

Safety Tips for Consumer Product Suppliers: Mattress Safety (Video Series) Part 2: Test Method for Part 1632 – Smoldering 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 noncompliant 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.¹

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 padsexposed 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 2 of the series.

Test Method for Part 1632 – Smoldering Ignition

Presented by

Lisa Scott

Senior Fire Protection Engineer

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U.S. Consumer Product Safety Commission

Sylvia: Justin mentions there are two regulations for mattresses and mattress pads. Would you like to go into the details?

Lisa: Sure. So he did mention there are two flammability standards for mattresses and mattress pad products which address different ignition hazard scenarios. Each of these standards applies to a slightly different subset of the industry.

Part 1632 addresses the “smoldering” requirement. The most common smoldering ignition source is a cigarette. It applies to both mattresses and mattress pads, but not to the foundation or box spring that is sometimes used beneath a mattress. Part 1632 addresses the hazard associated with smoldering ignition of a mattress or mattress pad,

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

often from dropped smoking material, fireplace embers, or another heat source that is not an open flame. Part 1633 addresses the “open flame” requirement and covers a different scope of products. It does not apply to mattress pads but does apply to mattresses and mattress sets. Mattress sets are a matched mattress and foundation set intended for use together. Mattress foundations are not included in the scope of Part 1632 at all, and they are included only in the scope of Part 1633 when tested together with the matched mattress.

Sylvia: Can you describe the test set-up?

Lisa: Sure. There are a couple of different test procedures in the Part 1632 regulation. The main one is the same for both mattresses and mattress pads. There are also optional test procedures for ticking—or cover fabric--substitution or tape edge substitution if a manufacturer wants to change those components of a qualified prototype. I will not show those procedures here. I will only cover the major steps—please consult the regulation and CPSC guidance from our web site for all the details.

Lisa in front of the conditioning chamber

Before we test any mattress, we require the conditioning of the mattress for 48 hours in the standard temperature in the humidity requirements. All mattress samples are conditioned for at least 48 hours prior to testing. This ensures the samples tested all start with baseline temperature and humidity conditions. Smoldering is especially susceptible to the humidity conditions of the product, so this starts us with a fair test. All the other test supplies are also conditioned prior to testing. Once we take the sample out of the conditioning space, we have 10 minutes to complete the setup and begin the test.

Lisa setting up the test at the lab

Now that the mattress is out of the conditioning chamber, we have 10 minutes to complete the set-up and begin the test. And my first step is to measure and find the midway point of the mattress. Then I will draw a line with the marker and write “sheet” or “bare” on either side. So this half side with the sheet is marked “sheet,” and this half side without the sheet is marked “bare.”

My next step is going to be to clean the entire surface of the mattress. We use a vacuum cleaner, and we vacuum all the loose debris off the surface and make sure all the debris is off every square inch of the surface.

Lisa vacuuming the mattress.

I will continue vacuuming until I make sure that I have the entire surface vacuumed clean.

The next step is to place the first sheet. This is when we need two people, and thus, I will have a helper on the other side. We will put the sheet up to the line I previously

marked on the mattress and tuck the sheet under the mattress on both sides and the end.

The next thing we do is pre-plan where we are going to place our cigarettes. So for this mattress, there is a quilted feature, a flat feature, and a tape edge. We will plan to put three cigarettes on the “bare” side and three cigarettes on the “sheet” side in each of those features.

My next step will be lighting the cigarettes and beginning the test. We have a video to show that. Up to this point, these are the steps that need to be completed just before lighting the cigarettes within the first 10 minutes of removing the mattress and mattress pad from the conditioning chamber.

Sylvia: Can you show us how the test is run?

Lisa: Sure. We just walked through how to set up a test in the lab, vacuuming and marking the line. We prepared the locations with our team, and now we’re ready to start the test. We have 9 locations to place cigarettes on the bare side and 9 locations on the sheeted side. In our case, we place three cigarettes on the quilt line, 3 cigarettes on the flat surface, and 3 on the tape edge on each side. So 9 and 9. We then light the cigarettes and make sure they’re all burning. In this case, we have a video to show only one location, but there would be really 18 total locations on a mattress or mattress pad surface. We lit the cigarette and checked that it was still burning. Then we monitored our cigarette to burn for the full 20 to 30 minutes that it takes the cigarette to burn. So we allow the cigarette to burn its full length, and then we see what happens.

Video clip of the cigarette lighting test and Lisa narrating the video clip:

In this case, we see the smoldering fire is continuing to expand and expand beyond the cigarette. So we’re pretty sure that it’s not going to comply with the test. It will fail the test. We can extinguish that location, and then measure. So we need to measure from the distance of the farthest smoldering front from where the cigarette was placed originally. We can sometimes use a pen or some other object to approximate where the cigarette was if it’s obvious that the cigarette is not there anymore. This particular location fails. Our measurement is more than two inches or 5.1 centimeters away from where the cigarette was placed originally.

Lisa: We have some other examples of passing locations. Typically, for the part 1632 test, a location is a very obvious pass or very obvious fail. It’s rare that we need to measure to figure out exactly whether it’s above or below 2 inches or 5.1 centimeters.

Sylvia: Which types of materials can be used in mattresses or mattress pads to comply with 16 CFR Part 1632, and which types are a concern?

Lisa: We don’t prescribe what type of materials need to be used. It has a performance test that describes how the product will be evaluated, and it specifies the pass/fail criteria. It’s up to the manufacturer to select materials and test the prototypes. However, we have seen that pure cellulosic materials have some difficulty passing the

test, while synthetic materials tend to perform better on this test. But remember that for some products—mattresses—the product must also comply with Part 1633. Some materials that work for this Part 1632 regulation do not work as well for Part 1633. So, it's sometimes a balancing act to design a mattress to comply with BOTH regulations. Mattress pads are only subject to Part 1632. Most mattress pads today have a synthetic filling and comply easily with this test.

Sylvia: I have heard that there are some recent changes to 16 CFR Part 1632. Can you explain?

Lisa: Yes. The standard ignition source specified in the regulation is a specific cigarette certified by the National Institute of Standards and Technology (NIST). NIST is also a U.S. federal government agency. CPSC published an update to Part 1632 in 2021, to incorporate an updated ignition source or testing cigarette—Standard Reference Material (SRM) 1196a. It is equivalent to the previous ignition source, SRM 1196, which is no longer available. SRM 1196a is available for sale on the NIST website.

Because the new SRM is equivalent to the previous one, manufacturers and test laboratories may use either SRM for testing if they still have reserved stock of SRM 1196. Going forward, only SRM 1196a is available for sale from NIST.

Sylvia: If a manufacturer viewing this video wants to learn more about possible changes? to 16 CFR Part 1632, is there a way they can learn about this?

Lisa: Absolutely! The CPSC website, CPSC.gov, has a *Mattress Information* page. CPSC maintains a *Mattress Flammability Information* page with links to a variety of topics. It includes links to Parts 1632 and 1633 on the Code of Federal Regulations page. It includes links to CPSC staff's 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 the CPSC.

CPSC Resources

- Regulations and test methods
- Laboratory test manuals
- Business resource page
- Mattress information webpage
- E-mail listserv
- www.CPSC.gov



For example, when NIST ran out of SRM 1196 testing cigarettes, we sent a listserv message with updated guidance for manufacturers and laboratories. In the future, when we have news about Part 1632, there will be a listserv notice sent out.

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

Here's our contact information:

Contact Information

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Sylvia: Thank you, Lisa. Thank you, Justin. In Part 3, we will focus on Test Method for Part 1633 – Open Flame Ignition. Stay tuned.

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

[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

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

[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

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

Regulatory Robot in Chinese

法规机器人

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

Acknowledgement

感谢

**Special thanks to the following people
For their contribution to the creation of this video:
特别感谢下列人士对本视频系列所做贡献**

Justin Jirgl
Lisa Scott
Allyson Tenney
Sylvia Chen
Greg Masenheimer
Weiyang Tao

A Production of CPSC Foreign Language Media Program
美国消费品安全委员会制作外语媒体项目
2022