved.

(6) The test results and details of any ticking classification test conducted in accordance with §1632.6, including the ticking classification (A, B, or C), the test room condition, the number of relights, whether each cigarette location passed or failed, the name and signature of the person conducting the test and the date of the test, or a certification from the ticking supplier. The certification should state the ticking classification and that the ticking was tested in accordance with §1632.6.

(7) The test results and details of any test of tape edge materials conducted in accordance with §1632.7, including prototype identification number, test room condition, number of relights, whether each cigarette passed or failed, name and signature of person conducting the test and date of test. The record shall include a certification by the person overseeing the testing as to

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the test results and that the test was carried out in accordance with §1632.7.

(8) Photograph (color or black and white) of the bare surface of each mattress or mattress pad tested in accordance with §1632.7, with the prototype identification number of the mattress or mattress pad and a clear designation as to which part of the mattress or mattress pad was sheeted and which part was tested bare.

(9) Details of any approved alternate laundering procedure used in laundering mattress pads required by the Standard to be laundered during testing.

(10) Identification, composition, and details of the application of any flame retardant treatments employed relative to mattress pads or mattress pad components.

(11) Disposition of all failing or rejected prototype mattress or mattress pads. Such records must demonstrate that the items were retested and reworked in accordance with the Standard prior to sale or distribution and that such retested or reworked mattresses or mattress pads comply with the Standard, or must otherwise show the disposition of such items.

(12) The records required by this paragraph shall be maintained for as long as the prototype is in production, the ticking is being used on the mattresses or mattress pad prototype, and/or the tape edge material is being used on the mattress or mattress pad prototype, and shall be retained for 3 years thereafter.

(d) *Tests for guaranty purposes.* Reasonable and representative tests for the purpose of issuing a guaranty under section 8 of the Act for mattress or mattress pads subject to the Standard shall be those prototype and substitution tests performed, pursuant to the requirements of the Standard.

(e) *Compliance with this section.* No person subject to the Flammable Fabrics Act shall manufacture for sale, import, distribute, or otherwise market or handle any mattress or mattress pad which is not in compliance with §1632.31.

(f) *“One of a kind” exemption for physician prescribed mattresses and mattress pads.* (1) A mattress or mattress pad manufactured in accordance with a

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physician’s written prescription or manufactured in accordance with other comparable written medical therapeutic specification, to be used in connection with the treatment or management of a named individual’s physical illness or injury, shall be considered a “one of a kind mattress” and shall be exempt from testing under the Standard pursuant to §1632.2(b)(4) thereof: Provided, that the mattress bears a permanent, conspicuous and legible label which states:

WARNING: This mattress or mattress pad may be subject to ignition and hazardous smoldering from cigarettes. It was manufactured in accordance with a physician’s prescription and has not been tested under the Federal Standard for the Flammability of Mattresses (FF 4-72).

Such labeling must be attached to the mattress or mattress pad so as to remain on or affixed thereto for the useful life of the mattress or mattress pad. The label must be at least 40 square inches (250 sq. cm) with no linear dimension less than 5 inches (12.5 cm). The letters in the word “WARNING” shall be no less than 0.5 inch (1.27 cm) in height and all letters on the label shall be in a color which contrasts with the background of the label. The warning statement which appears on the label must also be conspicuously displayed on the invoice or other sales papers that accompany the mattress in commerce from the manufacturer to the final point of sale to a consumer.

(2) The manufacturer of a mattress or mattress pad exempted from testing under this paragraph shall, in lieu of the records required to be kept by paragraph (c) of this section, retain a copy of the written prescription or other comparable written medical therapeutic specification for such mattress or mattress pad during a period of three years, measured from the date of manufacture.

(3) For purposes of this regulation the term *physician* shall mean a physician, chiropractor or osteopath licensed or otherwise permitted to practice by any State of the United States.

APPENDIX C

Subpart C—Interpretations and Policies

§§ 1632.61–1632.62 [Reserved]

§ 1632.63 Policy clarification on renovation of mattress.

(a) Section 3 of the Flammable Fabrics Act (15 U.S.C. 1192) prohibits, among other things, the “manufacture for sale” of any product which fails to conform to an applicable standard issued under the act. The standard for the Flammability of Mattresses, as amended (FF 4–72) (subpart A of this part), issued pursuant to the act, provides that, with certain exceptions, mattress must be tested according to a prescribed method. The standard does not exempt renovation; nor does it specifically refer to renovation.

(b) The purpose of this document is to inform the public that mattresses renovated for sale are considered by the Commission to be mattresses manufactured for sale and, therefore, subject to the requirements of the Mattress Standard. The Commission believes that this policy clarification will better protect the public against the unreasonable risk of fires leading to death, personal injury or significant property damage, and assure that purchasers of renovated mattresses receive the same protection under the Flammable Fabrics Act as purchasers of new mattresses.

(c) For purposes of this document, mattress renovation includes a wide range of operations. Replacing the ticking or batting, stripping a mattress to its springs, rebuilding a mattress, or replacing components with new or recycled materials, are all part of the process of renovation. Any one, or any combination of one or more, of these steps in mattress renovation is considered to be mattress manufacture.

(d) If the person who renovates the mattress intends to retain the renovated mattress for his or her own use, or if a customer or a renovator merely hires the services of the renovator and intends to take back the renovated mattress for his or her own use, “manufacture for sale” has not occurred and such a renovated mattress is not subject to the mattress standard.

(e) However, if a renovated mattress is sold or intended for sale, either by the renovator or the owner of the mattress who hires the services of the renovator, such a transaction is considered to be “manufacture for sale”.

(f) Accordingly, mattress renovation is considered by the Commission to be “manufacture for sale” and, therefore, subject to the Mattress Standard, when renovated mattresses are sold or intended for sale by a renovator or the customer of the renovator.

(g) A renovator who believes that certain mattresses are entitled to one-of-a-kind exemption, may present relevant facts to the Commission and petition for an exemption. Renovators are expected to comply with all the testing requirements of the Mattress Standard until an exemption is approved.

PART 1633—STANDARD FOR THE FLAMMABILITY (OPEN FLAME) OF MATTRESS SETS

Subpart A—The Standard

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- FIGURE 3 TO PART 1633—DETAILS OF HORIZONTAL BURNER HEAD
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Subpart C—Interpretations and Policies

§§ 1632.61–1632.62 [Reserved]

§ 1632.63 Policy clarification on renovation of mattress.

(a) Section 3 of the Flammable Fabrics Act (15 U.S.C. 1192) prohibits, among other things, the “manufacture for sale” of any product which fails to conform to an applicable standard issued under the act. The standard for the Flammability of Mattresses, as amended (FF 4–72) (subpart A of this part), issued pursuant to the act, provides that, with certain exceptions, mattress must be tested according to a prescribed method. The standard does not exempt renovation; nor does it specifically refer to renovation.

(b) The purpose of this document is to inform the public that mattresses renovated for sale are considered by the Commission to be mattresses manufactured for sale and, therefore, subject to the requirements of the Mattress Standard. The Commission believes that this policy clarification will better protect the public against the unreasonable risk of fires leading to death, personal injury or significant property damage, and assure that purchasers of renovated mattresses receive the same protection under the Flammable Fabrics Act as purchasers of new mattresses.

(c) For purposes of this document, mattress renovation includes a wide range of operations. Replacing the ticking or batting, stripping a mattress to its springs, rebuilding a mattress, or replacing components with new or recycled materials, are all part of the process of renovation. Any one, or any combination of one or more, of these steps in mattress renovation is considered to be mattress manufacture.

(d) If the person who renovates the mattress intends to retain the renovated mattress for his or her own use, or if a customer or a renovator merely hires the services of the renovator and intends to take back the renovated mattress for his or her own use, “manufacture for sale” has not occurred and such a renovated mattress is not subject to the mattress standard.

(e) However, if a renovated mattress is sold or intended for sale, either by the renovator or the owner of the mattress who hires the services of the renovator, such a transaction is considered to be “manufacture for sale”.

(f) Accordingly, mattress renovation is considered by the Commission to be “manufacture for sale” and, therefore, subject to the Mattress Standard, when renovated mattresses are sold or intended for sale by a renovator or the customer of the renovator.

(g) A renovator who believes that certain mattresses are entitled to one-of-a-kind exemption, may present relevant facts to the Commission and petition for an exemption. Renovators are expected to comply with all the testing requirements of the Mattress Standard until an exemption is approved.

PART 1633—STANDARD FOR THE FLAMMABILITY (OPEN FLAME) OF MATTRESS SETS

Subpart A—The Standard

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- 1633.10 Definitions.
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- FIGURE 1 TO PART 1633—TEST ASSEMBLY, SHOWN IN FURNITURE CALORIMETER (CONFIGURATION A)
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- FIGURE 3 TO PART 1633—DETAILS OF HORIZONTAL BURNER HEAD
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SCREWS) IN RELATION TO, PORTABLE FRAME ALLOWING BURNER HEIGHT ADJUSTMENT

FIGURE 7 TO PART 1633—ELEMENTS OF PROPANE FLOW CONTROL FOR EACH BURNER

FIGURE 8 TO PART 1633—JIG FOR SETTING MATTRESSES AND FOUNDATION SIDES IN SAME PLANE

FIGURE 9 TO PART 1633—BURNER PLACEMENTS ON MATTRESS/FOUNDATION

FIGURE 10 TO PART 1633—JIG FOR SETTING BURNERS AT PROPER DISTANCES FROM MATTRESS/FOUNDATION

FIGURE 11 TO PART 1633—DIAGRAMS FOR GLOSSARY OF TERMS

FIGURE 12 TO PART 1633—LABELS FOR DOMESTIC MATTRESS WITH FOUNDATION

FIGURE 13 TO PART 1633—LABELS FOR IMPORTED MATTRESS WITH FOUNDATION

FIGURE 14 TO PART 1633—LABEL FOR DOMESTIC MATTRESS ALONE AND WITH FOUNDATION

FIGURE 15 TO PART 1633—LABEL FOR IMPORTED MATTRESS ALONE AND WITH FOUNDATION

FIGURE 16 TO PART 1633—LABEL FOR DOMESTIC MATTRESS ONLY

FIGURE 17 TO PART 1633—LABEL FOR IMPORTED MATTRESS ONLY

AUTHORITY: 15 U.S.C. 1193, 1194

SOURCE: 71 FR 13498, Mar. 15, 2006, unless otherwise noted.

Subpart A—The Standard

§ 1633.1 Purpose, scope and applicability.

(a) *Purpose.* This part 1633 establishes flammability requirements that all mattress sets must meet before sale or introduction into commerce. The purpose of the standard is to reduce deaths and injuries associated with mattress fires by limiting the size of the fire generated by a mattress set during a thirty minute test.

(b) *Scope.* (1) All mattress sets, as defined in §1633.2(c), manufactured, imported, or renovated on or after the effective date of this standard are subject to the requirements of the standard.

(2) One-of-a-kind mattress sets may be exempted from testing under this standard in accordance with §1633.13(c).

(c) *Applicability.* The requirements of this part 1633 shall apply to each “manufacturer” (as that term is defined in §1633.2(k)) of mattress sets which are manufactured for sale in commerce.

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§ 1633.2 Definitions.

In addition to the definitions given in section 2 of the Flammable Fabrics Act as amended (15 U.S.C. 1191), the following definitions apply for purposes of this part 1633.

(a) *Mattress* means a resilient material or combination of materials enclosed by a ticking (used alone or in combination with other products) intended or promoted for sleeping upon. This includes mattresses that have undergone renovation as defined in paragraph (d) of this section.

(1) This term includes, but is not limited to, adult mattresses, youth mattresses, crib mattresses (including portable crib mattresses), bunk bed mattresses, futons, flip chairs without a permanent back or arms, sleeper chairs, and water beds or air mattresses if they contain upholstery material between the ticking and the mattress core. Mattresses used in or as part of upholstered furniture are also included; examples are convertible sofa bed mattresses, corner group mattresses, day bed mattresses, roll-away bed mattresses, high risers, and trundle bed mattresses. See §1633.9 Glossary of terms, for definitions of these items.

(2) This term excludes mattress pads, mattress toppers (items with resilient filling, with or without ticking, intended to be used with or on top of a mattress), sleeping bags, pillows, liquid and gaseous filled tickings, such as water beds and air mattresses that contain no upholstery material between the ticking and the mattress core, upholstered furniture which does not contain a mattress, and juvenile product pads such as car bed pads, carriage pads, basket pads, infant carrier and lounge pads, dressing table pads, stroller pads, crib bumpers, and playpen pads. See §1633.9 Glossary of terms, for definitions of these items.

(b) *Foundation* means a ticking covered structure used to support a mattress or sleep surface. The structure may include constructed frames, foam, box springs, or other materials, used alone or in combination.

(c) *Mattress set* means either a mattress and foundation labeled by the manufacturer for sale as a set, or a mattress labeled by the manufacturer for sale without any foundation.

(d) *Renovation* means altering an existing mattress set for the purpose of resale.

(1) This term includes any one, or any combination of the following: replacing the ticking or batting, stripping a mattress to its springs, rebuilding a mattress, or replacing components with new or recycled materials.

(2) This term excludes alterations if the person who renovates the mattress intends to retain the renovated mattress for his or her own use, or if a customer or a renovator merely hires the services of the renovator and intends to take back the renovated mattress for his or her own use.

(e) *Ticking* means the outermost layer of fabric or related material of a mattress or foundation. It does not include any other layers of fabric or related materials quilted together with, or otherwise attached to, the outermost layer of fabric or related material.

(f) *Upholstery material* means all material, either loose or attached, between the mattress ticking and the core of a mattress.

(g) *Edge* means the seamed, unseamed or taped border edge of a mattress or foundation that joins the top and/or bottom with the side panels.

(h) *Tape edge* means an edge made by using binding tape to encase and finish raw edges.

(i) *Binding tape* means a fabric strip used in the construction of some edges.

(j) *Seam thread* means the thread used to form stitches in construction features, seams, and tape edges.

(k) *Manufacturer* means an individual plant or factory at which mattress sets are manufactured or assembled. For purposes of this part 1633, importers and renovators are considered manufacturers.

(l) *Prototype* means a specific design of mattress set that serves as a model for production units intended to be introduced into commerce and is the same as the production units with respect to materials, components, design and methods of assembly. A mattress intended for sale with a foundation(s) shall be considered a separate and distinct prototype from a mattress intended for sale without a foundation.

(m) *Prototype developer* means a third party that develops a prototype for use by a manufacturer. Such prototypes may be qualified by either the prototype developer or by the manufacturer.

(n) *Qualified prototype* means a prototype that has been tested in accordance with §1633.4(a) and meets the criteria stated in §1633.3(b).

(o) *Confirmed prototype* means a prototype that is part of a pooling arrangement and is the same as a qualified prototype with respect to materials, components, design and methods of assembly and has been tested in accordance with §1633.5(a)(3) and meets the criteria stated in §1633.3(b).

(p) *Subordinate prototype* means a mattress set that is based on a qualified or confirmed prototype and is the same as the qualified or confirmed prototype, except as permitted by §1633.4(b). A subordinate prototype is considered to be represented by a qualified or confirmed prototype and need not be tested in accordance with §1633.4(a) or §1633.5(a)(3).

(q) *Prototype pooling* means a cooperative arrangement—whereby one or more manufacturers build mattress sets based on a qualified prototype produced by another manufacturer or prototype developer. A manufacturer who relies on another manufacturer's or prototype developer's qualified prototype must perform a confirmation test on the mattress set it manufactures.

(r) *Confirmation test* means a pre-market test conducted by a manufacturer who is relying on a qualified prototype produced by another manufacturer or prototype developer. A confirmation test must be conducted in accordance with the procedures set forth in §1633.7 and meet the criteria in §1633.3(b).

(s) *Production lot* means any quantity of finished mattress sets that are produced in production intervals defined by the manufacturer, and are intended to replicate a specific qualified, confirmed or subordinate prototype that complies with this part 1633.

(t) *Specimen* means a mattress set tested under this regulation.

(u) *Twin size* means any mattress with the dimensions 38 inches (in) (965 millimeters) × 74.5 in. (1892 mm); all dimensions may vary by ±½ in. (±13 mm).

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(v) *Core* means the main support system that may be present in a mattress, such as springs, foam, water bladder, air bladder, or resilient filling.

§ 1633.3 General requirements.

(a) *Summary of test method.* The test method set forth in §1633.7 measures the flammability (fire test response characteristics) of a mattress specimen by exposing the specimen to a specified flaming ignition source and allowing it to burn freely under well-ventilated, controlled environmental conditions. The flaming ignition source shall be a pair of propane burners. These burners impose differing fluxes for differing times on the top and sides of the specimen. During and after this exposure, measurements shall be made of the time-dependent heat release rate from the specimen, quantifying the energy generated by the fire. The rate of heat release must be measured by means of oxygen consumption calorimetry.

(b) *Test criteria.* (1) When testing the mattress set in accordance with the test procedure set forth in §1633.7, the specimen shall comply with both of the following criteria:

(i) The peak rate of heat release shall not exceed 200 kilowatts (“kW”) at any time within the 30 minute test; and

(ii) The total heat release shall not exceed 15 megajoules (“MJ”) for the first 10 minutes of the test.

(2) In the interest of safety, the test operator should discontinue the test and record a failure if a fire develops to such a size as to require suppression for the safety of the facility.

(c) *Testing of mattress sets.* Mattresses labeled for sale with a foundation shall be tested with such foundation. Mattresses labeled for sale without a foundation shall be tested alone.

(d) *Compliance with this standard.* Each mattress set manufactured, imported, or renovated on or after the effective date of the standard shall meet the test criteria specified in paragraph (b) of this section and otherwise comply with all applicable requirements of this part 1633.

§ 1633.4 Prototype testing requirements.

(a) Except as otherwise provided in paragraph (b) of this section, each

manufacturer shall cause three specimens of each prototype to be tested according to §1633.7 and obtain passing test results according to §1633.3(b) before selling or introducing into commerce any mattress set based on that prototype, unless the manufacturer complies with the prototype pooling and confirmation testing requirements in §1633.5.

(b) Notwithstanding the requirements of paragraph (a) of this section, a manufacturer may sell or introduce into commerce a mattress set that has not been tested according to §1633.7 if that mattress set differs from a qualified or confirmed prototype only with respect to:

(1) Mattress/foundation length and width, not depth (*e.g.*, twin, queen, king);

(2) Ticking, unless the ticking of the qualified prototype has characteristics (such as chemical treatment or special fiber composition) designed to improve performance on the test prescribed in this part; and/or

(3) Any component, material, design or method of assembly, so long as the manufacturer can demonstrate on an objectively reasonable basis that such differences will not cause the mattress set to exceed the test criteria specified in §1633.3(b).

(c) All tests must be conducted on specimens that are no smaller than a twin size, unless the largest size mattress set produced is smaller than a twin size, in which case the largest size must be tested.

(d)(1) If each of the three specimens meets both the criteria specified in §1633.3(b), the prototype shall be qualified. If any one (1) specimen fails to meet the test criteria of §1633.3(b), the prototype is not qualified.

(2) Any manufacturer may produce a mattress set for sale in reliance on prototype tests performed before the effective date of this Standard, provided:

(i) The manufacturer has documentation showing that such tests were conducted in accordance with all requirements of this section and §1633.7 and yielded passing results according to the test criteria of §1633.3(b);

(ii) Any tests conducted more than 30 days after publication of this standard in the FEDERAL REGISTER must comply

with the recordkeeping requirements in §1633.11;

(iii) Such mattress sets may be used for prototype pooling only if the manufacturer complies with applicable recordkeeping requirements in §1633.11; and

(iv) Such mattress sets may serve as the basis for a subordinate prototype only if the manufacturer has all records required by §1633.11.

§1633.5 Prototype pooling and confirmation testing requirements.

(a) *Prototype pooling.* One or more manufacturers may rely on a qualified prototype produced by another manufacturer or prototype developer provided that:

(1) The prototype meets the requirements of §1633.4;

(2) The mattress sets being produced are the same as the qualified prototype with respect to materials, components, design and methods of assembly; and

(3) The manufacturer producing mattress sets in reliance on a qualified prototype has performed a confirmation test on at least one (1) Specimen of the mattress set it produces in accordance with §1633.7. The tested specimen must meet the criteria under §1633.3(b) before any mattress sets based on the qualified prototype may be sold or introduced into commerce.

(b) *Confirmation test failure.* (1) If the confirmation test specimen fails to meet the criteria of §1633.3(b), the manufacturer thereof shall not sell any mattress set based on the same qualified prototype until that manufacturer takes corrective measures, tests a new specimen, and the new specimen meets the criteria of §1633.3(b).

(2) If a confirmation test specimen fails to meet the criteria of §1633.3(b), the manufacturer thereof must notify the manufacturer of the prototype of the test failure.

§1633.6 Quality assurance requirements.

(a) *Quality assurance.* Each manufacturer shall implement a quality assurance program to ensure that mattress sets manufactured for sale are the same as the qualified and/or confirmed prototype on which they are based with respect to materials, components, de-

sign and methods of assembly, except as permitted by §1633.4(b). At a minimum these procedures shall include:

(1) Controls, including incoming inspection procedures, of all mattress set materials, components and methods of assembly to ensure that they are the same as those used in the prototype on which they are based;

(2) Designation of a production lot that is represented by the prototype; and

(3) Inspection of mattress sets produced for sale sufficient to demonstrate that they are the same as the prototype on which they are based with respect to materials, components, design and methods of assembly.

(b) *Production testing.* Manufacturers are encouraged to conduct, as part of the quality assurance program, random testing of mattress sets being produced for sale according to the requirements of §§1633.3 and 1633.7.

(c) *Failure of mattress sets produced for sale to meet flammability standard—*(1) *Sale of mattress sets.* If any test performed for quality assurance yields results which indicate that any mattress set of a production lot does not meet the criteria of §1633.3(b), or if a manufacturer obtains test results or other evidence that a component or material or construction/assembly process used could negatively affect the test performance of the mattress set as set forth in §1633.3(b), the manufacturer shall cease production and distribution in commerce of such mattress sets until corrective action is taken.

(2) *Corrective action.* A manufacturer must take corrective action when any mattress set manufactured or imported for sale fails to meet the flammability test criteria set forth in §1633.3(b).

§1633.7 Mattress test procedure.

(a) *Apparatus and test materials—*(1) *Calorimetry.* The rate of heat release must be measured by means of oxygen consumption calorimetry. The calibration should follow generally accepted practices for calibration. The calorimetry system shall be calibrated at a minimum of two (2) calibration points—at 75 kW and 200 kW.

(2) *Test area.* The test area must have either Test Configuration A or B. The

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test area conditions shall be maintained at a temperature greater than 15 °C (59 °F) and less than 27 °C (80.6 °F) and a relative humidity less than 75 percent.

(i) *Test configuration A. (an open calorimeter (or furniture calorimeter)).* In this configuration, the specimen to be tested is placed under the center of an open furniture calorimeter. Figure 1 of this part shows the test assembly atop a bed frame and catch surface. The specimen shall be placed under an open hood which captures the entire smoke plume and is instrumented for heat release rate measurements. The area surrounding the test specimen in an open calorimeter layout shall be sufficiently large that there are no heat re-radiation effects from any nearby materials or objects. The air flow to the test specimen should be symmetrical from all sides. The air flow to the calorimeter hood shall be sufficient to ensure that the entire fire plume is captured, even at peak burning. Skirts may be placed on the hood periphery to help assure this plume capture, if necessary, though they must not be of such an excessive length as to cause the incoming flow to disturb the burning process. Skirts must also not heat up to the point that they contribute significant re-radiation to the test specimen. The air supply to the hood shall be sufficient that the fire is not in any way limited or affected by the available air supply. The fire plume should not enter the hood exhaust duct. Brief (seconds) flickers of flame that occupy only a minor fraction of the hood exhaust duct inlet cross-section are acceptable since they do not signify appreciable suppression of flames.

(ii) *Test configuration B.* The test room shall have dimensions 10 ft. by 12 ft. by 8 ft. (3048 mm × 3658 mm × 2438 mm) high. The specimen is placed within the burn room. All smoke exiting from the room is caught by a hood system instrumented for heat release rate measurements. The room shall have no openings permitting air infiltration other than a doorway opening 38 in ±0.25 in by 80 in ±0.25 in (965 mm ±6.4 mm × 2032 mm ±6.4 mm) located as indicated in Figure 2 of this part and other small openings as nec-

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essary to make measurements. The test room shall be constructed of wood or metal studs and shall be lined with fire-rated wallboard or calcium silicate board. An exhaust hood shall be positioned outside of the doorway so as to collect all of the combustion gases. There shall be no obstructions in the air supply to the set-up.

(3) *Location of test specimen.* The location of the test specimen is shown in Figure 2 of this part. The angled placement is intended to minimize the interaction of flames on the side surfaces of the test specimen with the room walls. One corner of the test specimen shall be 13 centimeters (cm) to 17 cm from the wall and the other corner shall be 25 cm to 30 cm from the wall. The test room shall contain no other furnishings or combustible materials except for the test specimen.

(4) *Bed frame. (i) Frame dimensions.* The specimen shall be supported around its perimeter by the bed frame with a flat surface and no edges extending up from the surface (i.e., the angle is configured down). For twin size mattresses, the specimen shall be placed on top of a welded bed frame 1.90 m by 0.99 m (75 in by 39 in) made from 40 mm (1.50 in) steel angle. If testing a size other than twin, the test frame shall similarly match the dimensions of the specimen.

(ii) *Frame height.* The frame shall be 115 mm (4.5 in) high, except if adjustments are necessary to accommodate the required burner position in paragraph (h)(2)(ii) of this section. The height of the test frame shall also be adjusted, as necessary, so that the burner is no less than 25mm (1 in) above the supporting surface.

(iii) *Frame crosspieces.* The frame shall be completely open under the foundation except for two crosspieces, 25 mm wide (1 in) at the 1/3 length points, except when sagging of the specimen between the crosspieces exceeds 19 mm (3/4 in) below the test frame. Minimal additional crosspieces shall then be added to prevent sagging of the specimen.

(5) *Catch pan.* The bed frame feet shall rest on a surface of either calcium silicate board or fiber cement board, 13 mm (0.5 in) thick, 2.11 m by 1.19 m (83 in by 47 in). The board serves

as a catch surface for any flaming melt/drip material falling from the bed assembly and may be the location of a pool fire that consumes such materials. This surface must be cleaned between tests to avoid build-up of combustible residues. Lining this surface with aluminum foil to facilitate cleaning is not recommended since this might increase fire intensity via reflected radiation.

(6) *Ignition source*—(i) *General*. The ignition source shall consist of two T-shaped burners as shown in Figures 3 and 4 of this part. One burner impinges flames on the top surface of the mattress. The second burner impinges flames on the side of the mattress and on the side of the foundation. Each of the burners shall be constructed from stainless steel tubing (12.7 mm diameter with 0.89 ± 0.5 mm wall thickness; 0.50 in diameter with 0.035 ± 0.002 in wall). Each burner shall incorporate a stand-off foot to set its distance from the test specimen surface (Figure 5 of this part). Both burners shall be mounted with a mechanical pivot point but the side burner is locked in place to prevent movement about this pivot in normal usage. The top burner, however, is free to rotate about its pivot during a burner exposure and is lightly weighted so as to exert a downward force on the mattress top through its stand-off foot so that the burner follows a receding top surface on the test specimen (Figure 6 of this part). The combination of burner stand-off distance and propane gas flow rate to the burners determines the heat flux they impose on the surface of the test specimen so that both of these parameters are tightly controlled.

(ii) *Top surface burner*. The T head of the top surface burner (horizontal burner, Figure 3 of this part) shall be 305 ± 2 mm (12 ± 0.08 in) long with gas tight plugs in each end. Each side of the T shall contain 17 holes equally spaced over a 135 mm length (8.5 mm ± 0.1 mm apart; 0.333 ± 0.005 in). The holes on each side shall begin 8.5 mm (0.33 in) from the centerline of the burner head. The holes shall be 1.45 mm to 1.53 mm (0.058 in to 0.061 in) in diameter (which corresponds to Grade 10 machining practice with a well formed #53 drill bit). The holes shall point 5° out of the plane of the diagram in Fig-

ure 3. This broadens the width of the heat flux profile imposed on the surface of the test specimen.

(iii) *Side surface burner*. The T head of the side surface burner (vertical burner) shall be constructed similarly to the top surface burner, as shown in Figure 4 of this part, except that its overall length shall be 254 ± 2 mm (10 ± 0.08 in). Each side of the burner head shall contain 14 holes spaced evenly over a 110 mm length (8.5 mm ± 0.1 mm apart; 0.333 ± 0.005 in). The holes shall be 1.45 mm to 1.53 mm (0.058 in to 0.061 in) in diameter (which corresponds to Grade 10 machining practice with a well formed #53 drill bit). The holes shall point 5° out of the plane of the diagram in Figure 4.

(iv) *Burner stand-off*. The burner stand-off on each burner shall consist of a collar fixed by a set screw onto the inlet tube of the burner head (Figure 5 of this part). The collar shall hold a 3 mm diameter stainless steel rod having a 12.7 mm by 51 mm by (2–2.5 mm) thick (0.5 in by 2 in by (0.08–0.10 in) thick) stainless steel pad welded on its end with its face (and long axis) parallel to the T head of the burner. The foot pad shall be displaced about 10 mm to 12 mm from the longitudinal centerline of the burner head so that it does not rest on the test specimen in an area of peak heat flux.

(v) *Burner inlet lines*. A short section (9.5 mm outer diameter (“OD”), about 80 mm long; $\frac{3}{8}$ in OD, about 3.2 in long) of copper tubing shall be placed in the inlet gas line just before the burner to facilitate making the burner nominally parallel to the test specimen surface (by a procedure described below). The copper tube on the top surface burner should be protected from excessive heat and surface oxidation by wrapping it with a suitable layer of high temperature insulation to protect the equipment. Both copper tubes are to be bent by hand in the burner alignment process. They must be replaced if they become work-hardened or crimped in any way. The gas inlet lines (12.7 mm OD stainless steel tubing; 0.50 in) serve as arms leading back to the pivot points and beyond, as shown in Figure 6 of this part. The length to the pivot for the top burner shall be approximately 1000 mm (40 in).

(vi) *Burner frame.* Figure 6 of this part shows the frame that holds the burners and their pivots, which are adjustable vertically in height. All adjustments (burner height, burner arm length from the pivot point, counterweight positions along the burner arm) are facilitated by the use of knobs or thumbscrews as the set screws. The three point footprint of the burner frame, with the two forward points on wheels, facilitates burner movement and burner stability when stationary.

(vii) *Arms.* The metal arms attached to the burners shall be attached to a separate gas control console by flexible, reinforced plastic tubing.¹ The gas control console is mounted separately so as to facilitate its safe placement outside of the test room throughout the test procedure. The propane gas lines running between the console and the burner assembly must be anchored on the assembly before running to the burner inlet arms. A 1.5 m \pm 25 mm (58 in \pm 1 in) length of flexible, reinforced tubing between the anchor point and the end of each burner inlet allows free movement of the top burner about its pivot point. The top burner arm shall have a pair of moveable cylindrical counterweights that are used, as described below, to adjust the downward force on the stand-off foot.

(viii) *Burner head.* Each burner head shall have a separate pilot light consisting of a 3 mm OD ($\frac{1}{8}$ in OD) copper tube with an independently-controlled supply of propane gas. The tube terminates within 10 mm of the center of the burner head. Care must be taken to set the pilot flame size small enough so as not to heat the test specimen before the timed burner exposure is begun.

(ix) *Flow control system.* Each burner shall have a flow control system of the type shown in Figure 7 of this part. Propane gas from a source such as a bottle is reduced in pressure to approximately 140 \pm 5 kilopascals (“kPa”) (20 \pm 1 pounds per square inch gage (“psig”)) and fed to the system shown in Figure 7 of this part. The gas flow to the burner is delivered in a square-wave manner (constant flow with rapid

onset and termination) by means of the solenoid valve upstream of the flowmeter. An interval timer (accurate to \pm 0.2 s) determines the burner flame duration. The pilot light assures that the burner will ignite when the solenoid valve opens.² The gas flow shall be set using a rotameter type of flowmeter, with a 150 mm scale, calibrated for propane. When calibrating the flowmeter, take into account that the flow resistance of the burner holes causes a finite pressure increase in the flowmeter above ambient. (If a calibration at one atmosphere is provided by the manufacturer, the flowmeter reading, at the internal pressure existing in the meter, required to get the flow rates listed below must be corrected, typically by the square root of the absolute pressure ratio. This calls for measuring the actual pressure in the flow meters when set near the correct flow values. A value roughly in the range of 1 kPa to 3 kPa—5 in to 15 in of water—can be expected.) See information on calibration in paragraph (b) of this section.

(x) *Gas flow rate.* Use propane gas: The propane shall be minimum 99% pure (often described by suppliers as CP or “chemically pure” grade, but this designation should not be relied on since the actual purity may vary by supplier). Each burner has a specific propane gas flow rate set with its respective, calibrated flowmeter. The gas flow rate to the top burner is 12.9 liters per minute (“L/min”) \pm 0.1 L/min at a pressure of 101 \pm 5 kPa (standard atmospheric pressure) and a temperature of 22 \pm 3 °C. The gas flow rate to the side burner is 6.6 \pm 0.05 L/min at a pressure of 101 \pm 5 kPa (standard atmospheric pressure) and a temperature of 22 \pm 3 °C. The total heat release rate of the burners is 27 kW.

(b) *Calibration of Propane Flowmeters—*
(1) *Preparation.* Once the assembly of the burner is completed and all the connecting points are checked for gas leakage, the most critical task is ensuring the exact flow rates of propane

¹Fiber-reinforced plastic tubing (6 mm ID by 9.5 mm OD; 0.25 inch ID by 0.4 inch OD) made of PVC should be used.

²If the side burner, or more commonly one half of the side burner, fails to ignite quickly, adjust the position of the igniter, bearing in mind that propane is heavier than air. The best burner behavior test assessment is done against an inert surface (to spread the gas as it would during an actual test).

into the top and side burners, as described in the test protocol. The gas flow rates are specified at 12.9 Liters per minute (LPM) ± 0.1 LPM and 6.6 LPM ± 0.05 LPM for the top and side burners (Burners 1 and 2), respectively, at a pressure of 101 ± 5 kiloPascal (kPa) (standard atmospheric pressure) and a temperature of 22 ± 3 °C. The rotameters that are installed in the control box of the burner assembly need to be calibrated for accurate measurement of these flow rates.

(i) The most practical and accurate method of measuring and calibrating the flow rate of gases (including propane) is use of a diaphragm test meter (also called a dry test meter). A diaphragm test meter functions based on positive displacement of a fixed volume of gas per rotation and its reading is therefore independent of the type of the gas being used. The gas pressure and temperature, however, can have significant impact on the measurement of flow rate.

(ii) The gas pressure downstream of the rotameters that are installed in the control box of the burner assembly should be maintained near atmospheric pressure (only a few millimeters of water above atmosphere). Therefore, the best location to place the diaphragm test meter for gas flow calibration is right downstream of the control box. The pressure at the propane tank must be set at 20 ± 1 pounds per square inch gage (psig).

(2) *Calibration Procedure.* Install the diaphragm test meter (DTM) downstream of the control box in the line for the top burner. Check all connecting points for gas leakage. Open the main valve on the propane tank and set a pressure of 20 ± 0.5 psig. Set the timers in the control box for 999 seconds (or the maximum range possible). Record the barometric pressure. Turn the "Burner 1" switch to ON and ignite the top burner. Allow the gas to flow for 2-3 minutes until the DTM is stabilized. Record the pressure and temperature in the DTM. Use a stopwatch to record at least one minute worth of complete rotations while counting the number of rotations.³

³With a diaphragm test meter well-sized to this application, this should be more than

Calculate the propane gas flow rate using the recorded time and number of rotations (total flow in that time). Use the pressure and temperature readings to convert to standard conditions. Repeat this measurement for two additional meter setting to allow for calibrating the flowmeter throughout the range of interest. Plot the flow versus meter reading, fit a best line (possibly quadratic) through these points to find the meter setting for a flow of 12.9 LPM at the above "standard conditions." Repeat this procedure for "Burner 2" using three meter readings to find the setting that gives a flow rate of 6.6 LPM at the standard conditions. After completion of the calibration, re-set the timers to 70 and 50 seconds.

(c) *Conditioning.* Remove the specimens from any packaging prior to conditioning. Specimens shall be conditioned in air at a temperature greater than 18 °C (65 °F) and less than 25 °C (77 °F) and a relative humidity less than 55 percent for at least 48 continuous hours prior to test. Specimens shall be supported in a manner to permit free movement of air around them during conditioning.

(d) *Test preparation—(1) General.* Horizontal air flow at a distance of 0.5 m (20 in) on all sides of the test specimen at the mattress top height shall be no more than 0.5 m/s. If there is any visual evidence that the burner flames are disturbed by drafts during their exposure durations, the burner regions must be enclosed on two or more sides by at least a triple layer of screen wire. The screens shall be at least 25 cm tall. The screen(s) for the top burner shall sit on the mattress top and shall be wide enough to extend beyond the area of the burner impingement. All screens shall be far enough away (typically 30 cm or more) from the burner tubes so as not to interfere or interact with flame spread during the burner exposure. The screen for the side burner will require a separate support from below. All screens shall be removed at

five rotations. A one liter per rotation meter will require 10 to 15 rotations for the flow measurements and greater than the minimum of one minute recording time specified here.

the end of the 70 second exposure interval.

(2) *Specimen*. Remove the test specimen from the conditioning room immediately before it is to be tested. Testing shall begin within 20 minutes after removal from the conditioning area. Be sure the test frame is approximately centered on the catch surface. Carefully center the foundation on top of the test frame to eliminate any gaps between the bottom periphery of the foundation and the inside edges of the test frame. If the mattress is to be tested alone, place it similarly. A mattress tested with its foundation should be centered longitudinally and laterally on the foundation. Carefully center them on the bed frame and on each other. The mattress shall be centered on top of the foundation (see Figure 1 of this part). However, in order to keep the heat flux exposure the same for the sides of the two components, if the mattress is 1 cm to 2 cm narrower than the foundation, the mattress shall be shifted so that the side to be exposed is in the same plane as the foundation. Refer to Figure 8 of this part. A product having an intended sleep surface on only one side shall be tested with the sleeping side up so that the sleeping surface is exposed to the propane burner.

(e) *Burner flow rate/flow timer confirmation*. Just prior to moving the burner adjacent to the test specimen, briefly ignite each burner at the same time, and check that the propane flow to that burner is set at the appropriate level on its flowmeter to provide the flows listed in §1633.7(a)(6)(x). Check that the timers for the burner exposures are set to 70 seconds for the top burner and 50 seconds for the side burner. For a new burner assembly, check the accuracy of the gas flow timers against a stop watch at these standard time settings. Set pilot flows to a level that will not cause them to impinge on sample surfaces.

(f) *Location of the gas burners*. The general layout for the room configuration is shown in Figure 2 of this part. Place the burner heads so that they are within 300 mm (1 ft) of the mid-length of the mattress. If there are unique construction features (e.g., handles, zippers) within the burner placement

zone, the burner shall impinge on this feature. For a quilted mattress top the stand-off foot pad must alight on a high, flat area between dimples or quilting thread runs. The same is to be true for the side burner if that surface is quilted. If a specimen design presents a conflict in placement such that both burners cannot be placed between local depressions in the surface, the top burner shall be placed at the highest flat surface.

(g) *Burner set-up*. The burners shall be placed in relation to the mattress and foundation surfaces in the manner shown in Figure 9 of this part, i.e., at the nominal spacings shown there and with the burner tubes nominally parallel⁴ to the mattress surfaces on which they impinge. Since the heat flux levels seen by the test specimen surfaces depend on burner spacing, as well as gas flow rate, care must be taken with the set-up process.

(h) *Burner alignment procedure*—(1) *Preparation*. Complete the following before starting the alignment procedure:

(i) Check that the pivot point for the mattress top burner feed tube and the two metal plates around it are clean and well-lubricated so as to allow smooth, free movement.

(ii) Set the two burners such that the 5° out-of-plane angling of the flame jets makes the jets on the two burners point slightly *toward* each other.

(iii) Check the burner stand-off feet for straightness and perpendicularity between foot pad and support rod and to see that they are clean of residue from a previous test.

(iv) Have at hand the following items to assist in burner set-up: The jig, shown in Figure 10 of this part, for setting the stand-off feet at their proper distances from the front of the burner tube; a 3 mm thick piece of flat stock (any material) to assist in checking the parallelness of the burners to the mattress surfaces; and a 24 gage stainless steel sheet metal platen that is 30 mm (12 in) wide, 610 mm (24 in) long and has

⁴The top burner will tend to be tangential to the mattress surface at the burner mid-length; this orientation will not necessarily be parallel to the overall average mattress surface orientation nor will it necessarily be horizontal. This is a result of the shape of the mattress top surface.

a sharp, precise 90° bend 355 mm (14 in) from one 30 mm wide end or another dimension that meets the requirements for a specific sample.

(2) *Alignment.* (i) Place the burner assembly adjacent to the test specimen. Place the sheet metal platen on the mattress with the shorter side on top. The location shall be within 30 cm (1 ft) of the longitudinal center of the mattress. The intended location of the stand-off foot of the top burner shall not be in a dimple or crease caused by the quilting of the mattress top. Press the platen laterally inward from the edge of the mattress so that its side makes contact with either the top and bottom edge or the vertical side of the mattress.⁵ Use a sufficient length of duct tape (platen to mattress top) to assure that the platen stays firmly against the surfaces of the mattress.

(ii) With both burner arms horizontal (pinned in this position), fully retract the stand-off feet of both burners and, if necessary, the pilot tubes as well.⁶ (Neither is to protrude past the front face of the burner tubes at this point.) Move the burner assembly forward (perpendicular to the mattress) until the vertical burner lightly contacts the sheet metal platen. Adjust the height of the vertical burner on its vertical support column so as to center the tube on the crevice between the mattress and the foundation. (This holds also for pillow top mattress tops, i.e.,

⁵ Mattresses having a convex side are treated separately since the platen cannot be placed in the above manner. Use the platen only to set the top burner parallelness. Set the in/out distance of the top burner to the specification in paragraph (h)(1)(iii). Set the side burner so that it is approximately (visually) parallel to the flat side surface of the foundation below the mattress/foundation crevice once its foot is in contact with the materials in the crevice area. The burner will not be vertical in this case. If the foundation side is also non-flat, set the side burner vertical (± 3 mm, as above) using a bubble level as a reference. The side surface convexities will then bring the bowed out sections of the specimen closer to the burner tube than the stand-off foot.

⁶ The pilot tubes can normally be left with their ends just behind the plane of the front of the burner tube. This way they will not interfere with positioning of the tube but their flame will readily ignite the burner tubes.

ignore the crevice between the pillow top and the main body of the mattress.)⁷ Adjust the height of the horizontal burner until it sits lightly on top of the sheet metal platen. Its burner arm should then be horizontal.

(iii) Move the horizontal burner in/out (loosen the thumb screw near the pivot point) until the outer end of the burner tube is 13 mm to 19 mm ($\frac{1}{2}$ in to $\frac{3}{4}$ in) from the corner bend in the platen (this is facilitated by putting a pair of lines on the top of the platen 13 mm and 19 mm from the bend and parallel to it). Tighten the thumb screw.

(iv) Make the horizontal burner parallel to the top of the platen (within 3 mm ($\frac{1}{8}$ inch) over the burner tube length); when properly parallel, it should not be possible to insert the 3 mm flat stock under either burner end by bending the copper tube section appropriately. Note: After the platen is removed (in paragraph (h)(2)(vii) of this section), the burner tube may not be horizontal; this is normal. For mattress/foundation combinations having nominally flat, vertical sides, the similar adjustment for the vertical burner is intended to make that burner parallel to the sides and vertical. Variations in the shape of mattresses and foundations can cause the platen section on the side to be non-flat and/or non-vertical. If the platen is flat and vertical, make the vertical burner parallel to the side of the platen (± 3 mm) by bending its copper tube section as needed. If not, make the side burner parallel to the mattress/foundation sides by the best visual estimate after the platen has been removed.

(v) Move the burner assembly perpendicularly back away from the mattress about 30 cm (1 ft). Set the two stand-off feet to their respective distances using the jig designed for this purpose. Install the jig *fully* onto the burner tube (on the *same side* of the tube as the stand-off foot), with its side edges parallel to the burner feed arm,

⁷ For tests of the mattress alone, set the center of the side burner at the lower edge of the mattress OR the top (upper tip) of the side burner 25 mm (1 in) below the top edge of the mattress, whichever is lower. This prevents inappropriate (excessive) exposure of the top surface of the mattress to the side burner.

at about the position where one end of the foot will be. Loosen the set screw and slide the foot out to the point where it is flush with the bottom end of the jig. Tighten the set screw. Make sure the long axis of the foot is parallel to the burner tube. It is essential to use the correct side of the spacer jig with each burner. Double check this. The jig must be clearly marked.

(vi) Set the downward force of the horizontal burner. Remove the retainer pin near the pivot. While holding the burner feed arm horizontal using a spring scale⁸ hooked onto the thumbscrew holding the stand-off foot, move the small and/or large weights on the feed tube appropriately so that the spring scale reads 170 g to 225 g (6 oz to 8 oz).

(vii) Remove the sheet metal platen (and tape holding it).

(viii) Hold the horizontal burner up while sliding the burner assembly forward until the vertical burner stand-off foot just touches the mattress and/or the foundation, then release the horizontal burner. The outer end of the burner tube should extend at least 6 mm to 12 mm ($\frac{1}{4}$ in to $\frac{1}{2}$ in) out beyond the uppermost corner/edge of the mattress so that the burner flames will hit the edge. (For a pillow top mattress, this means the outer edge of the pillow top portion and the distance may then be greater than 6 mm to 12 mm.) If this is not the case, move the burner assembly (perpendicular to the mattress side)—not the horizontal burner alone—until it is.⁹ Finally, move the

⁸An acceptable spring scale has a calibrated spring mounted within a holder and hooks on each end.

⁹The foot should depress the surface it first contacts by no more than 1 mm to 2 mm. This is best seen up close, not from the rear of the burner assembly. However, if a protruding edge is the first item contacted, compress it until the foot is in the plane of the mattress/foundation vertical sides. The intent here is that the burner be spaced a fixed distance from the vertical mattress/foundation sides, not from an incidental protrusion. Similarly, if there is a wide crevice in this area which would allow the foot to move inward and thereby place the burners too close to the vertical mattress/foundation sides, it will be necessary to use the spacer jig (rather than the stand-off foot) above or below this crevice to set the proper burner

vertical burner tube until its stand-off foot just touches the side of the mattress and/or the foundation. (Use the set screw near the vertical burner pivot.)

(ix) Make sure all thumbscrews are adequately tightened. Care must be taken, once this set-up is achieved, to avoid bumping the burner assembly or disturbing the flexible lines that bring propane to it.

(x) If there is *any* indication of flow disturbances in the test facility which cause the burner flames or pilot flames to move around, place screens around the burners so as to minimize these disturbances.¹⁰ These screens (and any holders) must be far enough away from the burners (about 30 cm or more for the top, less for the side) so that they do not interact with the flames growing on the specimen surfaces. For the top surface burner, at least a triple layer of window screen approximately 30 cm high sitting vertically on the mattress top (Figure 9 of this part) has proved satisfactory. For the side burner at least a triple layer of screen approximately 15 cm wide, formed into a square-bottom U-shape and held from below the burner has proved satisfactory. Individual laboratories will have to experiment with the best arrangement for suppressing flow disturbances in their facility.

(i) *Running the test.* (1) Charge the hose line to be used for fire suppression with water.

(2) *Burner Preparation.* (i) Turn AC power on; set propane pressure to 20 psig at bottle; set timers to 70 s (top burner) and 50 s (side burner); with burner assembly well-removed from test specimen, ignite burners and check that, WHEN BOTH ARE ON AT THE SAME TIME, the flowmeters are set to the values that give the requisite propane gas flow rates to each burner. Turn off burners. Set pilot tubes just behind front surface of burners; set pilot flow valves for approximately 2 cm flames. Turn off pilots.

spacing. Compress the mattress/foundation surface 1 mm to 2 mm when using the jig for this purpose.

¹⁰The goal here is to keep the burner flames impinging on a fixed area of the specimen surface rather than wandering back and forth over a larger area.

(ii) Position burner on test specimen and remove sheet metal platen.

(iii) Place screens around both burners.

(3) *Start pilots.* 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 (Note that 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.)

(4) *Start recording systems.* With the calorimetry system fully operational, after instrument zeroes and spans, start the video lights and video camera and data logging systems two minutes before burner ignition (or, if not using video, take a picture of the setup).

(5) *Initiate test.* Start test exposure by simultaneously turning on power to both timers (timers will turn off burners at appropriate times). Also start a 30 minute timer of the test duration. 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.) If not using video, one photo must be taken within the first 45 seconds of starting the burners.

(6) *End of burner exposure.* When the burners go out (after 70 seconds for the longer exposure), carefully lift the top burner tube away from the specimen surface, producing as little disturbance as possible to the specimen. Turn off power to both timers. Remove all screens. Turn off pilots at their ball valves. Remove the burner assembly from the specimen area to facilitate the video camera view of the full side of the specimen. In the case of the room-based configurations, remove the burner assembly from the room to protect it.

(j) *Video Recording/Photographs.* Place a video or still frame camera so as to have (when the lens is zoomed out) just slightly more than a full-length view of the side of the test specimen being ignited, including a view of the flame impingement area while the burner assembly is present. The view must also include the catch pan so that it is clear

whether any melt pool fire in this pan participates significantly in the growth of fire on the test specimen. The camera shall include a measure of elapsed time to the nearest 1 second for video and 1 minute for still frame within its recorded field of view (preferably built into the camera). For the room-based configuration, the required full-length view of the sample may require an appropriately placed window, sealed with heat resistant glass, in one of the room walls. Place the camera at a height just sufficient to give a view of the top of the specimen while remaining under any smoke layer that may develop in the room. The specimen shall be brightly lit so that the image does not lose detail to over-exposed flames. This will require a pair or more of 1 kW photo flood lights illuminating the viewed side of the specimen. The lights may need to shine into the room from the outside via sealed windows.

(k) *Cessation of Test.* (1) The heat release rate shall be recorded and video/photographs taken until either 30 minutes has elapsed since the start of the burner exposure or a fire develops of such size as to require suppression for the safety of the facility.

(2) Note the time and nature of any unusual behavior that is not fully within the view of the video camera. This is most easily done by narration to a camcorder.

(3) Run the heat release rate system and datalogger until the fire has been fully out for several minutes to allow the system zero to be recorded.

(1) *Use of alternate apparatus.* Mattress sets may be tested using test apparatus that differs from that described in this section if the manufacturer obtains and provides to the Commission data demonstrating that tests using the alternate apparatus during the procedures specified in this section yield failing results as often as, or more often than, tests using the apparatus specified in the standard. The manufacturer shall provide the supporting data to the Office of Compliance, Recalls & Compliance Division,

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U.S. Consumer Product Safety Commission, 4330 East West Highway, Bethesda, Maryland 20814. Staff will review the data and determine whether the alternate apparatus may be used.

[71 FR 13498, Mar. 15, 2006, as amended at 73 FR 6842, Feb. 6, 2008]

§ 1633.8 Findings.

(a) *General.* In order to issue a flammability standard under the FFA, the FFA requires the Commission to make certain findings and to include these in the regulation, 15 U.S.C. 1193(j)(2). These findings are discussed in this section.

(b) *Voluntary standards.* No findings concerning compliance with and adequacy of a voluntary standard are necessary because no relevant voluntary standard addressing the risk of injury that is addressed by this regulation has been adopted and implemented.

(c) *Relationship of benefits to costs.* The Commission estimates the potential total lifetime benefits of a mattress that complies with this standard to range from \$45 to \$57 per mattress set (based on a 10 year mattress life and a 3% discount rate). The Commission estimates total resource costs of the standard to range from \$8 to \$22 per mattress. This yields net benefits of \$23 to \$50 per mattress set. The Commission estimates that aggregate lifetime benefits associated with all mattresses produced the first year the standard becomes effective range from \$1,024 to \$1,307 million, and that aggregate resource costs associated with these mattresses range from \$175 to \$511 million, yielding net benefits of about \$514 to \$1,132 million. Accordingly, the Commission finds that the benefits from the regulation bear a reasonable relationship to its costs.

(d) *Least burdensome requirement.* The Commission considered the following alternatives: alternative maximum peak heat release rate and test duration, alternative total heat released in the first 10 minutes of the test, mandatory production testing, a longer effective date, taking no action, relying on a voluntary standard, and requiring labeling alone (without any performance requirements). The alternatives of taking no action, relying on a voluntary standard (if one existed), and requiring

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labeling alone are unlikely to adequately reduce the risk. Requiring a criterion of 25 MJ total heat release during the first 10 minutes of the test instead of 15 MJ would likely reduce the estimated benefits (deaths and injuries reduced) without having much effect on costs. Both options of increasing the duration of the test from 30 minutes to 60 minutes and decreasing the peak rate of heat release from 200 kW to 150 kW would likely increase costs significantly without substantial increase in benefits. Requiring production testing would also likely increase costs. Therefore, the Commission finds that an open flame standard for mattresses with the testing requirements and criteria that are specified in the Commission rule is the least burdensome requirement that would prevent or adequately reduce the risk of injury for which the regulation is being promulgated.

§ 1633.9 Glossary of terms.

(a) *Absorbent pad.* Pad used on top of mattress. Designed to absorb moisture/body fluids thereby reducing skin irritation, can be one time use.

(b) *Basket pad.* Cushion for use in an infant basket.

(c) *Bunk beds.* A tier of beds, usually two or three, in a high frame complete with mattresses (see Figure 11 of this part).

(d) *Car bed.* Portable bed used to carry a baby in an automobile.

(e) *Carriage pad.* Cushion to go into a baby carriage.

(f) *Chaise lounge.* An upholstered couch chair or a couch with a chair back. It has a permanent back rest, no arms, and sleeps one (see Figure 11).

(g) *Convertible sofa.* An upholstered sofa that converts into an adult sized bed. Mattress unfolds out and up from under the seat cushioning (see Figure 11).

(h) *Corner groups.* Two twin size bedding sets on frames, usually slipcovered, and abutted to a corner table. They also usually have loose bolsters slipcovered (see Figure 11).

(i) *Crib bumper.* Padded cushion which goes around three or four sides inside a crib to protect the baby. Can also be used in a playpen.

(j) *Daybed*. Daybed has foundation, usually supported by coil or flat springs, mounted between arms on which mattress is placed. It has permanent arms, no backrest, and sleeps one (see Figure 11).

(k) *Dressing table pad*. Pad to cushion a baby on top of a dressing table.

(l) *Drop-arm loveseat*. When side arms are in vertical position, this piece is a loveseat. The adjustable arms can be lowered to one of four positions for a chaise lounge effect or a single sleeper. The vertical back support always remains upright and stationary (see Figure 11).

(m) *Futon*. A flexible mattress generally used on the floor that can be folded or rolled up for storage. It usually consists of resilient material covered by ticking.

(n) *High riser*. This is a frame of sofa seating height with two equal size mattresses without a backrest. The frame slides out with the lower mattress and rises to form a double or two single beds (see Figure 11).

(o) *Infant carrier and lounge pad*. Pad to cushion a baby in an infant carrier.

(p) *Mattress foundation*. This is a ticking covered structure used to support a mattress or sleep surface. The structure may include constructed frames, foam, box springs or other materials used alone or in combination.

(q) *Murphy bed*. A style of sleep system where the mattress and foundation are fastened to the wall and provide a means to retract or rotate the bed assembly into the wall to release more floor area for other uses.

(r) *Pillow*. Cloth bag filled with resilient material such as feathers, down, sponge rubber, urethane, or fiber used as the support for the head of a person.

(s) *Playpen pad*. Cushion used on the bottom of a playpen.

(t) *Portable crib*. Smaller size than a conventional crib. Can usually be converted into a playpen.

(u) *Quilted* means stitched with thread or by fusion through the ticking and one or more layers of material.

(v) *Roll-away-bed*. Portable bed which has frame that folds with the mattress for compact storage.

(w) *Sleep lounge*. Upholstered seating section which is mounted on a frame. May have bolster pillows along the

wall as backrests or may have attached headrests (see Figure 11).

(x) *Stroller pad*. Cushion used in a baby stroller.

(y) *Sofa bed*. These are pieces in which the back of the sofa swings down flat with the seat to form the sleeping surface. Some sofa beds have bedding boxes for storage of bedding. There are two types: the one-piece, where the back and seat are upholstered as a unit, supplying an unbroken sleeping surface; and the two-piece, where back and seat are upholstered separately (see Figure 11 of this part).

(z) *Sofa lounge*—(includes glideouts). Upholstered seating section is mounted on springs and in a frame that permit it to be pulled out for sleeping. Has upholstered backrest bedding box that is hinged. Glideouts are single sleepers with sloping seats and backrests. Seat pulls out from beneath back and evens up to supply level sleeping surface (see Figure 11).

(aa) *Studio couch*. Consists of upholstered seating section on upholstered foundation. Many types convert to twin beds (see Figure 11).

(bb) *Studio divan*. Twin size upholstered seating section with foundation is mounted on metal bed frame. Has no arms or backrest, and sleeps one (see Figure 11 of this part).

(cc) *Trundle bed*. A low bed which is rolled under a larger bed. In some lines, the lower bed springs up to form a double or two single beds as in a high riser (see Figure 11).

(dd) *Tufted* means buttoned or laced through the ticking and upholstery material and/or core, or having the ticking and loft material and/or core drawn together at intervals by any other method which produces a series of depressions on the surface.

(ee) *Twin studio divan*. Frames which glide out (but not up) and use seat cushions, in addition to upholstered foundation to sleep two. Has neither arms nor back rest (see Figure 11).

(ff) *Flip or sleeper chair*. Chair that unfolds to be used for sleeping, typically has several connecting fabric covered, solid foam core segments.

Subpart B—Rules and Regulations**§ 1633.10 Definitions.**

(a) *Standard* means the Standard for the Flammability (Open-Flame) of Mattress Sets (16 CFR part 1633, subpart A).

(b) The definition of terms set forth in the §1633.2 of the Standard shall also apply to this section.

§ 1633.11 Records.

(a) *Test and manufacturing records C general.* Every manufacturer and any other person initially introducing into commerce mattress sets subject to the standard, irrespective of whether guarantees are issued relative thereto, shall maintain the following records in English at a location in the United States:

(1) Test results and details of each test performed by or for that manufacturer (including failures), whether for qualification, confirmation, or production, in accordance with §1633.7. Details shall include: name and complete physical address of test facility, type of test room, test room conditions, time that sample spent out of conditioning area before starting test, prototype or production identification number, and test data including the peak rate of heat release, total heat release in first 10 minutes, a graphic depiction of the peak rate of heat release and total heat release over time. These records shall include the name and signature of person conducting the test, the date of the test, and a certification by the person overseeing the testing as to the test results and that the test was carried out in accordance with the Standard. For confirmation tests, the identification number must be that of the prototype tested.

(2) Video and/or a minimum of eight photographs of the testing of each mattress set, in accordance with §1633.7 (one taken before the test starts, one taken within 45 seconds of the start of the test, and the remaining six taken at five minute intervals, starting at 5 minutes and ending at 30 minutes), with the prototype identification number or production lot identification number of the mattress set, date and time of test, and name and location of testing facility clearly displayed.

(b) *Prototype records.* In addition to the records specified in paragraph (a) of this section, the following records shall be maintained for each qualified, confirmed and subordinate prototype:

(1) Unique identification number for the qualified or confirmed prototype and a list of the unique identification numbers of each subordinate prototype based on the qualified or confirmed prototype. Subordinate prototypes that differ from each other only by length or width may share the same identification number.

(2) A detailed description of all materials, components, and methods of assembly for each qualified, confirmed and subordinate prototype. Such description shall include the specifications of all materials and components, and the name and complete physical address of each material and component supplier.

(3) A list of which models and production lots of mattress sets are represented by each qualified, confirmed and/or subordinate prototype identification number.

(4) For subordinate prototypes, the prototype identification number of the qualified or confirmed prototype on which the mattress set is based, and, at a minimum, the manufacturing specifications and a description of the materials substituted, photographs or physical specimens of the substituted materials, and documentation based on objectively reasonable criteria that the change in any component, material, or method of assembly will not cause the subordinate prototype to exceed the test criteria specified in §1633.3(b).

(5) Identification, composition, and details of the application of any flame retardant treatments and/or inherently flame resistant fibers or other materials employed in mattress components.

(c) *Pooling confirmation test records.* In addition to the test and prototype records specified in paragraphs (a) and (b) of this section, the following records shall be maintained:

(1) The prototype identification number assigned by the qualified prototype manufacturer;

(2) Name and complete physical address of the qualified prototype manufacturer;

(3) Copy of qualified prototype test records, and records required by paragraph (b)(2) of this section; and

(4) In the case of imported mattress sets, the importer shall be responsible for maintaining the records specified in paragraph (b) of this section for confirmation testing that has been performed with respect to mattress sets produced by each foreign manufacturing facility whose mattress sets that importer is importing.

(d) *Quality assurance records.* In addition to the records required by paragraph (a) of this section, the following quality assurance records shall be maintained:

(1) A written copy of the manufacturer's quality assurance procedures;

(2) Records of any production tests performed. Production test records must be maintained and shall include, in addition to the requirements of paragraph (a) of this section, an assigned production lot identification number and the identification number of the qualified, confirmed or subordinate prototype associated with the specimen tested;

(3) For each qualified, confirmed and subordinate prototype, the number of mattress sets in each production lot based on that prototype;

(4) The start and end dates of production of that lot; and

(5) Component, material and assembly records. Every manufacturer conducting tests and/or technical evaluations of components and materials and/or methods of assembly must maintain detailed records of such tests and evaluations.

(e) *Record retention requirements.* The records required under this Section shall be maintained by the manufacturer (including importers) for as long as mattress sets based on the prototype in question are in production and shall be retained for 3 years thereafter. Records shall be available upon the request of Commission staff.

(f) *Record location requirements.* (1) For mattress sets produced in the United States, all records required by this section must be maintained at the plant or factory at which the mattress sets are manufactured or assembled.

(2) For mattress sets produced outside of the United States, a copy of all

records required by this section must be maintained at a U.S. location, which must be identified on the mattress set label as specified in §1633.12(a).

§ 1633.12 Labeling.

(a) Each mattress set subject to the Standard shall bear a permanent, conspicuous, and legible label(s) containing the following information (and no other information) in English:

(1) Name of the manufacturer, or for imported mattress sets, the name of the foreign manufacturer and importer;

(2)(i) For mattress sets produced in the United States, the complete physical address of the manufacturer.

(ii) For imported mattress sets, the complete address of the foreign manufacturer, including country, and the complete physical address of the importer or the United States location where the required records are maintained if different from the importer;

(3) Month and year of manufacture;

(4) Model identification;

(5) Prototype identification number for the mattress set;

(6) A certification that the mattress complies with this standard.

(i) For mattresses intended to be sold without a foundation, a certification stating "This mattress meets the requirements of 16 CFR part 1633 (federal flammability (open flame) standard for mattresses) when used without a foundation"; or

(ii) For mattresses intended to be sold with a foundation, a certification stating "This mattress meets the requirements of 16 CFR part 1633 (federal flammability (open flame) standard for mattresses) when used with foundation <ID>." Such foundation(s) shall be clearly identified by a simple and distinct name and/or number on the mattress label; or

(iii) For mattresses intended to be sold both alone and with a foundation, a certification stating "This mattress meets the requirements of 16 CFR part 1633 (federal flammability (open flame) standard for mattresses) when used without a foundation or with foundation(s) <ID>." Such foundation(s) shall be clearly identified by a simple and distinct name and/or number on the mattress label; and

(7) A statement identifying whether the manufacturer intends the mattress to be sold alone or with a foundation.

(i) For mattresses intended to be sold without a foundation, the label shall state “THIS MATTRESS IS INTENDED TO BE USED WITHOUT A FOUNDATION.” See Figures 16 and 17 of this part; or

(ii) For mattresses intended to be sold with a foundation, the label shall state “THIS MATTRESS IS INTENDED TO BE USED WITH FOUNDATION(S): <Foundation ID>.” See Figures 12 and 13 of this part; or

(iii) For mattresses intended to be sold both alone and with a foundation, the label shall state “THIS MATTRESS IS INTENDED TO BE USED WITHOUT A FOUNDATION OR WITH FOUNDATION(S): <Foundation ID>.” See Figures 14 and 15 of this part.

(b) The mattress label required in paragraph (a) of this section must measure 2¾” in width and the length can increase as needed for varying information. The label must be white with black text. The label text shall comply with the following format requirements:

(1) All information specified in paragraphs (a)(1) through (6) of this section must be in 6-point font or larger with mixed uppercase and lowercase letters. The text must be left justified and begin ¼” from left edge of label. See Figure 12–17 of this part.

(2) The statement specified in paragraph (a)(7)(i) of this section must be in 10-point Arial/Helvetica font or larger, uppercase letters with the words “WITHOUT A FOUNDATION” bolded and the word “WITHOUT” in italics. The text shall be centered in a text box with the width measuring 2½” and the length increasing as needed. See Figures 16 and 17 of this part.

(3) The statement specified in paragraph (a)(7)(ii) of this section must be in 10-point Arial/Helvetica font or larger in uppercase letters. The foundation identifier should be in 12-point font or larger, bolded, and underlined. The text shall be centered in a text box with the width measuring 2½” and the length increasing as needed. See Figures 12 and 13 of this part.

(4) The statement specified in paragraph (a)(7)(iii) of this section must be

in 10-point or larger Arial/Helvetica font, uppercase letters with the words “WITHOUT A FOUNDATION OR” bolded and the word “WITHOUT” in italics. The foundation identifier should be in 12-point font or larger, bolded, and underlined. The text shall be centered in a text box with the width measuring 2½” and the length increasing as needed. See Figures 14 and 15 of this part.

(c) The foundation label required in paragraph (a) of this section must measure 2¾” in width and the length can increase as needed for varying information. The label must be white with black text. The label shall contain the following:

(1) The information specified in paragraphs (a)(1) through (5) of this section; and

(2) The words “Foundation ID:” followed by a distinct name and/or number that corresponds to the name and/or number used on the mattress. This text must be in 10-point or larger bold Arial/Helvetica font, and the foundation identifier must be underlined. See Figures 12 through 15 of this part.

(d) The statements specified in paragraphs (a)(6)(i) through (iii) and (a)(7)(i) through (iii) of this section may be translated into any other language and printed on the reverse (blank) side of the label.

(e) No person, other than the ultimate consumer, shall remove or mutilate, or cause or participate in the removal or mutilation of, any label required by this section to be affixed to any item.

[71 FR 13498, Mar. 15, 2006, as amended at 73 FR 6843, Feb. 6, 2008]

§ 1633.13 Tests for guaranty purposes, compliance with this section, and “one of a kind” exemption.

(a) *Tests for guaranty purposes.* Reasonable and representative tests for the purpose of issuing a guaranty under section 8 of the Flammable Fabrics Act, 15 U.S.C. 1197, for mattress sets subject to the Standard shall be the tests performed to show compliance with the Standard.

(b) *Compliance with this section.* No person subject to the Flammable Fabrics Act shall manufacture for sale, import, distribute, or otherwise market

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or handle any mattress set which is not in compliance with the provisions under Subpart B.

(c) *“One of a kind” exemption for physician prescribed mattresses.* (1)(i) A mattress set manufactured in accordance with a physician’s written prescription or manufactured in accordance with other comparable written medical therapeutic specification, to be used in connection with the treatment or management of a named individual’s physical illness or injury, shall be considered a “one of a kind mattress” and shall be exempt from testing under the Standard pursuant to §1633.7 thereof: Provided, that the mattress set bears a permanent, conspicuous and legible label which states:

WARNING: This mattress set may be subject to a large fire if exposed to an open flame. It was manufactured in accordance with a physician’s prescription and has not been tested under the Federal Standard for the Flammability (Open-Flame) of Mattress Sets (16 CFR part 1633).

(ii) Such labeling must be attached to the mattress set so as to remain on or affixed thereto for the useful life of the mattress set. The label must be at

least 40 square inches (250 sq. cm) with no linear dimension less than 5 inches (12.5 cm). The letters in the word “WARNING” shall be no less than 0.5 inch (1.27 cm) in height and all letters on the label shall be in a color which contrasts with the background of the label. The warning statement which appears on the label must also be conspicuously displayed on the invoice or other sales papers that accompany the mattress set in commerce from the manufacturer to the final point of sale to a consumer.

(2) The manufacturer of a mattress set exempted from testing under this paragraph (c) shall, in lieu of the records required to be kept by §1633.10, retain a copy of the written prescription or other comparable written medical therapeutic specification for such mattress set during a period of three years, measured from the date of manufacture.

(3) For purposes of this regulation the term physician shall mean a physician, chiropractor or osteopath licensed or otherwise permitted to practice by any State of the United States.

FIGURE 1 TO PART 1633—TEST ASSEMBLY, SHOWN IN FURNITURE CALORIMETER (CONFIGURATION A)

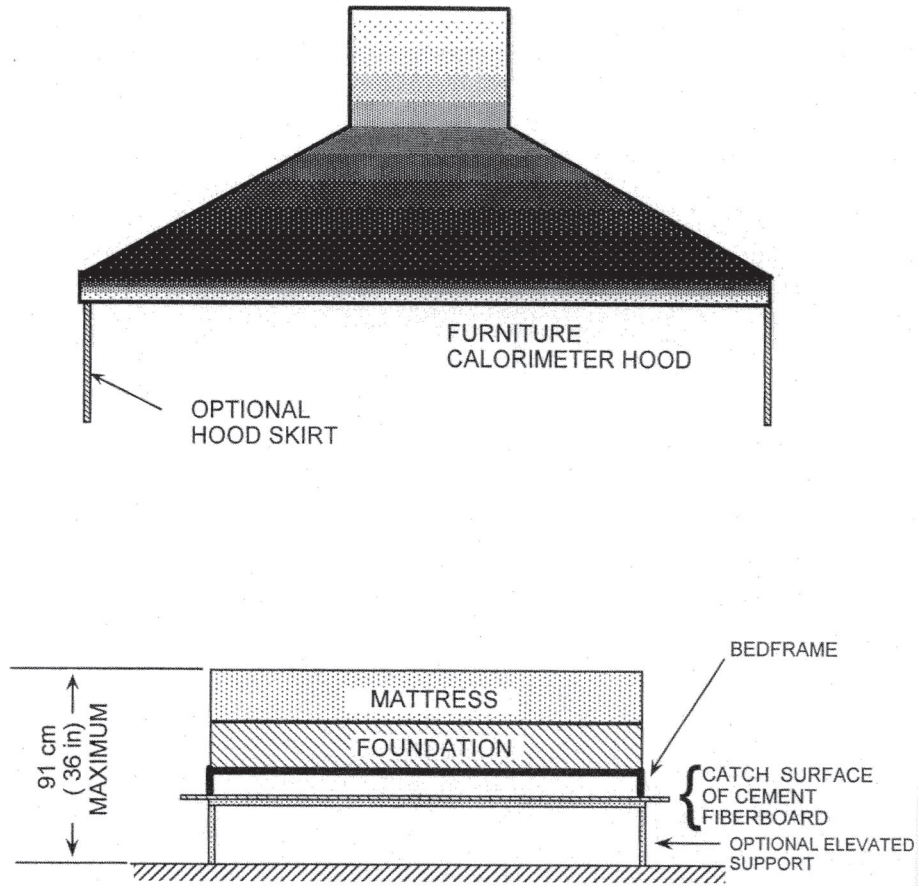


FIGURE 1. TEST ASSEMBLY, SHOWN IN FURNITURE CALORIMETER. (CONFIGURATION A.)

FIGURE 2 TO PART 1633—TEST ARRANGEMENT IN 3.05M × 3.66M (10 FT × 12 FT) ROOM (CONFIGURATION B)

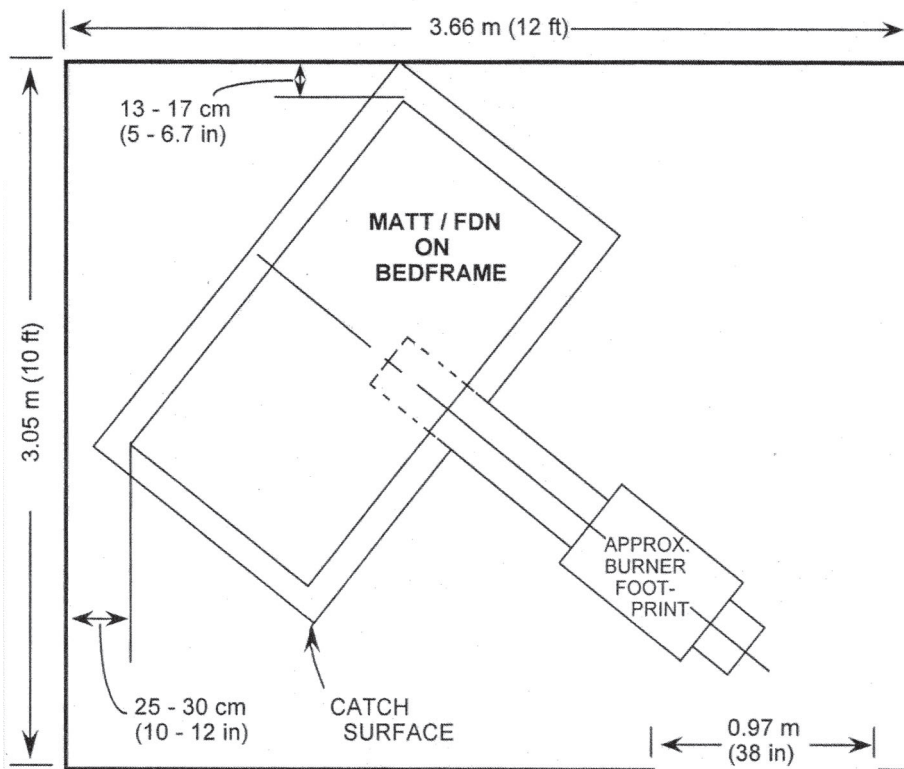


FIGURE 2. TEST ARRANGEMENT IN 3.05m X 3.66 m (10 ft x 12 ft) ROOM; CONFIGURATION B.

FIGURE 3 TO PART 1633—DETAILS OF HORIZONTAL BURNER HEAD

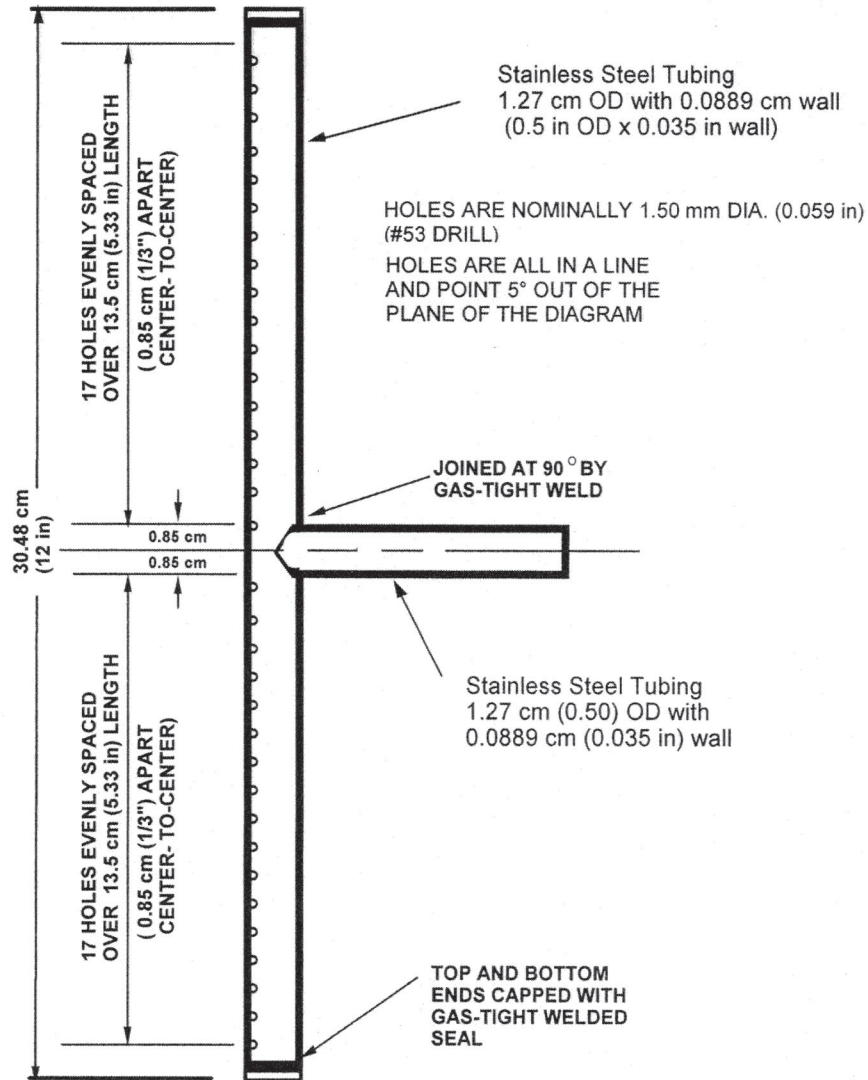


FIGURE 3. DETAILS OF HORIZONTAL BURNER HEAD.

FIGURE 4 TO PART 1633—DETAILS OF VERTICAL BURNER HEAD

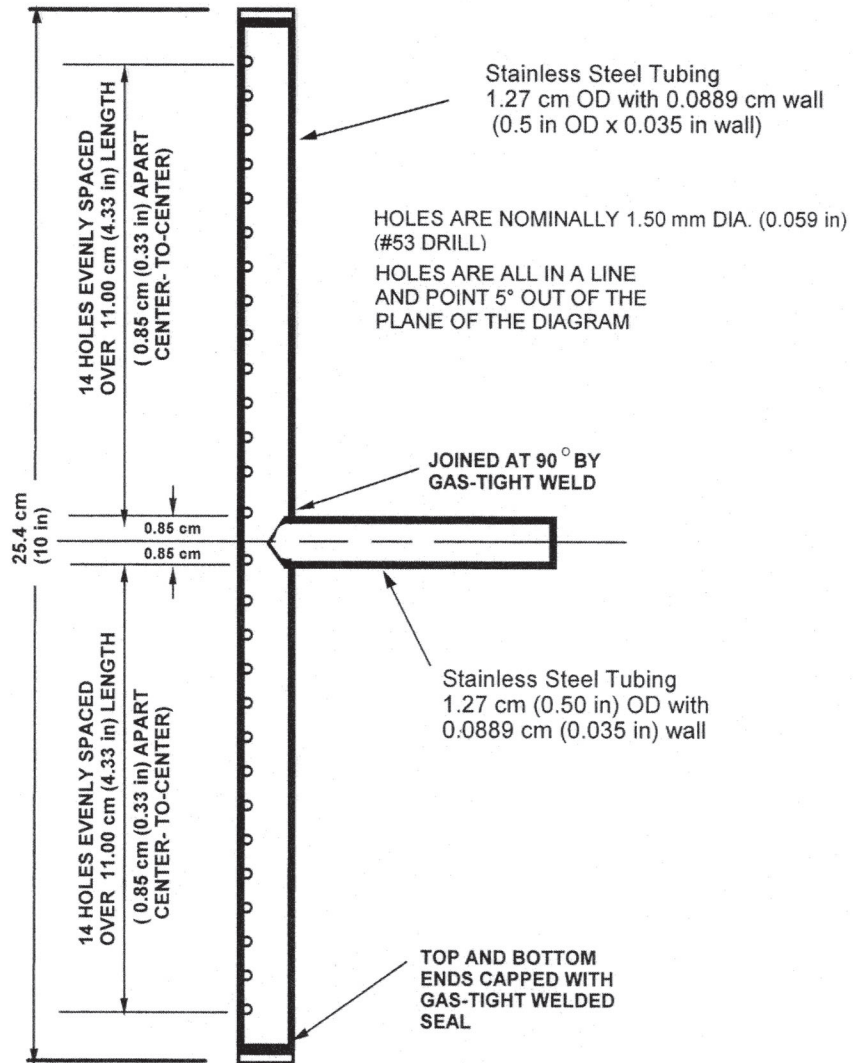


FIGURE 4. DETAILS OF VERTICAL BURNER HEAD.

FIGURE 5 TO PART 1633—DETAILS OF BURNER STAND-OFF

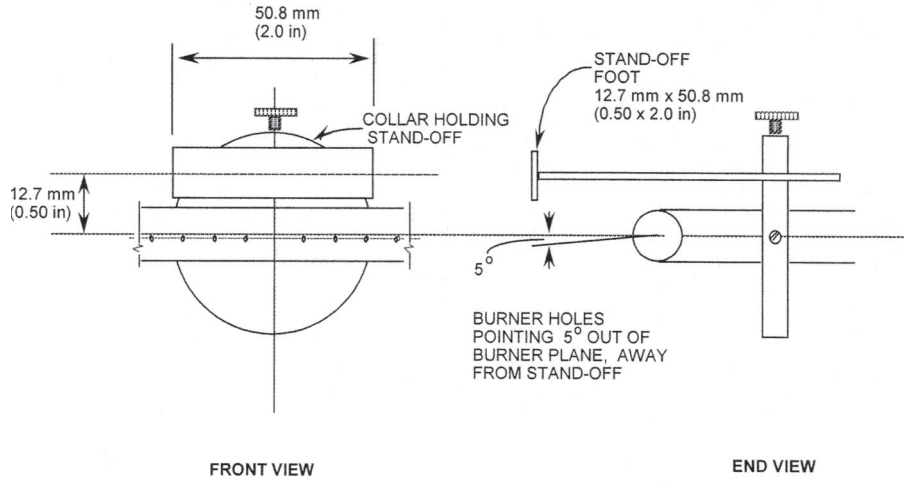


FIGURE 5. DETAILS OF BURNER STAND-OFF

FIGURE 6 TO PART 1633—BURNER ASSEMBLY SHOWING ARMS AND PIVOTS (SHOULDER SCREWS) IN RELATION TO, PORTABLE FRAME ALLOWING BURNER HEIGHT ADJUSTMENT

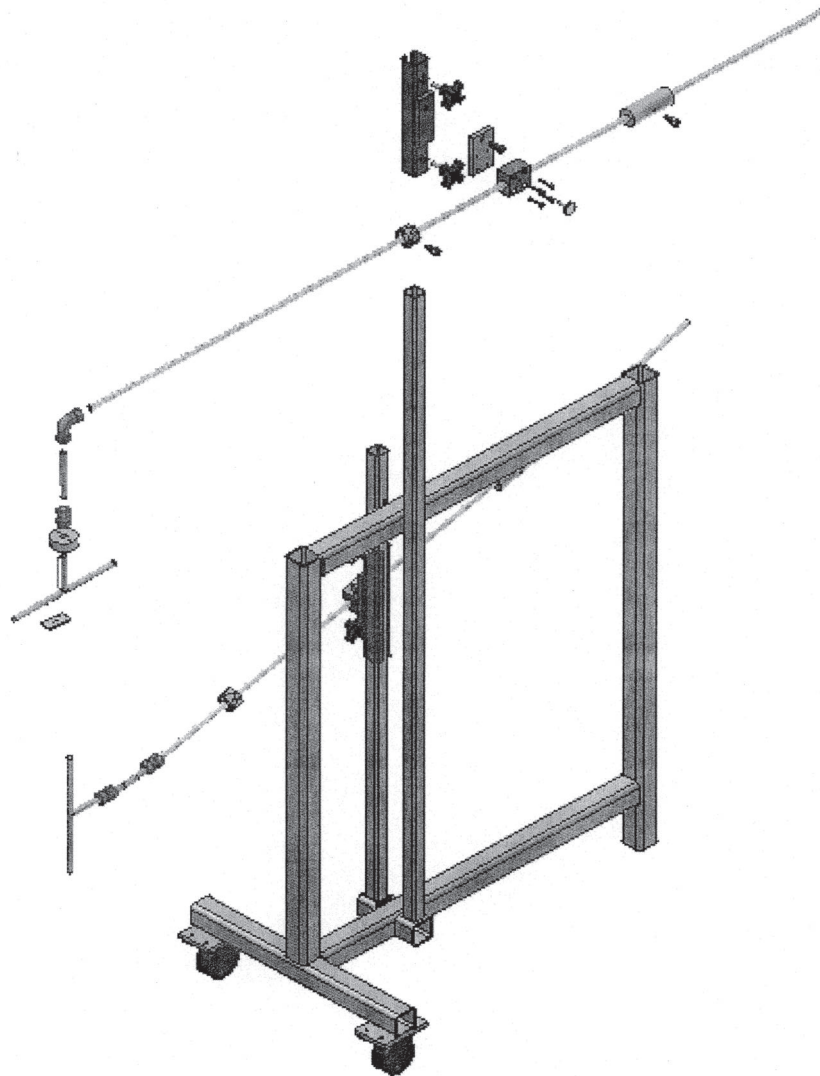


FIGURE 6. BURNER ASSEMBLY* SHOWING ARMS AND PIVOTS (Shoulder Screws), IN RELATION TO, PORTABLE FRAME ALLOWING BURNER HEIGHT ADJUSTMENT.

*Note that the feed tube for the side burner will be horizontal when the side burner pivot is locked in place, as is usual during a test exposure.

FIGURE 7 TO PART 1633—ELEMENTS OF PROPANE FLOW CONTROL FOR EACH BURNER

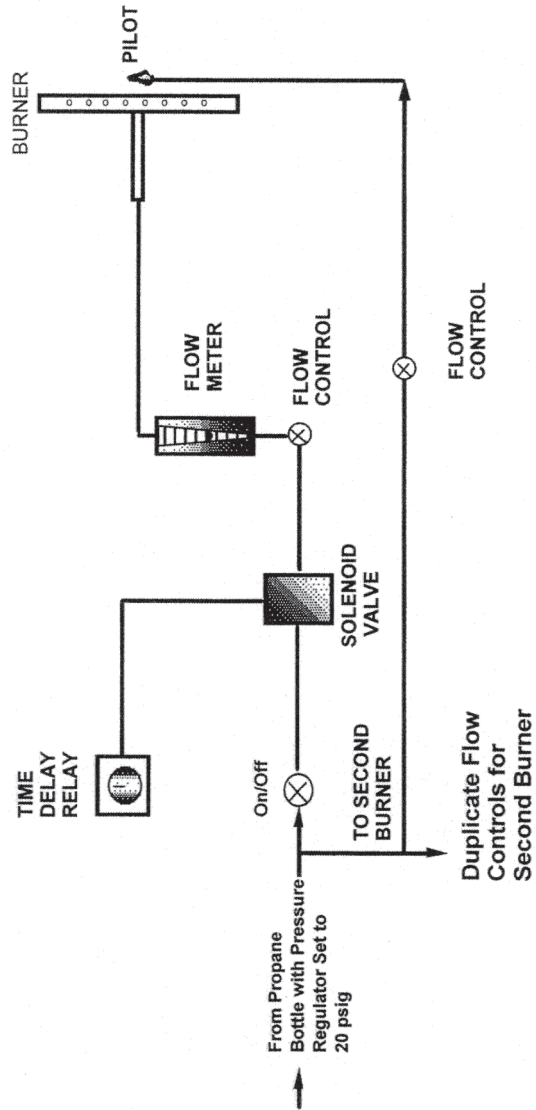


FIGURE 7. ELEMENTS OF PROPANE FLOW CONTROL FOR EACH BURNER

FIGURE 8 TO PART 1633—JIG FOR SETTING MATTRESSES AND FOUNDATION SIDES IN SAME PLANE

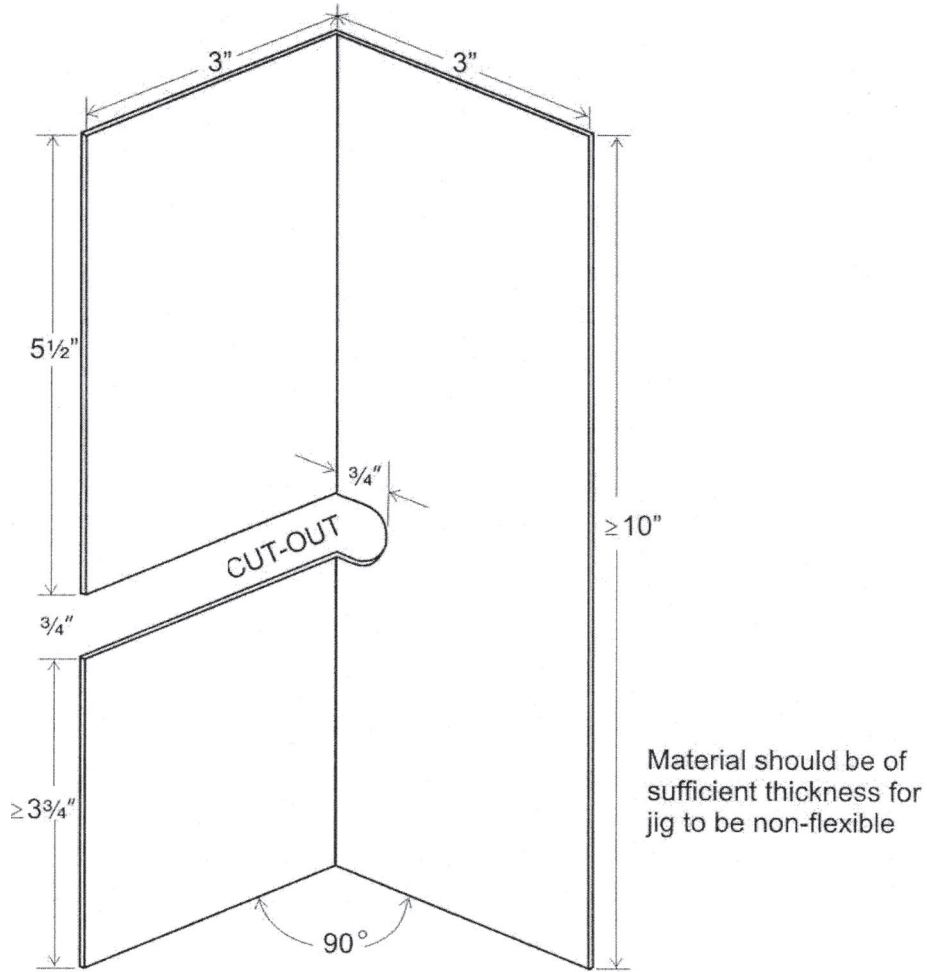


FIGURE 8 JIG FOR SETTING MATTRESS AND FOUNDATION SIDES IN SAME PLANE

FIGURE 9 TO PART 1633—BURNER PLACEMENTS ON MATTRESS/FOUNDATION

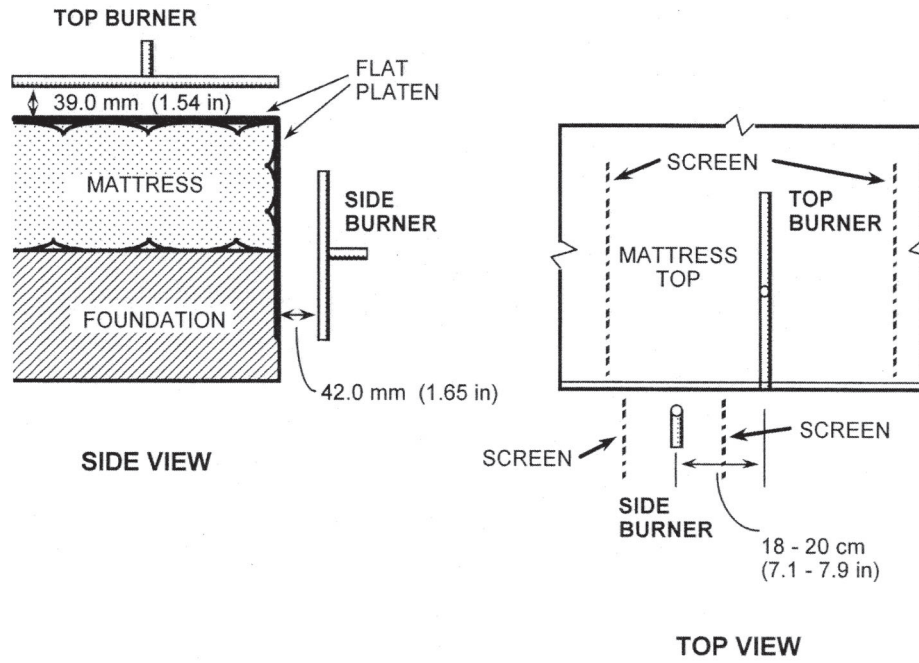
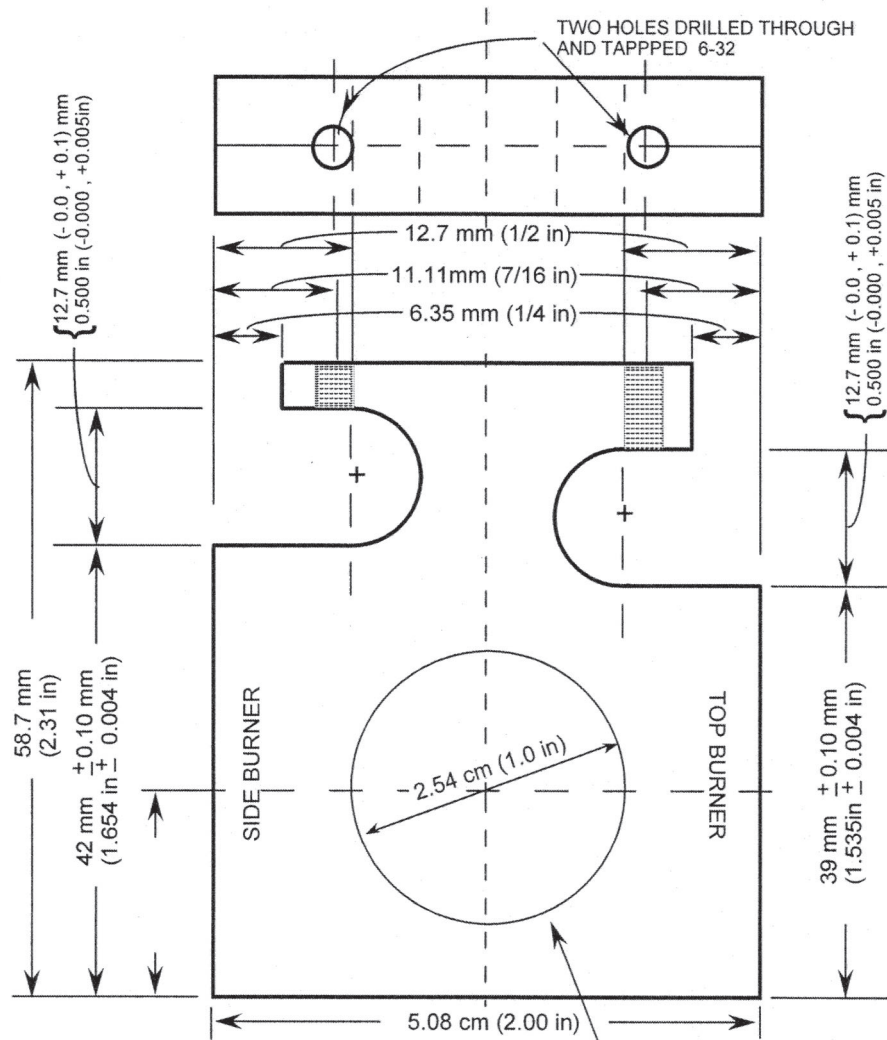


FIGURE 9. BURNER PLACEMENTS ON MATTRESS / FOUNDATION

FIGURE 10 TO PART 1633—JIG FOR SETTING BURNERS AT PROPER DISTANCES FROM MATTRESS/FOUNDATION



NOTE: PUNCH WORDS SHOWN ON BOTH FLAT FACES OF JIG.

PLACEMENT AND DIAMETER NOT CRITICAL (THIS HOLE IS JUST FOR LOWERING THE WEIGHT OF THE JIG).

FIGURE 10. JIG FOR SETTING BURNERS AT PROPER DISTANCES FROM MATTRESS / FOUNDATION

FIGURE 11 TO PART 1633—DIAGRAMS FOR GLOSSARY OF TERMS

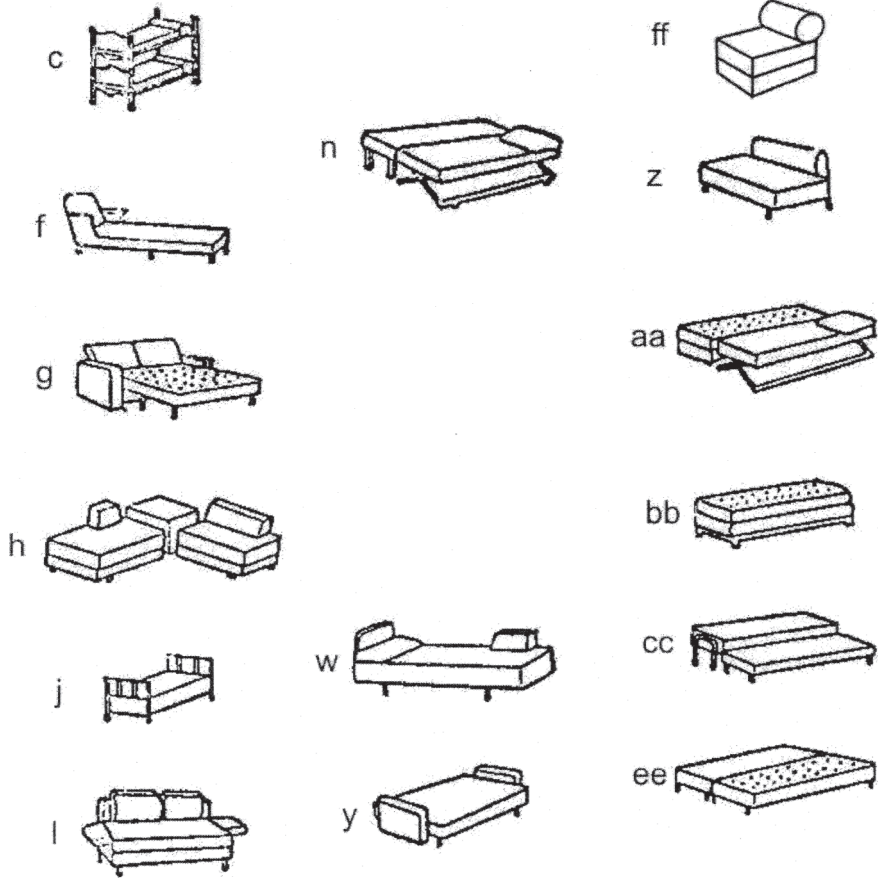


FIGURE 11. DIAGRAMS FOR GLOSSARY OF TERMS

FIGURE 12 TO PART 1633—LABELS FOR DOMESTIC MATTRESS WITH FOUNDATION

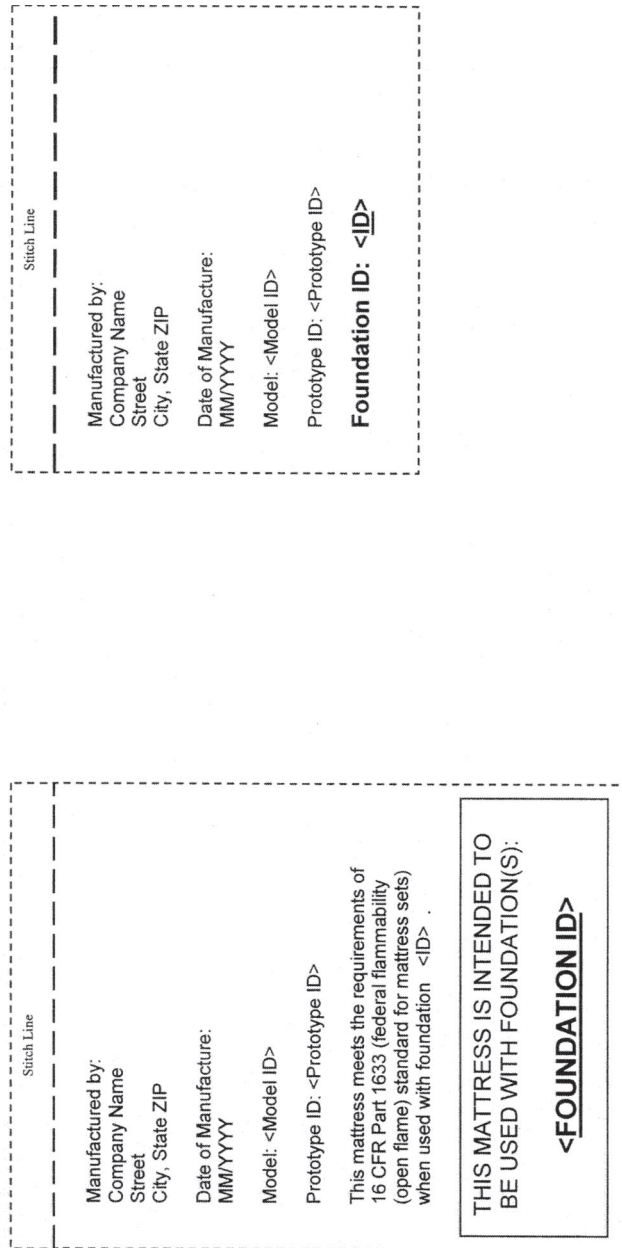


Figure 12. Labels for Domestic Mattress w/
Foundation

FIGURE 13 TO PART 1633—LABELS FOR IMPORTED MATTRESS WITH FOUNDATION

Stitch Line

Manufactured by:
Foreign Company Name
Street
City, State
Country

Date of Manufacture:
MM/YYYY

Importer/U.S. Records Location:
Importer Name
Street
City, State ZIP
Model: <Model ID>

Prototype ID: <Prototype ID>

Foundation ID: <ID>

Stitch Line

Manufactured by:
Foreign Company Name
Street
City, State
Country

Date of Manufacture:
MM/YYYY

Importer/U.S. Records Location:
Importer Name
Street
City, State ZIP
Model: <Model ID>

Prototype ID: <Prototype ID>

This mattress meets the requirements of
16 CFR Part 1633 (federal flammability
(open flame) standard for mattress sets)
when used with foundation <ID>.

<FOUNDATION ID>

**Figure 13. Labels for Imported Mattress w/
Foundation**

FIGURES 14 AND 15 TO PART 1633—LABEL FOR DOMESTIC MATTRESS ALONE AND WITH FOUNDATION AND LABEL FOR IMPORTED MATTRESS ALONE AND WITH FOUNDATION

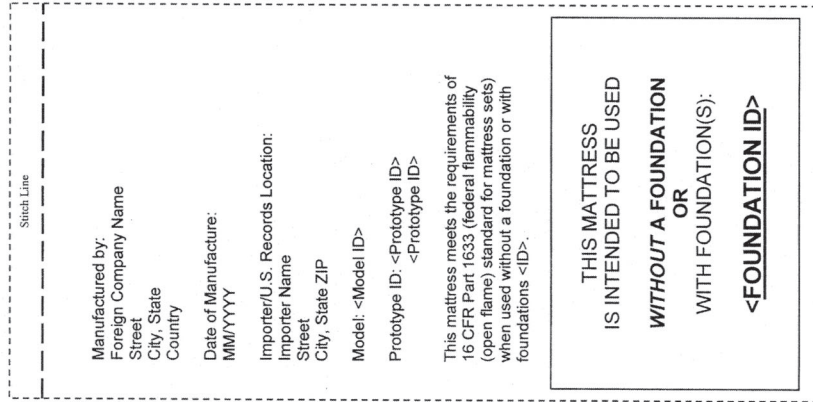


Figure 15. Label for Imported Mattress Alone and w/ Foundation

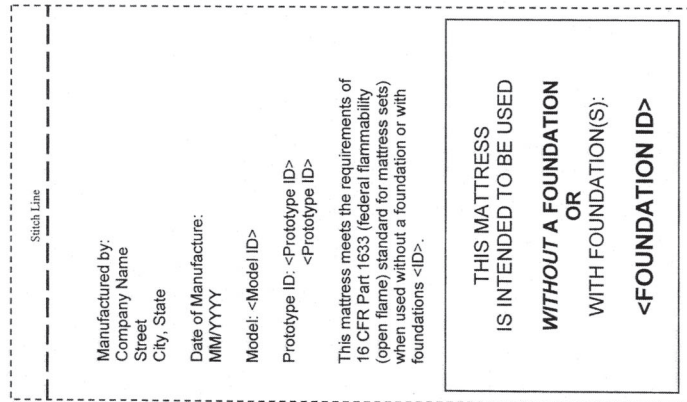


Figure 14. Label for Domestic Mattress Alone and w/ Foundation

FIGURES 16 AND 17 TO PART 1633—LABEL FOR DOMESTIC MATTRESS ONLY AND LABEL FOR IMPORTED MATTRESS ONLY

Stitch Line

Manufactured by:
Foreign Company Name
Street
City, State
Country

Date of Manufacture:
MM/YYYY

Importer/U.S. Records Location:
Importer Name
Street
City, State ZIP

Model: <Model ID>

Prototype ID: <Prototype ID>

This mattress meets the requirements of 16 CFR Part 1633 (federal flammability (open flame) standard for mattress sets) when used without a foundation.

**THIS MATTRESS
IS INTENDED TO BE USED
WITHOUT A FOUNDATION**

**Figure 17. Label for Imported
Mattress Only**

Stitch Line

Manufactured by:
Company Name
Street
City, State

Date of Manufacture:
MM/YYYY

Model: <Model ID>

Prototype ID: <Prototype ID>

This mattress meets the requirements of 16 CFR Part 1633 (federal flammability (open flame) standard for mattress sets) when used without a foundation.

**THIS MATTRESS
IS INTENDED TO BE USED
WITHOUT A FOUNDATION**

**Figure 16. Label for Domestic
Mattress Only**