

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION



LABORATORY TEST MANUAL

For

16 C.F.R. Part 1632:

Standard for the Flammability of Mattresses and Mattress Pads

This test manual was prepared by CPSC staff and it has not been reviewed or approved by, and may not necessarily represent the views of, the Commission.

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1 SCOPE

This U.S. Consumer Product Safety Commission (CPSC) staff laboratory test manual is a reference guide designed to assist with the testing procedures specified in the *Standard for the Flammability of Mattresses and Mattress Pads* codified at 16 C.F.R. part 1632 (the Standard).

This test manual is not the complete mandatory standard but is a tool that may be used in conjunction with the requirements specified in the Standard. The test manual is provided for guidance purposes only and provides guidance on the procedures to use when conducting a test. The manual is not intended to replace or supersede any sections of the Standard. In the case of any discrepancies between this manual and the Standard, the Standard will supersede this test manual.

This test manual lists the test equipment used to perform the testing in accordance with the Standard. The descriptions and pictures in this manual are not meant to serve as specifications or recommendations of any brand, make, or model of instrumentation that must be used to comply with the Standard. Rather, the descriptions and pictures provided serve as examples only, for clarification purposes.

2 SUMMARY OF 16 C.F.R. PART 1632

The *Standard for the Flammability of Mattresses and Mattress Pads* was issued to reduce the unreasonable risk of property damage, burn injuries, and deaths from fires associated with mattresses and mattress pads. The Standard prescribes a test to determine the smoldering ignition resistance of a mattress or mattress pad prototype when exposed to a smoldering ignition source (lighted cigarette). Additionally, the Standard prescribes a test method for classifying ticking and tape edge materials as candidates for substitution of those same materials used in the tested prototype.

3 PERFORMANCE REQUIREMENTS

To meet the requirements of the Standard, mattresses or mattress pads must meet the following criteria stated below and in § 1632.3(b):

- The char length on the specimen does not exceed 2.0 inches (5.1cm) from the smoldering ignition source (lighted cigarette) in any direction.

4 GENERAL EQUIPMENT LIST AND TEST MATERIALS

Perform the test in a room of sufficient size to accommodate the mattress or mattress pad specimen in a horizontal position and to allow the operator free movement around the test specimen. The test room must have a system, such as a fume hood, that has the ability to fully evacuate the combustion products caused by testing. The system must have the capability of being set at low velocity during a test. The test room should be able to be controlled for temperature greater than 18°C (65°F) and relative humidity less than 55 percent. Beyond those basic facility requirements, below is a list of suggested equipment for performing the test. Required equipment is indicated by an asterisk, “*.” Additional equipment is recommended. Refer to *Appendix D: Description of Test Equipment and Materials* for specifications on test equipment and test materials. Lists of specific equipment are provided at the beginning of each test section.

1. Automatic washing machine and dryer*
2. Balance/scale*
3. Ballast for laundering*
4. Char area measuring plate
5. Conditioning chamber*
6. Exhaust hood
7. Fire extinguisher*
8. Glass fiberboard
9. Hygrometer
10. Ignition source*
11. Laundering detergent*
12. Scale (ruler) marked in 1 mm or 0.1 in increments*
13. Scissors
14. Sheeting material*
15. Specimen preparation materials such as marking pens and tape
16. Stop watch or other timing device
17. Straight pins
18. Support system (*i.e.*, table, bench, platform)
19. Thermometer or thermocouple
20. Thin rod
21. Tongs
22. Vacuum
23. Water bottle* or other small extinguishment tool

5 CALIBRATION OF TEST INSTRUMENTS

Maintain all equipment used in the performance of these tests in conformance with the specifications required by 16 C.F.R. part 1632 and the suggested maintenance and calibration schedules.

6 SAFETY

Perform all burn tests under a properly functioning exhaust hood. Testing personnel should have personal protective equipment available that is appropriate for the test environment; in addition, testing personnel should be approved and trained to use the protective equipment. A method of fire suppression should be ready to use when testing specimens. Monitor all ignited specimens closely for situations that would present a danger to test personnel the test facility or both. Monitor suppressed specimens for re-ignition, and discard specimen remains in accordance with state and local environmental regulations.

7 REQUIREMENTS OF THE STANDARD AND TEST OVERVIEW

The Standard requires that mattress and mattress pad manufacturers test a prototype mattress or a mattress pad and obtain acceptable results to qualify that mattress or mattress pad prototype for production. Each manufacturer will construct or select enough units of each proposed mattress or mattress pad prototype for testing.¹

¹ See Appendix D: Interim Enforcement Policy.

- Mattress² Sample – 6 samples
- Mattress Pad³ Sample – 6 samples
- Substitution and Classification Testing
 - Ticking Substitution (see Appendix A)
 - Tape Edge Substitution (see Appendix B)

Figure 1 outlines the basic steps for performing the test, as described in §1632.4 and §1632.5.

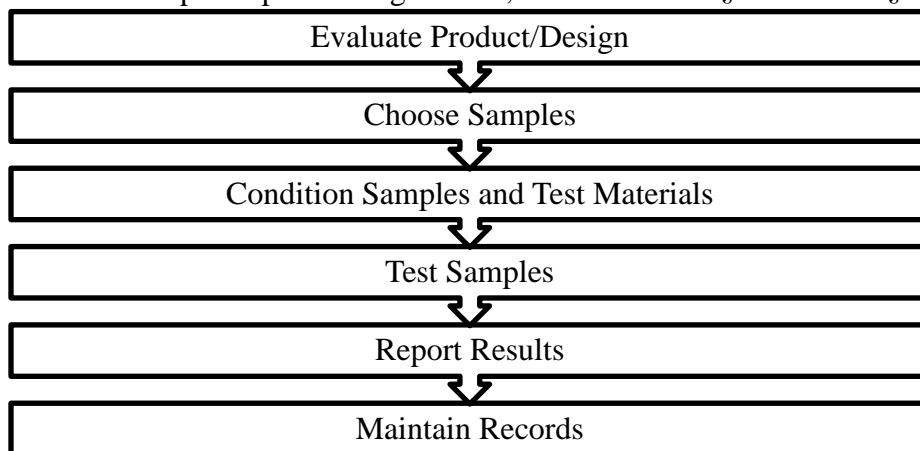


Figure 1. Overview of test.

8 SPECIMEN PREPARATION

The prototypes must be prepared for conditioning and testing. Remove packaging or plastic around the specimens, and leave hangtags and labels on the specimens. Before preparing the sample specimen for conditioning, each specimen should be inspected, and any manufacturing defects or damages in shipment should be noted on the data sheet. In addition, note snags, discolorations, skipped stitches, tears, or holes on the test report sheet before testing. The test operator should provide a physical description of the test specimen on the test report, including information such as: ticking fabric type; color; mattress thickness; presence of a tape edge; or any other observable physical characteristic that may impact testing. Inspect again before testing a specimen.

Additionally, before conditioning the sample, consider planning the placement of the cigarettes on the test surface, *i.e.*, smooth, quilted, and tape edge surfaces, to ensure a timely test start. See Section 10.3 *Cigarette Placement Planning* for additional guidance on the placement of cigarettes.

Equipment List:

- Scissors
- Scale (ruler) marked in 1 mm or 0.1 in increments*

² Hereafter, the term "mattress" will refer to mattresses, futons, and other products that are included in the definition of "mattress" in the Standard at §1632.1(a).

³ Hereafter, the term "mattress pad" will refer to mattress pads, absorbent pads, and other products that are included in the definition of "mattress pad" in the Standard at §1632.1(b).

- Marking tool, such as a pen
- Automatic washing machine and dryer*
- Ballast for laundering*
- Balance/scale*
- Laundering detergent*
- Thermometer or thermocouple

8.1 Mattress Specimens⁴

Remove the mattress from any packaging before conditioning. Draw a line to divide the mattress test surface laterally (Figure 2). Label half the surface “Sheet” for the Two-Sheet Test, and label the other half “Bare” for the Bare Mattress Test.



Figure 2. Mattress test surface divided.



Both sides of a mattress prototype need to meet the requirements of the standard if both sides of the mattress are intended to be used as sleep surfaces.

8.2 Mattress Pad Specimens

Remove the mattress pad from any packaging before conditioning. Mattress pads are to be tested in the condition in which they are intended for sale, except as noted below.

8.2.1 Launder Flame Resistant Mattress Pads

Wash mattress pads that contain a chemical fire retardant 10 times, as described in §1632.5(b)(2) and Section 12 of this document.⁵

1. Laundering is not required for mattress pads intended for one-time use and/or are not intended to be laundered, as determined by the CPSC.
2. Dry clean mattress pads that are labeled “dry clean only” or that will be damaged by regular home laundering.

If the mattress pad is not fire resistant, no laundering is required.

⁴ A “specimen” is a single test surface consisting of 18 observations. A “sample” is a grouping of six test surfaces.

⁵ See Appendix F: Glossary of Terms, “Laundering.”

8.3 Sheeting

Laundry the sheets or sheeting material once before testing. Launder the sheets or sheeting material in an automatic home washer, using the hot water setting and the longest normal cycle. Use the manufacturer's recommended quantity of a commercial detergent, and dry the sheets in an automatic home tumble dryer.



CPSC staff follows the laundering protocol outlined in Section 12 of this manual under the heading, *Laundering of Mattress Pads*.

1. After washing, cut across the width of the sheet to produce two equal-sized pieces of sheeting.
2. The sheeting material should be cut to cover half of the test mattress, as described in §1632.4(d)(3).

8.4 Ignition Source

Select unopened packages of [NIST SRM 1196](#) cigarettes for each series of tests. Remove the cigarettes from their packaging before conditioning. (Figure 3)



Figure 3. SRM 1196 package

9 SAMPLE CONDITIONING

Equipment List:

- Conditioning Chamber*
- Hygrometer
- Thermocouple or thermometer

Condition the mattresses, mattress pads, laundered sheets or sheeting material, and loose cigarettes in air at a temperature greater than 18 °C (65 °F) and at a relative humidity less than 55 percent for at least 48 continuous hours before testing. Support the mattresses, laundered sheets or sheeting material, and cigarettes in a suitable manner to permit free movement of air around them during conditioning. Any metallic core that may be present in the mattress is not required to be exposed to the temperature and humidity requirements.

10 TEST PROCEDURES FOR MATTRESS AND MATTRESS PAD SAMPLES

Equipment List:

- Cigarette Holder
- Exhaust Hood
- Fire extinguisher*
- Glass fiberboard
- Hygrometer
- Ignition Source*
- Scale (ruler) marked in 1 mm or 0.1 in increments*
- Sheeting material*, prepared and conditioned
- Straight pins
- Support system (*i.e.*, table, bench, platform)
- Thin rod
- Tongs
- Vacuum
- Water bottle* or other small extinguishment tool

10.1 General Procedure for Mattresses and Mattress Pads

Test mattress specimens in a room with a temperature greater than 18 °C (65 °F) and a relative humidity of less than 55 percent. Place at least one ignited cigarette on the mattress surface within 10 minutes of removing the cigarette from the conditioning room if the test is not performed in the same room used to condition the specimen. If the second side of the mattress will be tested, test it immediately after completion of the first side, as long as the second side of the mattress has not been impacted by extinguishing the first side.

Place at least 18 ignited cigarettes on each mattress surface. At least nine cigarettes are placed on the “Bare” mattress test surface, and at least nine cigarettes are placed on the “Sheet” test surface.

Position the cigarettes at least 6 inches (15.2 cm) apart on the mattress surface. Do not allow more than 4 mm (0.16 inch) of the length of the cigarettes to burn before placing them on the mattress surface.

Perform the test with cigarettes on the bare mattress and between the sheeting on each sleep surface at the same time.

10.2 Test Setup

1. Record temperature and relative humidity in the test area.
2. Place the specimen directly on the test surface. Fiberboard is used to support mattress pads or thin flexible mattresses during testing.



Make sure to remove any debris or lint.

10.3 Cigarette Placement Planning

Place at least three ignited cigarettes on each type of surface test location for each test surface, Bare and Two-Sheet. The types of surface test locations, if present, where cigarettes will be placed are:

1. smooth surface
2. tape edge (or edge seam)
3. quilted or tufted surface

Although not specifically mentioned in the Standard, additional surface locations may be present in the mattress prototype:

4. surface seam
5. projecting edge (as a result of a top-stitched seam at the ends of a futon).



When only two types of surface locations are present on the testing surface, place four cigarettes on the smooth surface location and five cigarettes on the other type of surface location. For example, if the two surface locations are a smooth surface and a tuft, place four ignited cigarettes on the smooth surface and five ignited cigarettes on the tuft locations for each test surface.

10.3.1 Bare Mattress Test Locations

At least nine cigarettes must be tested on the bare mattress surface. The following figures demonstrate placement of the cigarette in the different types of locations described in the previous section for a Bare Mattress Test.

10.3.1.1 *Smooth Surface Location, Bare Mattress Test*

Place an ignited cigarette directly on a smooth surface location on the half of the test surface reserved for the Bare Mattress Test. Position the cigarette so that the full length will burn on a smooth surface without burning across a tuft or the stitching of a quilt line area. If this is not possible because of the mattress design, then place the cigarette in a position that allows as much of the ignited end as possible to burn on the smooth surface. (Figure 4)



Figure 4. Cigarette placement for smooth location on a quilted surface mattress.

10.3.1.2 *Tape Edge Location, Bare Mattress Test*

Place an ignited cigarette in the depression between the mattress top surface and the tape edge, parallel to the tape edge on the half of the test surface reserved for the Bare Mattress Test (Figure 5).

Use straight pins to support a cigarette that may roll off the tape edge. Insert three straight pins through the tape edge at a 45° angle so that one pin supports the cigarette at the ignited end, one at the center, and one at the smoking end. The heads of the pins should be below the upper surface of the cigarette (Figure 6).

If there is no tape edge, but a seam is present along the edge of the specimen, then support the cigarette in place along the seam and parallel to the edge of the specimen with straight pins. Position the straight pins as described above. If there is no tape edge or seam along the top edge, then place the cigarettes at the other surface locations

10.3.1.3 *Quilt Location, Bare Mattress Test*

Place an ignited cigarette directly over the thread or in the depression created by the quilting process on the half of the test surface reserved for the Bare Mattress Test. If the quilt design is such that the cigarette cannot burn its full length over the thread or depression, place the cigarette so that as much of the butt end as possible burns on the thread or depression. (Figure 7)



Figure 5. Cigarette placement for tape edge, top view.



Figure 6. Cigarette placement for tape edge, side view.



Figure 7. Cigarette placement for quilted surface.

10.3.1.4 *Tuft Location, Bare Mattress Test*

Place an ignited cigarette so that it burns down into the depression caused by the tuft, and so that the butt end burns over the buttons or laces (threads, yarns) used in the tuft on the half of the test surface reserved for the Bare Mattress Test. (Figure 8)



Figure 8. Cigarette placement for a tuft surface.

10.3.2 Two-Sheet Test Locations

At least nine cigarettes must be tested between two sheets. In all of the test locations, the cigarette is placed over the bottom sheet and covered with the top sheet.

The following figures demonstrate placement of the cigarette in the different types of locations described in the previous section for Two-Sheet Tests.

10.3.2.1 *Smooth Surface Location, Two-Sheet Test*

Place the cigarette so that both ends are on the smooth surface. Run a finger or a thin rod along the quilt lines to help define the smooth surface lines through the sheeting fabric. (Figure 9)



Figure 9. Cigarette placement for smooth location on a tufted surface mattress, on the bottom sheet.

10.3.2.2 *Tape Edge, Two-Sheet Test*

Place cigarettes in the crevice made by the stitching on the edge of the specimen. Place pins through the bottom piece of sheeting to hold the cigarette in place once the cigarette is covered. The pins should be below the upper surface of the cigarette. For ease of placement, this can be done before the ignited cigarette is placed on the test surface. (Figure 10)

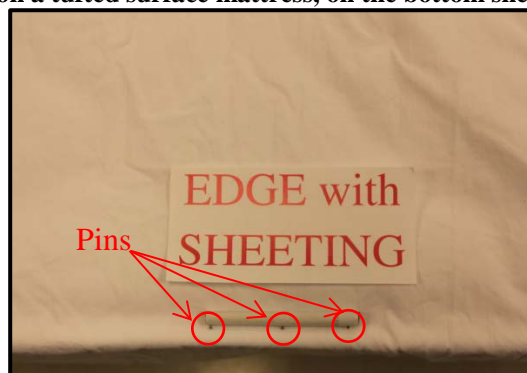


Figure 10. Cigarette placement for tape edge, on the bottom sheet.

10.3.2.3 *Quilt Location, Two-Sheet Test*

Place the cigarette on the bottom layer of sheeting in the crevice made by the quilting. For ease of placement, run your finger along the crevice so that it is clear where the quilt line is located under the sheeting. (Figure 11)

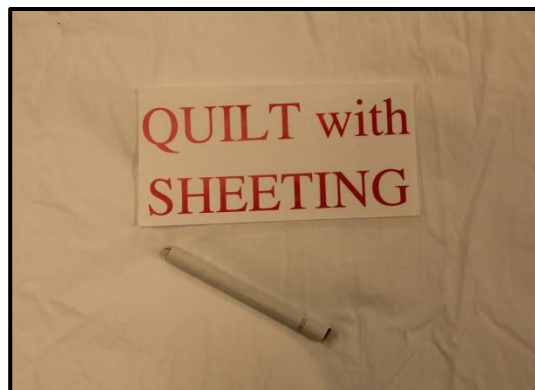


Figure 11. Cigarette placement for quilt location, on the bottom sheet

10.3.2.4 *Tuft Location, Two-Sheet Test*

Place an ignited cigarette in the crevice made by the tufting. Press your fingers into the tuft, creating a depression against the test surface.

Cigarettes may be placed radially in any direction out of the tuft. Place the ignited end of the cigarette outside the valley; the cigarette will burn into the tuft, as shown in Figure 12. Figure 13 shows the location once the top sheet is placed, over the cigarette.**

**Note: These pictures show a small piece of sheeting for demonstration purposes only. The test must be run using sheeting as described in Section 8.3.

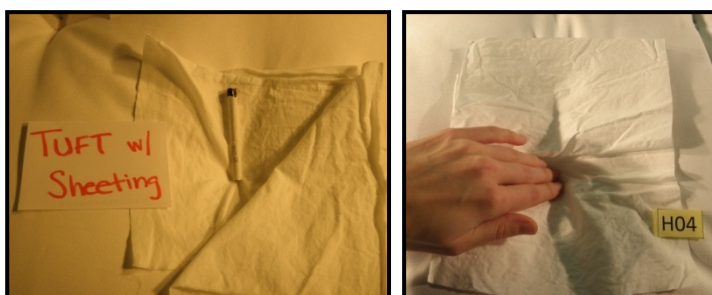


Figure 12. Cigarette placement for tuft location on the bottom sheet.**

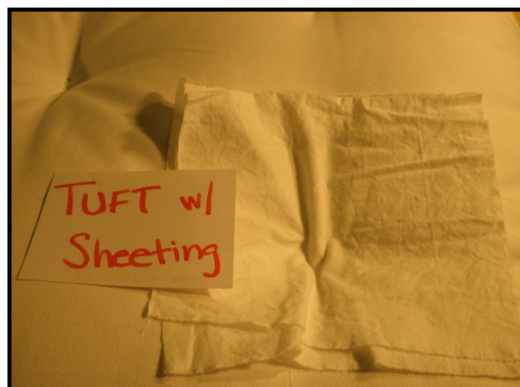


Figure 13. Cigarette placement for tuft location, with top sheet in place.**

10.4 Additional potential test surfaces

Mattresses may have one of the following features, place the cigarettes as described in this section

1. surface seam
2. projecting edge

10.4.1 Surface Seam

In some constructions, a seam is present on the test surface.

For the Bare Mattress Test: Place the cigarette parallel with and directly on the seam on the half of the test surface reserved for the Bare Mattress Test. (Figure 14)

For the Two-Sheet Test: Place cigarette on the bottom layer of sheeting in the crevice made by the seam. For ease of placement, run your finger along the crevice so that it is clear where the seam line is located under the sheeting.

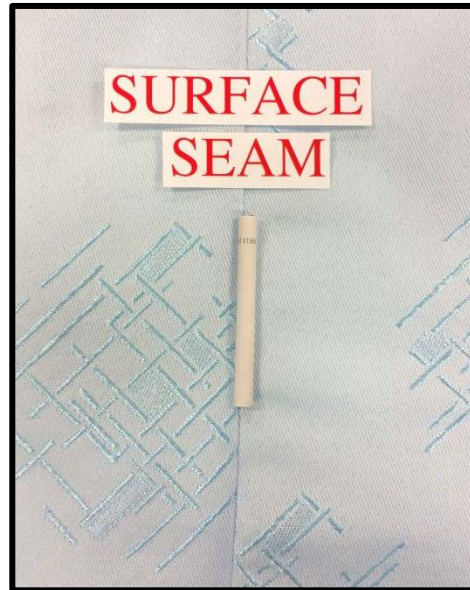


Figure 14. Cigarette placement on surface seam.

10.4.2 Projecting Edge

In some constructions, the mattress specimen is closed at each end with a top stitched seam that creates a projecting (flange-like) edge. This edge is capable of supporting a cigarette during testing. This type of edge finish is not considered a true tape edge, and so this projecting edge is evaluated as a separate test surface location.

For the Bare Mattress Test: Place the cigarette in the depression created by the stitching on the half of the test surface. Use straight pins to support a cigarette that may roll off the projecting edge, as described above in 10.3.1.2.

For the Two-Sheet Test: Place the cigarette in the crevice made by the stitching on the edge of the specimen. Place pins through the bottom piece of sheeting to hold the cigarette in place once the cigarette is covered, as described above in 10.3.2.2.

10.5 Lighting the Ignition Source

The Standard does not specify an ignition procedure; however, for safety and repeatability, CPSC staff uses the following procedure to ignite the SRM 1196 cigarette:

1. Light the cigarettes using a vacuum pump or vacuum cleaner and an alcohol burner.
2. Hold the cigarette with the smoking-end (butt) about a half inch into the hose and the lighting tip over the flame until the cigarette is ignited. Ensure that the cigarette is evenly ignited, no more than 0.16in (4mm), as described in § 1632.4(d)(ii).
3. Place the ignited cigarette on the mattress or mattress pad surface, per Section s 10.3 and 10.4.

10.6 Conducting a Bare Mattress Test

Test half of the cigarettes on the bare part of the mattress by placing the ignited cigarettes directly onto the mattress or mattress pad surface.



If the test room does not meet the conditioning requirements, at least one (1) cigarette must be placed on the mattress within 10 minutes of removal from the conditioning room.

1. Ignite SRM 1196 cigarettes; ensure that each cigarette is not burned more than 0.16in (4mm). See Section 10.5.
2. Place the ignited cigarettes in the designated test areas on the required surface locations. See Sections 10.3 and 10.4 for surface location examples.



Place the cigarettes at least 6 inches apart.

3. If an ignited cigarette self-extinguishes within 60 seconds of placement, re-ignite the same cigarette, and place in the same location.
4. The Bare Mattress Test is complete when one of the following requirements has been met:
 - a. The cigarettes tested at each surface location have burned their full lengths,
 - b. The cigarettes tested at each surface location have extinguished before burning their full lengths. A maximum of two relights are allowed for each individual cigarette test location, or



To relight: repeat the test with a new ignited cigarette at another position in the same type of surface location if a cigarette:

- Extinguishes before burning its full length but after 60 seconds from placement on any mattress surface location,
- Shifts out of position when tested on a tuft, or
- Rolls off any test location.

- c. The char length at any individual cigarette test location does not meet the test criterion (see § 1632.3(b), Section 11).
5. Report results for each cigarette as “pass” or “fail,” as defined in the test criterion.



Even under the most carefully observed conditions, smoldering combustion can progress to the point where it can be difficult to extinguish. Discontinue testing as soon as ignition is observed. 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 charred material out of the mattress with tongs. Make sure that all charred or burned material is removed. Ventilate the room once the test is completed.

10.7 Conducting a Two-Sheet Test

Test half of the cigarettes between two sheets on each sleep surface. Prepare the test sheeting as described in Section 8.3 of this document. Place the sheets on the mattress after conditioning and immediately before testing begins.

1. Place a piece of sheeting over the half of the sleep surface marked as “sheet” (see 8.1). Smooth the sheeting, and tuck the ends under the mattress.



Figure 15. Bottom sheet tucked in.



- The hem or any other portion of the sheet that is more than one fabric thickness should not be directly under or over a test cigarette.
- To minimize the air space between the test surface and the bottom sheet, press the bottom sheet into the depressions that occur at the test locations. This depression can be formed by using the hand or a suitable instrument (*i.e.*, thin rod); see examples in Section 10.3 of this document.

2. Ignite SRM 1196 cigarettes.
3. Place the ignited cigarettes directly on the first layer of sheeting, according to 10.3.2.
4. Immediately after the cigarettes are positioned at each test surface location, place the top (second) sheet smoothly over the bottom (first) sheet to cover the burning cigarettes, see Figure 16.)



Figure 16. Top sheet hanging over side of mattress.



To ensure that there is good contact between the sheet and the cigarette, gently run a finger along the cigarette on the top sheet. Although this is not required in the Standard, staff does this to ensure contact between the sheets and the cigarette. Be careful not to press the cigarette too hard or crush it.



When placing the top sheet over the cigarettes, be careful not to disturb the cigarettes' placement. For example, if a cigarette is placed in a quilted surface, make sure the cigarette does not roll off of the quilt stitching.

5. The Two-Sheet Test is complete when one of the following requirements has been met.
 - a. The cigarettes tested at each surface location have burned their full lengths,
 - b. The cigarettes tested at each surface location have extinguished before burning their full lengths.A maximum of two relights are allowed for each individual cigarette test location, or



If a relight is needed, carefully pick another location around the perimeter of the mattress and place the lit cigarette, being careful to not disturb the other cigarettes; or if it is too far into the test, recondition the mattress and then place the cigarette, especially if a test is needed on the second side of the same mattress.

- c. The char length at any individual cigarette test location does not meet the test criterion.



Do not lift the top sheet during testing, unless an obvious ignition occurs, or until the cigarettes have burned their whole length or self-extinguished. Holding a hand near the surface of the top sheet over the test location will help to determine whether the cigarette has extinguished. If no heat is felt, nor smoke observed, then the cigarette has extinguished.

6. Report results for each cigarette as “pass” or “fail,” as defined in the test criterion (see §1632.3(b), Section 11).



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.



Extinguishing failing test locations on one side of a mattress can result in the second side of the same mattress not being suitable for testing because the water may penetrate all the way through the mattress.

11 TEST CRITERION

The test criterion specified in §1632.3(b) of the Standard states that 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.

- Measure char lengths using a linear scale graduated in millimeters, 0.1 inch or 1/16 inch divisions.
- Measure char length both across the mattress surface and downward into the mattress in the case of burns that penetrate through the mattress surface.

The mattress prototype that the sample represents is acceptable if all the cigarette test locations on the mattress surfaces yield passing results. The mattress prototype is rejected if one or more cigarette test locations tested do not meet the test criterion. Figure 17 shows a passing result on the mattress surface. Figure 18 shows a failing result on the mattress surface. When testing in the two-sheet location, the measurement must be made on the mattress surface, not on the sheeting. The pass and fail results will be similar in appearance to the Bare Mattress Tests.

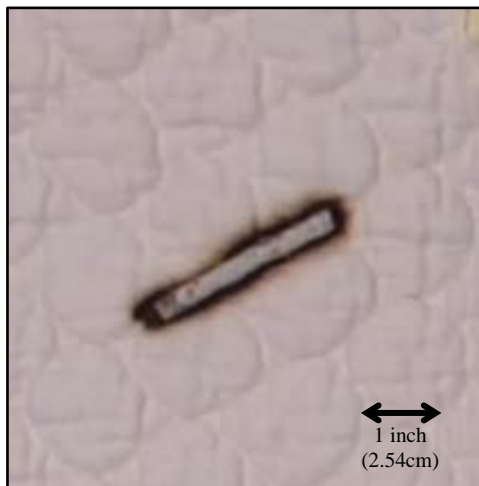


Figure 17. Example pass result for bare mattress.

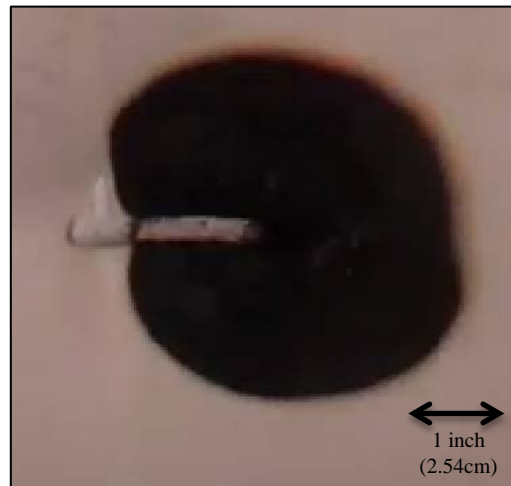


Figure 18. Example fail result on mattress surface.

In most cases, the char lengths will be allowed to reach 2 inches (5.1 cm) before the test for the sleep surface is stopped. In the interest of safety, apply water to extinguish an obvious ignition before the 2-inch (5.1cm) char length is reached. Record the test result on the data sheet as a failure for the test location. A measuring template can be used to make this measurement. See Figure 19.

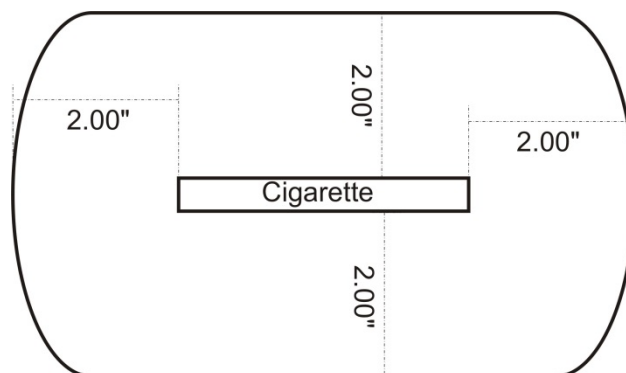


Figure 19. Char measurement template for specimen surface. Not to scale.

12 LAUNDERING MATTRESS PADS

Equipment List:

- Automatic washing machine and dryer*
- Ballast for laundering*
- Balance/scale*
- Laundering detergent*
- Thermometer or thermocouple

Procedure:

Label all items (mattress pads with chemical fire retardants) in the test unit with any identification information using an indelible marker.

Launder the test mattress pad specimen or sheeting following the American Association of Textile Chemists and Colorists (AATCC) Test Method 124-1996, *Appearance of Fabrics after Repeated Home*

Laundrying. The procedure is described as option (1)(V)(A)(iii) from Table II of that test method. See Table 1 and § 1632.5(b)(1) and § 1632.5(b)(2).

Table 1. Washing and Drying Conditions

Washing Cycle	Normal/Cotton Sturdy
Wash Temperature	60 ± 3 °C (140 ± 5 °F)
Rinse Temperature	< 29 °C (85 °F)
Drying Procedure	Tumble

The technical requirements for the laundrying procedure are shown in Table 2.

Table 2. Technical Requirements for Laundrying

Washing Machine Conditions	Water Level	18 ± 1 gal
	Agitator Speed	179 ± 2 spm
	Washing Time	12 min
	Spin Speed	645 ± 15 rpm
	Final Spin Cycle	6 min
	Wash Load	3.1 to 3.6 kg (7 to 8 lb.)
Detergent	AATCC 1993 Standard Reference Detergent	Powder
	Amount	66.0 ± 0.1 g
Dryer Conditions	Exhaust Temperature	66 ± 5 °C (150 ± 10 °F)
	Cool Down Time	10 min



Check the indelible markings, after each laundrying cycle to be sure they are still legible. If they are faint or faded, relabel the test mattress pad specimens or sheeting with the identification information.

Weigh the test mattress pad specimen or sheeting to be laundered and add ballast⁶ to make a wash load of approximately 3.6 kg (8.0 lb.).

⁶ Refer to *Table 1. Wash Load Ballast* in the AATCC Test Method 124-1996 for fabric type options.

Fill the wash tub. Use a temperature measuring device, such as a thermometer or thermocouple, to check the water temperature as the wash tub fills. (Figure 20)



Figure 20. Check water temperature.



If the water temperature is outside of the stated range as the wash tub fills, empty the wash tub using the spin cycle and refill. Do not add the detergent, test mattress pad specimen or sheeting items, and ballast until the water temperature is in the stated range.

Weigh 66.0 ± 0.1 g of detergent (AATCC 1993 Standard Reference Detergent, powdered). (Figure 21)



Remember to tare the scale for the weighing container!



Figure 21. Weigh detergent.

Add the detergent to the wash tub as it fills. Allow detergent to dissolve before adding the items in the test mattress pad specimen or sheeting and ballast. Add the test unit and ballast before the machine agitation begins.

Wash the test mattress pad specimen or sheeting and ballast according to the conditions and settings in Tables 3 and 4.

Once the washing process is complete, place the test mattress pad specimen or sheeting items and ballast in the dryer, and dry according to the conditions and settings in Tables 3 and 4. This completes one laundering cycle. Repeat for a total of 10 laundering cycles.



Complete the washing and drying cycle within the same day.

After the laundering process is complete, condition the test mattress pad specimen or sheeting, and test the laundered mattress pad specimen or sheeting according to the test procedure.

13 TEST REPORT

Record results of all tests performed. The Standard requires the following information to be recorded:

- Name of the mattress manufacturer;
- Manufacturing specification and a description of each mattress or mattress pad prototype;
- Prototype identification number;
- Ticking classification, if known;
- Mattress sample number;
- Description of the visual appearance of the mattress sample;
- Photograph of the bare surface of each mattress or mattress pad tested, with the prototype number and a clear designation of which part of the surface was sheeted, and which part was tested bare;
- Name and signature of person(s) conducting the tests;
- Date tests are performed;
- Cigarette test locations;
- Test room conditions;
- Number of relights for each test location;
- Result for each cigarette as a pass or fail (test results for each cigarette location will be recorded as “P” (pass) or “F” (fail), defined by the test criterion of the Standard); and
- Signature of the supervisor.

A test report can also include:

- Details of the sampling plan(s) used.

Maintain all physical and written records required to document compliance with the test procedures and sampling plans as specified by the Standards. See *Section 15 Recordkeeping* of this manual for more information on the recordkeeping requirements of the Standards.

Certification of the test report should be completed by the person overseeing the testing with an understanding of the test, provided they did not perform the tests to be certified.

14 PHYSICAL SAMPLE DISPOSITION

Discard specimen remains in accordance with state and local environmental regulations.

In the case of a failing sample, see *Section 15.1 Disposition Records* for guidance on maintaining records on the prototype.

15 RECORDKEEPING

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.

The requirements for prototype testing are applicable to each “manufacturer” (including importers and renovators) of mattresses or mattress pads that are manufactured for sale in commerce. Each manufacturer is responsible for performing testing required under the Standard and maintaining records of such testing, as applicable:

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 *Section 10* (§ 1632.4 or § 1632.5), including prototype 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 of the bare surface of each mattress or mattress pad tested, in accordance with *Section 10* (§ 1632.4 or § 1632.5), with the prototype identification number of the mattress or mattress pad and a clear designation of 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 descriptions of any new ticking or tape edge material substituted in accordance with *Appendix A* or *B* (§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 Appendix A (§ 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 Appendix A (§ 1632.6).
7. The test results and details of any test of tape edge materials conducted in accordance with Appendix B (§ 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 the test results and that the test was carried out in accordance with Appendix B (§ 1632.7).
8. Photograph of the bare surface of each mattress or mattress pad tested in accordance with Appendix B (§ 1632.7), with the prototype identification number of the mattress or mattress pad and a clear designation of 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.

15.1 Disposition Records

Disposition of all failing or rejected prototype mattress or mattress pads.

In the case of failing test results for a mattress specimen, maintain records demonstrating that the items were retested and reworked in accordance with the Standard before 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. Mattress specimens that do not meet the requirements of the Standard cannot be entered into commerce.

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.

15.2 Retention Requirements

Maintain the records required in this section for three (3) years plus the longest of the following:

- (1) as long as the prototype is in production,
- (2) the ticking is being used on the mattresses or mattress pad prototype, and/or
- (3) the tape edge material is being used on the mattress or mattress pad prototype.

APPENDIX A: TICKING SUBSTITUTION PROCEDURE

The Standard provides two optional test methods that can be used to reduce the number of additional prototype tests required when materials are changed. One of the optional test methods is the Ticking Substitution Test. This test procedure classifies ticking fabrics into categories to allow substitution of ticking fabrics permitted in § 1632.6(c) of the Standard without requiring a new prototype test of the mattress or mattress pad.

This procedure is optional and 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.



However, if using alternate material and 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.

For the purpose of this section, the following definitions apply in addition to those in §1632.1.

1. Mattress ticking prototype: 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.
 - a. Film-coated ticking prototype: a specific ticking as described above, plus film coating with a given method of application, chemical formula, and thickness.
 - b. Quilted ticking prototype: a specific ticking as described above, plus;
 - i. a specific filling, thickness, density, and chemical composition;
 - ii. a specific thread;
 - iii. a specific method of quilting; and,
 - iv. a specific backing fabric construction, weave, finish, fiber content, and weight.
2. Mattress pad ticking prototype: 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.
 - a. Film-coated ticking: a specific ticking as described above, plus a film coating with a given method of application, chemical formula, and thickness.
 - b. 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.

Equipment List:

Required equipment is indicated by an asterisk, “*.” Additional equipment is recommended.

- Cotton Felt*
 - Undamaged. 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 a previous test.
- Exhaust Hood*
- Fire extinguisher*
- Hygrometer*
- Ignition Source*
- Mounting Box*
- Scale (ruler)* marked in 1 mm or 0.1 in increments
- Scissors*
- Sheeting material*, prepared and conditioned per Section 9
- Stapler or masking tape or other means of attachment to secure fabric to test box.*
- Straight pins*
- Support system (*i.e., table, bench, platform*)
- Template for ticking test*
- Thin rod*
- Tongs*
- Urethane foam, untreated, as specified in 1632.6(e)(vi)*
- Vacuum

A1. Scope and Application

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 barriers against cigarette ignition.
- Class B represents tickings evaluated as having no effect on cigarette ignition.
- Class C represents tickings evaluated as having the potential, in some manner, to act as a contributor to cigarette ignition.

On any accepted prototype, substituting any ticking with another ticking that has been evaluated as the same performance class or better is not considered a “difference in materials,” as described in § 1632.1 (j) and (k). See the Table 3 below for acceptable substitutions.

Table 3. Acceptable substitutions for tickings.

Classification of Substitution Ticking	Classification of Ticking in Qualified Prototype		
	Class A	Class B	Class C
Class A	<i>Permitted without New Prototype Testing</i>	<i>Permitted without New Prototype Testing</i>	<i>Permitted without New Prototype Testing</i>
Class B	Requalification of Prototype Required	<i>Permitted without New Prototype Testing</i>	<i>Permitted without New Prototype Testing</i>
Class C	Requalification of Prototype Required	Requalification of Prototype Required	Requalification of Prototype Required

Any ticking classified by the substitution test as a Class A ticking can be substituted on any qualified mattress or mattress pad prototype without there being a difference in materials. Any ticking classified by the substitution test as Class B may be substituted on a mattress or mattress pad prototype qualified with a Class B or Class C ticking.

A ticking classified as Class C using the test method can only be used on the prototype on which it was qualified. Class C tickings are not interchangeable, and each prototype using a Class C ticking is considered a new prototype design.



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 using the unclassified ticking in question.

A2. Test Criterion

1. Cigarette Test Location - 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. A measuring template can be used to make this measurement, see Figure 22.



In the interest of safety, the test operator may discontinue the test and record a failure before reaching the 1-inch (2.54 cm) char length if an obvious ignition has occurred.

2. Test Specimen - An individual test specimen passes the test if all three cigarette test locations meet the cigarette test criterion.

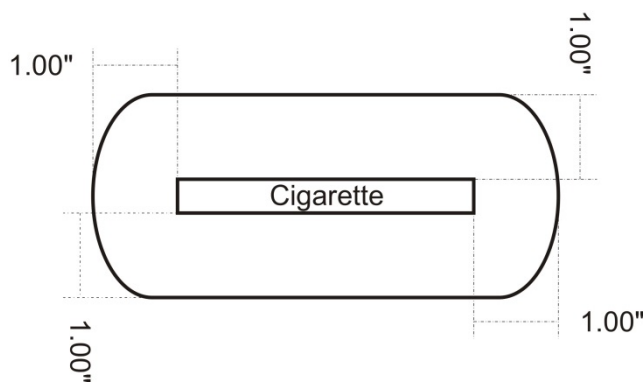


Figure 22. Char measurement template for ticking test. Not to scale.

A3. Specimen Selection

Test three specimens for each ticking prototype classification test. Each specimen should measure at least 20 inches by 20 inches (50.8 cm × 50.8 cm) square. Select the specimens from any fabric piece taken from a ticking prototype that is representative of the prototype.

A4. Ticking Classification

Classify the ticking prototype as Class A, Class B, or Class C, in accordance with the following:

- Class A - three specimens meet the test criterion when tested directly over the cotton felt on the test box.
- Class B - three specimens meet the test criterion when tested on a $1/4$ inch \pm $1/32$ inch (6.3 mm \pm 0.8 mm) thick untreated urethane foam pad covering the cotton felt on the test box.
- Class C - any specimen fails to meet the test criterion when tested on a $1/4$ inch \pm $1/32$ inch (6.3 mm \pm 0.8 mm) thick untreated urethane foam pad covering the cotton felt on the test box.

See § 1632.6(e) and § 1632.6(d)(2) of the Standard for more information.



Figure 23. Flow diagram to determine Ticking Classification.

A5. General Test Procedure

Test ticking specimens in a test room greater than 65 °F (18 °C) with a relative humidity less than 55 percent. Burn three cigarettes on each ticking specimen, with no more than one cigarette burning at any time. Place at least one cigarette on the most prominent area of the color and weave pattern design in the ticking. If the ticking is quilted, place one cigarette over the thread or in the depression created by the quilting process. Position each cigarette at least 2 inches (5.08 cm) from any other cigarette or the edge of the box.

A6. Sample Conditioning

Condition the test specimens, cigarettes, laundered sheets or sheeting material, foam and felt at a temperature greater than 65 °F (18 °C) and a relative humidity less of than 55 percent for at least 48 continuous hours before test. Support the test specimens, laundered sheets or sheeting material, and cigarettes to permit free movement of air around them during conditioning. The test specimens meet this conditioning requirement if the test specimens and/or all its component materials have been exposed only to the above temperature and humidity conditions for at least 48 continuous hours before testing the mattress.

A7. Sample Preparation

1. Place 2 ± 0.01 pounds (907.2 ± 4 grams) 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 of the box (Figure 24).
2. For the first part of this test, place a 12-inch by 12-inch (30.48 cm by 30.48 cm) square urethane foam pad on top of the cotton felt (Figure 25).



Figure 24. Cotton felt in test box, protruding up to 3 in. from the top of the box.



Figure 25. Urethane foam placed over cotton felt.

3. Stretch the ticking specimen over the foam pad, and fasten it to the sides of the test box using a stapler or tape (Figure 26 and Figure 27).



Figure 26. View of ticking, urethane foam and cotton felt partially fastened.



Figure 27. Ticking fastened, using staples.



Position the ticking specimen over the foam so that it is approximately centered over the box. Secure one side with staples/tape/clamps. Smooth fabric over the box to remove wrinkles and achieve firm contact with the foam. Secure opposite side and then continue securing remaining two sides, folding over corners, as shown in Figure 27. Take care not to cover the two air intake holes on the sides of the box.

Avoid wrinkles in the fabric, and have sufficient tautness to ensure firm contact between the fabric and the filling materials in the test box.

A8. Conducting the Test

1. Ignite and place one cigarette on the test specimen.
Once ignited, do not allow the cigarette to burn more than 4 mm (0.16 inch) by the time it is placed on the test specimen.
2. Immediately cover the ignited cigarette with test sheeting material.



If necessary, support the cigarette with 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. (Figure 28).



If smoldering 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)/Section A4.

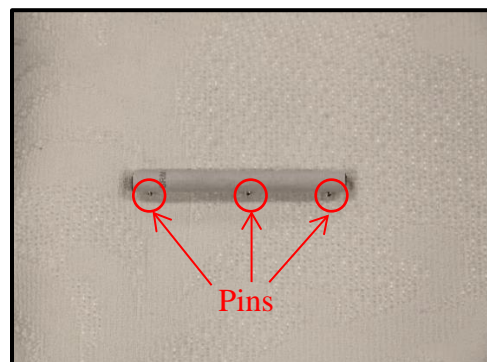


Figure 28. Pin placement to hold cigarette in place.

3. Report the result for each cigarette as pass (Figure 29) or fail (Figure 30), as defined in Test Criterion § 1632.6(d)(2). An obvious ignition is recorded as a failure.



Figure 29. Pass result example on ticking.

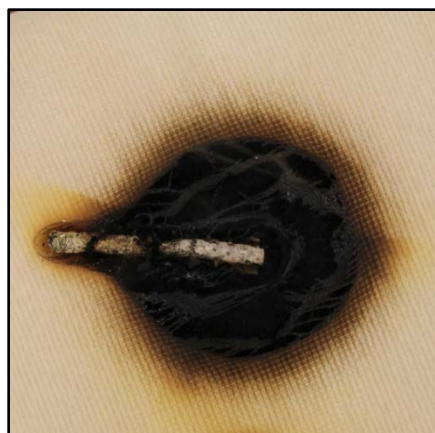


Figure 30. Fail result example on ticking.

4. 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).



Tongs or another method can also be used.



Figure 31. Removal of charred felt.

5. Add new felt to replace the discarded, charred fibers as necessary to maintain the full 2 ± 0.01 pounds (907.2 \pm 4 grams) of felt for each test.



Replace any cotton felt that is charred, discolored, or warm with intact, fully conditioned cotton felt.



If the cigarette extinguishes before burning its full length, the test must be repeated with a freshly ignited cigarette on a different portion of the ticking specimen until either three cigarettes have burned their full lengths or three cigarettes have extinguished.

6. Remove the urethane foam pad and charred or heat discolored area from the cotton felt, as specified in § 1632.6(e)(v)(B) before testing. Record the test results as “pass” or “fail,” as defined in Test Criterion § 1632.6(d)(2)/Section A2, and classify according to § 1632.6(d)(4)/Section A4.
7. If all cigarette test locations meet the *Test Criterion* in §1632.6(d)(2)/Section A2 of this manual, repeat the procedure outlined in steps 1 through 6 above 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.

A9. Test Records

Maintain records of any ticking classification test results relied upon by the mattress or mattress pad manufacturer or importer in accordance with rules and regulations established by CPSC 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. This test procedure is optional. 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).



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.

A full scale test must be performed, per §1632.4. Once the prototype has been accepted, a manufacturer can rely on the ticking substitution test to use alternate tickings.

APPENDIX B: TAPE EDGE SUBSTITUTION PROCEDURE

The Standard provides two optional test methods that can be used to reduce the number of additional prototype tests required when materials are changed. This optional test method is the Tape Edge Substitution Test. This test procedure may be used to demonstrate that the substitution of the tape edge materials will not reduce the ignition resistance of a mattress or mattress pad prototype.

According to §1632.1 (j) and §1632.1(k), “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 CPSC that such change will not reduce the ignition resistance” of the mattress prototype or the mattress pad prototype.

A showing “to the satisfaction of the CPSC” means that that for materials substitution of items, such as flange materials and tapes at the tape edge:

- The mattress or mattress pad prototype has been qualified previously under the provisions of §1632.3.
- A substitution of materials involving only tape edge construction is contemplated
- 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).
- 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 CPSC (see §1632.31).

APPENDIX C: INTERIM ENFORCEMENT POLICY

The following information is from the interim enforcement policy made by the Office of Compliance and Field Operations dated May 15, 2006.

Enforcement Policy

The Office of Compliance will exercise its enforcement discretion and permit manufacturers to reduce testing from six mattress surfaces to two mattress surfaces for each new prototype created, to comply with the Open-Flame Standard. Thus, a prototype will be accepted if the char lengths of the 18 individual cigarettes are not more than 2 inches in any direction from the nearest point of the cigarette on two mattress surfaces. This policy applies only to mattress prototypes created after the March 15, 2006 publication of 16 C.F.R. part 1633 in the *Federal Register*. Mattress prototypes created before March 15, 2006, are subject to the full requirements of part 1632.

Effective Date

This policy went into effect on May 1, 2006, and will remain effective until further notice. The Office of Compliance retains the right to modify or suspend the interim enforcement policy at any time. However, the staff intends to provide at least 30 days' notice on the CPSC's website before making any change to this interim policy.

APPENDIX D: DESCRIPTION OF TEST EQUIPMENT AND MATERIALS

Automatic washing machine and dryer: The laundering procedures in the Standard require the use of an automatic washing machine and tumble dryer. The specifications for this equipment are found in § 1615.4(g)(4) and § 1616.5(c)(4) and in section 12. *Laundering*, Tables 2 and 3 of this laboratory manual.

Balance/scale*: A mass measurement device, with a tolerance of 0.01pounds.

Ballast for laundering*: Add mattress pad to ballast fabric to make up a wash load of at least 4 pounds but not greater than 8 pounds. Ballast may be either 100 percent cotton or 50/50 polyester/cotton blend. CPSC staff follows Table 1, *Wash Load Ballast: Finished Fabric Specification*, in AATCC Test Method 124-1996.

Conditioning chamber*: A space or room that can maintain consistently over time set environmental conditions, such as temperature and relative humidity.

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



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

Exhaust Hood: A suitable overhead system for exhausting smoke and/or noxious gases produced by testing.

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

Glass fiberboard*: Required for thin, flexible mattresses or mattress pads. Material 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.

Hygrometer: An instrument used to measure moisture content in the immediate environment.

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 \(NIST\)](http://www.nist.gov), 100 Bureau Drive, Gaithersburg, MD 20899.

* This symbol denotes equipment that is required in the Standard.

Laundering detergent*: AATCC 1993 Standard Reference Detergent (powdered) is specified by the Standards. This detergent can be obtained from the American Association of Textile Chemists and Colorists (AATCC).⁷

Mounting Box*: A 6-inch deep, 12-inch square plywood box. The box contains two ½-inch in diameter ventilation holes. This box is used for the optional Ticking Substitution Test.

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

Sheeting material*: White, 100 percent cotton sheets or sheeting material must be used. It cannot be treated with a chemical finish that imparts a characteristic such as permanent press or flame resistance. It must 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 must be appropriate for the mattress being tested.

1. The fiber content of the sheets will be 100 per cent cotton, as determined by microscopic analysis.
2. The fabric weight of the sheets will be 3.7 ± 0.8 oz/yd² (125 ± 28 gm/m²).

Sheet and sheeting material (Ticking Substitution Test)*: Test covers made from sheets or sheeting material that are at least 12 inches by 12 inches (30.48 cm by 30.48 cm) square.

Specimen preparation materials, such as scissors, marking pens, and tape.

Stopwatch or other timing device: A stopwatch or similar timing device is used to measure time to 0.1 second.

Straight pins: Pins used to support cigarettes in locations where the cigarette may roll or fall.

Support system: 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.

Stapler, or masking tape, or other means of attachment to secure fabric to test box.

Template for char measurement* (for ticking substitution testing): Designed to allow for a 1-inch marking around the placement of the cigarette. Use of this template is optional.

Template for char measurement (for mattress surface testing): Designed to allow for a 2-inch marking around the placement of the cigarette. Use of this template is optional.

Thermometer or thermocouple: A device to measure temperature.

⁷ American Association of Textile Chemists and Colorists (AATCC), PO Box 12215, Research Triangle Park, NC 27709 (www.aatcc.org).

Thin rod: a thin metal rod, approximately the diameter of a cigarette, used to press sheeting into tuft crevices.

Tongs: Metal tongs to remove cigarettes during testing.

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 1/4 inch \pm 1/32 inch (6.3 mm \pm 0.8 mm). The foam cannot be treated with a flame retardant chemical.

Vacuum: An appliance for ignition of cigarettes and clean up.

Water bottle* or other small extinguishment tool: A water bottle fitted with a spray nozzle can be used to extinguish the ignited portions of the mattress.

APPENDIX E: GLOSSARY OF TERMS

Char length: The distance of char spread measured in any direction from the cigarette, including into the specimen.

Core: The main support system that may be present in a mattress, such as springs, foam, hair block, water bladder, air bladder, or resilient filling.

Labeling, Mattress Pad with Chemical Fire Retardant: Label a mattress pad containing a chemical fire retardant with the letter “T” per § 1632.5(b)(3).

- Care label. Label all mattress pads that contain a chemical fire retardant treatment with precautionary instructions to protect the pads from agents or treatments known to cause deterioration of their flame resistance. Such labels shall be permanent and are otherwise in accordance with § 1632.31(b).
- One-time use products, as defined in § 1632.5(b)(1)(i), are not subject to these labeling requirements.

Laundering: The process of washing mattress pad samples with an aqueous detergent solution; includes rinsing, extraction, and tumble drying. The Standard uses a laundering procedure outlined in the American Association of Textile Chemists and Colorists (AATCC) Test Method 124-1996.

Manufacturer: An individual plant or factory, at which mattresses and/or mattress pads are produced or assembled.

Mattress: 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 that 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.
2. This definition excludes sleeping bags, pillows, mattress foundations, liquid- and gaseous-filled tickings, such as water beds and air mattresses that do not contain upholstery material between the ticking and the mattress core, upholstered furniture that 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.

Mattress Pad: 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 that are totally enclosed in ticking. This definition excludes convoluted foam pads that are not totally encased in ticking.

Mattress Prototype: 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 CPSC 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.

Mattress Pad Prototype: 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 CPSC 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.

Obvious Ignition: Pronounced continuous and self-sustaining combustion, smoldering or flaming, of the test system, accompanied by rapid generation of heat and smoke. It is a matter of operator judgment, based upon experience in this type of operation.⁸

Projected Edge: A top-stitched seam that creates a projecting (flange-like) edge, which closes the mattress specimen at each end.

Quilted: Stitched with thread or by fusion through the ticking and one or more layers of upholstery material.

Renovated Mattress: A mattress that has undergone renovation, including 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. 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. See § 1632.63 for more information.

⁸ ASTM 1353, *Standard Test Methods for Cigarette Ignition Resistance of Components of Upholstered Furniture*. ASTM International. West Conshohocken, PA. 2002

Sample: A grouping of six test surfaces.

Specimen: A single test surface consisting of 18 observations.

Tape Edge (edge): The seam or border edge of a mattress or mattress pad.

Surface: One side of a mattress or mattress pad that is intended for sleeping upon and that can be tested.

Surface Seam: A seam located on the test surface.

Ticking: The outermost layer of fabric or related material that encloses the core and upholstery materials of a mattress or mattress pad. A mattress ticking may consist of several layers of fabric or related materials quilted together.

Tufted: Buttoned or laced through the ticking and upholstery material and/or core, or having the ticking and upholstery material and/or core drawn together at intervals by any other method that produces a series of depressions on the surface.

Upholstery Material: All material, either loose or attached, between the mattress or mattress pad ticking and the core of a mattress, if a core is present.

APPENDIX F: EXAMPLE DATA SHEETS AND REPORTS

Manufacturing Specifications for Mattresses and Mattress Pads

Date: _____ **Prototype Identification Number:** _____

Method of _____ Smooth _____ Tufted

Assembly: _____ Panel Quilt _____ Continuous Quilt

Order of Assembly from Surface to Core: _____

Description of component materials used in the prototype: At a minimum, include the information needed to reorder the component, including the suppliers. If a particular component is not used in the prototype, write "None" in the space provided.

1. Ticking (Include Ticking Prototype Number or Certification Number): Ticking Class:

2. Quilted Ticking components: Quilted Ticking Class _____
(Include Ticking Prototype Number or Certification Number)

a. Filling (foam, fiber-fill, or combination): _____

b. Quilt backing: _____

c. Thread: _____

3. Foam (if more than one layer, describe all): _____

Manufacturing Specifications for Mattresses and Mattress Pads

Date: _____ **Prototype Identification Number:** _____

4. Cotton batting or cotton felt: (if more than one layer, describe all): _____

5. Insulator Pad (may be freely substituted if it does not influence cigarette ignition during prototype testing): _____

6. Core (may be freely substituted if it does not influence cigarette ignition during prototype testing):

7. Flange: _____

8. Binding Tape: _____

9. Tufting (buttons, laces, threads, yarns, and twine): _____

10. Thread: _____

11. Border or Boxing Components (may be freely substituted if it does not influence cigarette ignition during prototype testing): _____

a. Ticking: _____

b. Filling: _____

c. Thread: _____

12. Other (Specify): _____

Mattress and Mattress Pad Prototype Data Sheet

Prototype Identification Number: _____ Ticking Classification: _____

Date: _____ Test Room: _____ °C, _____ percent RH

<u>SURFACE 1</u>		Cigarette Number					Number of Relights
		1	2	3	4	5	
Bare Surface Test	Smooth						
	Quilt/Tuft						
	Tape Edge						
Two Sheet Test	Smooth						
	Quilt/Tuft						
	Tape Edge						

<u>SURFACE 2</u>		Cigarette Number					Number of Relights
		1	2	3	4	5	
Bare Surface Test	Smooth						
	Quilt/Tuft						
	Tap Edge						
Two Sheet Test	Smooth						
	Quilt/Tuft						
	Tape Edge						

<u>SURFACE 3</u>		Cigarette Number					Number of Relights
		1	2	3	4	5	
Bare Surface Test	Smooth						
	Quilt/Tuft						
	Tape Edge						
Two Sheet Test	Smooth						
	Quilt/Tuft						
	Tape Edge						

Mattress and Mattress Pad Prototype Data Sheet

Prototype Identification Number: _____ Ticking Classification: _____

Date: _____ Test Room: _____ °C, _____ percent RH

<u>SURFACE 4</u>		Cigarette Number					Number of Relights
		1	2	3	4	5	
Bare Surface Test	Smooth						
	Quilt/Tuft						
	Tape Edge						
Two Sheet Test	Smooth						
	Quilt/Tuft						
	Tape Edge						

<u>SURFACE 5</u>		Cigarette Number					Number of Relights
		1	2	3	4	5	
Bare Surface Test	Smooth						
	Quilt/Tuft						
	Tape Edge						
Two Sheet Test	Smooth						
	Quilt/Tuft						
	Tape Edge						

<u>SURFACE 6</u>		Cigarette Number					Number of Relights
		1	2	3	4	5	
Bare Surface Test	Smooth						
	Quilt/Tuft						
	Tape Edge						
Two Sheet Test	Smooth						
	Quilt/Tuft						
	Tape Edge						

Manufacturing Specification for Ticking Substitutions

Date: _____ **Ticking Prototype Identification Number:** _____

Description of component materials used in the prototype: At a minimum, include the information needed to reorder the component, including the suppliers. If a particular component is not used in the prototype, write "None" in the space provided.

Ticking: Ticking Class _____

1. Construction: _____

2. Color/Color Pattern: _____

3. Finish Application: _____

4. Fiber Content: _____

5. Fabric Weight: _____

Additional Factors

Quilted Ticking Components:

1. Filling (foam, fiber-fill, or combination): _____

a. Thickness: _____

b. Density: _____

c. Chemical Composition: _____

2. Quilt backing: _____

3. Thread: _____

Manufacturing Specification for Ticking Substitutions

Date: _____

Ticking Prototype Identification Number: _____

Film- Coated Ticking:

1. Application Method: _____

2. Thickness of Application of Film-Coating: _____

3. Chemical Formula: _____

Supplier(s): _____

Style Number: _____

This ticking will be substituted on the following mattress prototype(s):

Ticking Classification Test Data Sheet

Ticking Prototype Identification Number: _____

Ticking Description: _____

Description of Ticking Components, as appropriate or applicable:

1. Filling: _____

2. Quilt backing: _____

3. Thread: _____

Date: _____ Test Room: _____ °C, _____ percent RH

Part 1. Ticking Over Foam

<u>Test Specimen Number</u>	<u>Cigarette Number</u>			<u>Number of Relights</u>
	1	2	3	
1				
2				
3				

Part 2. Ticking over Cotton Batting

<u>Test Specimen Number</u>	<u>Cigarette Number</u>			<u>Number of Relights</u>
	1	2	3	
1				
2				
3				

Test Results: Class _____

I certify that this test was carried out in full accordance with the provisions of 16 C.F.R. part 1632, Section 1632.6 of *the Standard for the flammability of Mattresses and Mattress Pads*. (FF 4-72 Amended).

Tested By: _____ **Certified By:** _____

Manufacturing Specification for Tape Edge Substitutions

Date: _____

Prototype Identification Number: _____

Description of component materials used in the prototype: At a minimum, include the information needed to reorder the component, including the suppliers. If a particular component is not used in the prototype, write "None" in the space provided.

1. Ticking: Ticking Class _____

2. Quilted Ticking components: Quilted Ticking Class _____

a. Filling (foam, fiber-fill, or combination): _____

b. Quilt backing: _____

c. Thread: _____

3. Binding Tape: _____

a. Color: _____

b. Width: _____

c. Fiber Content: _____

d. Construction: _____

4. Flange: _____

5. Tufting Twine: _____

6. Thread: _____

Manufacturing Specification for Tape Edge Substitutions

Date: _____

Prototype Identification Number: _____

7. Border or Boxing Components (may be freely substituted if it does not influence cigarette ignition during prototype testing): _____

a. Ticking: _____

b. Filling: _____

c. Thread: _____

d. Other (Specify): _____

Tape Edge Substitution Test Data Sheet

Prototype Identification Number: _____

Tape Edge Description:

1. Original Material: _____

2. Substitute Material: _____

Date: _____ Test Room: _____ °C, _____ percent RH

<u>SURFACE 1</u>	Cigarette Number									Number of Relights
	1	2	3	4	5	6	7	8	9	
Bare Surface Test										
Two Sheet Test										

Comments: _____

Date: _____ Test Room: _____ °C, _____ percent RH

<u>SURFACE 2</u>	Cigarette Number									Number of Relights
	1	2	3	4	5	6	7	8	9	
Bare Surface Test										
Two Sheet Test										

Comments:

Test Results: Accept _____ **Reject** _____

I certify that this test was carried out in full accordance with the provisions of 16 C.F.R. part 1632, Section 1632.7 of *The Standard for the flammability of Mattresses and Mattress Pads*. (FF 4-72 Amended).

Tested By: _____ **Certified By:** _____

END OF MANUAL

