

# **Safety Tips for Consumer Product Suppliers: Mattress Safety (Video Series) Part 3: Test Method for Part 1633 – Open Flame Ignition**

## **Disclaimer**

*This video is intended to highlight some considerations for designing safe products. The video is not a comprehensive statement of legal requirements or policy and should not be relied upon for that purpose. You should consult official versions of U.S. statutes and regulations, as well as published CPSC guidance when making decisions that could affect the safety and compliance of products entering U.S. commerce.*

***This presentation was prepared by CPSC Staff. It has not been reviewed or approved by the Commission and may not reflect its views.***

*Sylvia*

*Hello, my name is Sylvia Chen. I'm here to talk about the importance of designing safe products for consumer use. A product designed with safety in mind serves consumers best and gives them peace of mind. In contrast, poor design can lead to the production of defective and/or non-compliant products that could be hazardous. The consequences of manufacturing a defective product are serious because a "substantial product hazard" or an "unreasonable risk" of serious injury or death could result.*

*At CPSC's National Product Testing and Evaluation Center, scientists and engineers test products to identify hazards to determine whether a product is defective or hazardous. If a product creates a "substantial product hazard" or poses an "unreasonable risk" of serious injury or death, CPSC will seek a recall.*

*Joining me today are Ms. Lisa Scott, Senior Fire Protection Engineer in CPSC's Directorate for Laboratory Sciences and Mr. Justin Jirgl, Senior Compliance Officer in CPSC's Office of Compliance and Field Operations.*

*Lisa*

*Hello, I am Lisa Scott. I am the Senior Fire Protection Engineer in the Flammability Lab. I have been with the agency for more than 20 years. I have been the mattress flammability testing team leader since 2007.*

*Justin*

*Hello, I'm Justin Jirgl. I am a Senior Compliance Officer in the Office of Compliance and Field Operations. I have been with the Commission for more than 12 years, and I have been responsible for enforcing CPSC's mattress flammability requirements for 6 years.*

*Sylvia*

*In the United States, deaths and injuries associated with mattress fires account for an annual average of 330 deaths. According to U.S. National Estimates of Fires, Deaths,*

*Injuries, and Property Losses from Unintentional Fires, mattress fires are one of the leading contributors to fire deaths in the home.<sup>1</sup>*

*Lisa*

*In this three-part video series, titled, Safety Tips for Consumer Product Suppliers: Mattress Safety, we want to emphasize the importance of complying with U.S. laws and regulations for mattresses. The U.S. Code of Federal Regulations, Part 1632 details the federal requirements governing the flammability of mattresses and mattress pads exposed to smoldering ignition sources, while Part 1633 details the federal requirements governing the flammability of mattress sets exposed to open flame.*

*Justin*

*We also want to help manufacturers avoid poor designs that may lead to defective or noncompliant mattress products posing hazards to consumers. Part 1 explains the Scope, Prototypes and Pooling, Recordkeeping, and Labeling for both regulations. Part 2 addresses the Test Method for Part 1632 – Smoldering Ignition, and Part 3 explains the Test Method for Part 1633 – Open Flame Ignition.*

*Sylvia*

*This video is Part 3 of the series.*

## **Test Method for Part 1633 –Open Flame Ignition**

*Presented by*

*Lisa Scott*

*Senior Fire Protection Engineer*

*Directorate for Laboratory Sciences*

*Office of Hazard Identification and Reduction*

*U.S. Consumer Product Safety Commission*

*Sylvia: What is 16 CFR Part 1633 and how does it differ from 16 CFR Part 1632?*

*Lisa: As Justin mentioned, there are two regulations for the flammability of mattress products, which address different ignition hazard scenarios. Each of these regulations applies to a slightly different subset of the industry. Part 1633 covers the open-flame requirement. It applies to both mattresses and mattress sets, but not to mattress pads. Mattress pads are subject only to Part 1632. Sometimes, there is confusion about the term “mattress set.” A mattress set is either a mattress and foundation labeled by the manufacturer for sale as a matched set or a mattress labeled for sale without any foundation – so even a single mattress is technically a set if it is sold alone. For this video, I may use the terms interchangeably because the test method and requirements are the same. The test setup is a little different, but for this video, they are similar enough.*

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<sup>1</sup> [Annual Fire Loss Report \(cpsc.gov\)](https://www.cpsc.gov/Annual-Fire-Loss-Report).

Part 1633 addresses the hazard associated with the open flame ignition of the mattress or mattress set. In a real fire incident, it is usually the bedding--the blankets, sheets, or comforters---that are ignited first. No matter how the bedding is ignited, either by child's play, or by a candle or space heater, our ignition burner captures that hazard by mimicking the burning bedding.

As we discussed in the other episodes, Part 1632 addresses the smoldering ignition of mattresses and mattress pads.

*Sylvia: So, you ignite the mattress or mattress set with a big blow torch and see what happens?*

Lisa: Chuckling, No, It is not a blow torch. When I tell people I set fires for my job, it makes for some interesting conversations, and they often need to be reassured that we take safety precautions. The test method evaluates the response of the mattress or mattress set after we expose it to a specific ignition burner. And it requires more than just standing back and observing what happens. This test requires a specialized laboratory environment. The test is conducted under an instrumented hood to collect and analyze the smoke products. The test hood is a standard, 3-meter furniture calorimeter, and the laboratory is hardened for fire safety.

*Sylvia: I see. Can you show us the test setup?*

Lisa: Sure, but there are a lot of steps. Since this is not meant to be a tutorial, I will just cover the highlights. Typically, manufacturers contract this test out to a third-party test laboratory that will know how to perform all the detailed steps.

All mattress samples are conditioned for at least 48 hours before testing. This ensures that the samples tested all start with baseline temperature and humidity conditions. This starts us with a fair test.

Once we take the sample out of the conditioning space, we have 20 minutes to complete the setup and begin the test.

We position the sample on a metal test frame beneath the hood so that the hood captures all the combustion gases and smoke.

We position the burners on the top and side of the mattress. There are requirements for spacing and for how much vertical pressure the top arm exerts on the top of the mattress, so we check those things.

The regulation suggests optional screens to reduce drafts. We use them for every test, just in case.

Then we light the burners. Both start at the same time. The side burner shuts off at 50 seconds, and the top burner continues for an additional 20 seconds, for a total of 70 seconds. Then we remove our equipment to protect it.

The sensors in the duct measure the oxygen concentration and other combustion gases, and the computer calculates the heat release rate.

The test is a 30-minute test. The heat-release rate must remain below 200 kW for the entire test. And, during the first 10 minutes, the sample must not release more than 15 MJ of total heat.

*Sylvia: Can you show us the difference between a passing mattress and a failing one?*

Lisa: Yes! We have a comparison video showing just how different the performance is between a compliant mattress and a noncompliant mattress. When you see the difference, you will see why this requirement matters to consumer safety.

These show the test setup like I just explained. Both videos are speeded up from real time, but they are speeded up at the same rate for easy comparison.

Just to refresh: the burners are applied for 50 seconds for the side burner and 70 seconds for the top burner.

Let's just watch without narration.

*Sylvia: Wow! The contrast is eye-opening!*

Lisa: Yes! The idea is that with a compliant mattress, there is time to react and evacuate. Before this regulation was in force, we saw that people did not have time to react before the room reached flashover—when everything burns all at once. And even people down the hall from the room on fire sometimes did not survive. This gives people in the room some time to react and gives people in other rooms—maybe the children or siblings—a much better chance to survive.

*Sylvia: How is this improvement in performance possible?*

Lisa: It is important to know that the regulation does not prescribe specific components to pass the test. The regulation describes the test and sets the performance criteria. It is the responsibility of the manufacturer to design a product that complies, meanwhile, manufacturers can also have other features that are important to them, such as comfort and durability. Most manufacturers use fire-blocking barriers as part of the ticking cover fabric, or as a layer beneath the ticking. These barriers protect the bulk of the most flammable material in the mattress from becoming involved in the fire. There are many commercial options to meet a variety of design needs.

However, barriers are not foolproof—recently, we have seen some combinations of materials that defeat the barrier. We want to emphasize that developing a mattress prototype is not as simple as selecting a list of materials from a catalog. Prototypes must be carefully thought out and tested. So careful design and thorough testing are important.

*Sylvia: If a manufacturer viewing this video wants to learn more about CPSC requirements for mattress flammability, are there other resources available?*

Lisa: CPSC maintains a *Mattress Flammability Information* page with links to a variety of topics. It includes links to both Parts 1632 and 1633 on the Code of Federal Regulations page. It includes links to CPSC staff laboratory testing manuals for both standards and links to previous presentations on a variety of mattress flammability topics. There is a link to sign up for the CPSC subscription service for Mattress Information. When there is a pertinent update, we send a message to our listserv subscribers. Subscribing to our listserv and checking CPSC’s website are the best ways to stay current with news about mattress flammability requirements from CPSC.

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## CPSC Resources

- Regulations and test methods
- Laboratory test manuals
- Business resource page
- Mattress information webpage
- E-mail listserv
- [www.CPSC.gov](http://www.CPSC.gov)



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Finally, if you have questions, you could always contact us.

Here’s our contact information:

## Contact Information

### Lisa Scott

Senior Fire Protection  
Engineer

Directorate for Laboratory Sciences  
| Office of Hazard Identification and  
Reduction

E-mail: [LScott@cpsc.gov](mailto:LScott@cpsc.gov) | Office:  
(301) 987-2064

### Justin Jirgl

Compliance Officer

Regulatory Enforcement Division  
| Office of Compliance and Field  
Operations

E-mail: [JJirgl@cpsc.gov](mailto:JJirgl@cpsc.gov) | Office:  
(240) 687-6985



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*Sylvia: This concludes our Mattress Safety video series. We hope you found the information and knowledge conveyed in this video series helpful. A parting word, just remember when you design a product, always have safety in mind.*

*Sylvia: I'm Sylvia Chen.*

*Lisa: I'm Lisa Scott.*

*Justin: I'm Justin Jirgl.*

*Sylvia, Lisa and Justin together: Thank you for watching Safety Tips for Consumer Product Suppliers: Mattress Safety.*

### [Mattress Flammability Information | CPSC.gov](#)

[床垫可燃性信息 | CPSC.gov](#)

<https://www.cpsc.gov/zh-CN/FAQ/%E5%BA%8A%E5%9E%AB>

### **16 Code of Federal Regulation, Part 1632**

**16 联邦法规第 1632 部分**

<http://www.ecfr.gov/cgi-bin/text->

[idx?SID=59ceb81a60d382bcc84bf00de2828ad9&node=16:2.0.1.4.98&rqn=div5](http://www.ecfr.gov/cgi-bin/text-idx?SID=59ceb81a60d382bcc84bf00de2828ad9&node=16:2.0.1.4.98&rqn=div5)

### **16 Code of Federal Regulation, Part 1633**

**16 联邦法规第 1633 部分**

<https://www.ecfr.gov/cgi-bin/text->

[idx?SID=80fb5cb965175b6f41f2637cf585bad1&mc=true&node=pt16.2.1633&rqn=div5](https://www.ecfr.gov/cgi-bin/text-idx?SID=80fb5cb965175b6f41f2637cf585bad1&mc=true&node=pt16.2.1633&rqn=div5)

## LABORATORY TEST MANUAL

For 16 C.F.R. Part 1632:

*Standard for the Flammability of Mattresses and Mattress Pads*

实验室测试手册

联邦法典 16 卷 1632 部分

床垫和床褥垫阻燃标准

[https://www.cpsc.gov/s3fs-public/pdfs/blk\\_media\\_testmatt.pdf](https://www.cpsc.gov/s3fs-public/pdfs/blk_media_testmatt.pdf)

## LABORATORY TEST MANUAL

FOR 16 CFR Part 1633:

Standard for the Flammability (Open Flame) of Mattress Sets

实验室测试手册

联邦法典 16 卷 1633 部分

床垫套组阻燃（明火）标准

[https://www.cpsc.gov/s3fs-public/pdfs/blk\\_media\\_labmanual.pdf](https://www.cpsc.gov/s3fs-public/pdfs/blk_media_labmanual.pdf)

## Regulatory Robot in Chinese

法规机器人

<https://business.cpsc.gov/robot/>

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