UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
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This document has been electronically approved and signed.

DATE: June 9, 2021

BALLOT VOTE SHEET

TO: The Commission
Alberta E. Mills, Secretary

THROUGH: Jennifer Sultan, Acting General Counsel
Mary T. Boyle, Executive Director

FROM: Daniel R. Vice, Assistant General Counsel, Regulatory Affairs

SUBJECT: Standard for the Flammability of Mattresses and Mattress Pads, SRM 1196a Cigarette

BALLOT VOTE DUE: Tuesday, June 15, 2021

Staff is forwarding to the Commission for consideration a briefing memorandum recommending that the Commission issue a final rule to amend its Standard for the Flammability of Mattresses and Mattress Pads, 16 CFR part 1632.

The ignition source cigarette specified in the standard for use in the standard's performance tests, Standard Reference Material cigarette SRM 1196, is no longer available for purchase. This final rule amends the mattress standard to require a revised Standard Reference Material cigarette, SRM 1196a, which was developed by the National Institute of Standards and Technology, as the ignition source for testing to the standard.

A draft *Federal Register* notice is attached. If approved by the Commission, we will send the notice to the *Federal Register* for publication.

Please indicate your vote on the following options:

I. Approve publication of the attached notice in the *Federal Register*, as drafted.

_____ _____
(Signature) (Date)

II. Approve publication of the attached notice in the *Federal Register*, with the specified changes.

_____

_____

_____

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_____ _____

(Signature) (Date)

III. Do not approve publication of the attached notice in the *Federal Register*.

_____ _____

(Signature) (Date)

IV. Take other action specified below.

_____

_____

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_____ _____

(Signature) (Date)

Attachment: Draft *Federal Register* notice: Standard for the Flammability of Mattresses and Mattress Pads; Amendment

DRAFT

Billing Code 6355-01-P

CONSUMER PRODUCT SAFETY COMMISSION

[Docket No. CPSC-2020-0024]

16 CFR Part 1632

Standard for the Flammability of Mattresses and Mattress Pads; Amendment

AGENCY: Consumer Product Safety Commission.

ACTION: Final rule.

SUMMARY: The Consumer Product Safety Commission (Commission, or CPSC) is issuing this final rule to amend its Standard for the Flammability of Mattresses and Mattress Pads. The ignition source cigarette specified in the standard for use in the mattress standard's performance tests, Standard Reference Material cigarette SRM 1196, is no longer available for purchase. This final rule amends the mattress standard to require a revised Standard Reference Material cigarette, SRM 1196a, which was developed by the National Institute of Standards and Technology, as the ignition source for testing to the mattress standard.

DATES: This rule will become effective [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**].

FOR FURTHER INFORMATION CONTACT: Lisa Scott, Directorate for Laboratory Sciences, Office of Hazard Identification and Reduction, U.S. Consumer Product Safety Commission, 5 Research Place, Rockville, MD 20850; telephone: 301-987-2064; email: lscott@cpsc.gov.

SUPPLEMENTARY INFORMATION:

A. Background

1. The Standard

The Standard for the Flammability of Mattresses and Mattress Pads (Standard), 16 CFR part 1632, issued pursuant to the Flammable Fabrics Act (FFA), 15 U.S.C. 1191 *et seq*., sets forth a test to determine the ignition resistance of a mattress or mattress pad when exposed to a lighted cigarette. Lighted cigarettes are placed at specified locations on the mattress or mattress pad. The Standard establishes pass/fail criteria for the tests. The Standard currently specifies the ignition source for these tests as Standard Reference Material cigarette SRM 1196, available for purchase from the National Institute of Standards and Technology (NIST). *See* 16 CFR 1632.4(a)(2).

2. Development of the Original Standard Reference Material Cigarette

The original specification for the Standard's ignition source included physical characteristics of a conventional, commercially available, non-filtered, king-sized cigarette. Although no specific brand was identified in the standard, a Pall Mall Red cigarette, manufactured by R. J. Reynolds Tobacco Company (RJR), was commonly known to meet the specifications. In early 2008, RJR notified CPSC that the company intended to convert its production of Pall Mall Red cigarettes to be Fire Standard Compliant (FSC).

In 2008, CPSC sought to find an alternate ignition source and contracted with NIST to develop an ignition source with an ignition strength equivalent to the Pall Mall Red cigarette. The ignition strength value is on a scale from 0 to 100 and is analogous to the percentage of full-length burns on a laboratory substrate. Lower values indicate a cigarette is more likely to self-extinguish when not actively being smoked, while higher values indicate a

cigarette is more likely to remain lit while unattended. The non-FSC Pall Mall Red ignition strength varied by vintage from a low of 35 to a high of 95, most often falling at the higher end of the range. FSC cigarettes are required to have an ignition strength lower than 25, and in practice, they are often much weaker, to ensure uniform compliance.

In 2010, NIST developed SRM 1196, Standard Cigarette for Ignition Resistance Testing. SRM 1196 was available for purchase starting in September 2010. On November 1, 2010, CPSC proposed the use of SRM 1196 as the standard ignition source. 75 FR 67047. On September 23, 2011, CPSC issued a final rule amending the Standard to specify SRM 1196 as the standard ignition source, which became effective on September 23, 2012. 76 FR 59014.

3. Development of a New Standard Reference Material Cigarette

All of the SRM 1196 cigarettes were produced in one production run in 2010, with a supply estimated to last approximately 10 years. NIST staff made several attempts to procure a new batch of SRM 1196 cigarettes as the supply dwindled; but in late 2018, the supply of SRM 1196 was depleted before NIST was able to complete a new procurement. NIST was unable to find a manufacturer to produce additional SRM 1196 cigarettes. However, NIST successfully procured SRM 1196a as a replacement for SRM 1196.

NIST conducted tests to determine whether the SRM 1196 properties were replicated in the new SRM 1196a. NIST evaluated the suitability of SRM 1196a by examining the cigarette's ignition strength, tobacco column length and mass, use of unbanded paper, and absence of a filter. Tobacco column length is the length of the cigarette that contains tobacco. Banded paper contains bands that slow the cigarette's combustion when not actively being smoked, while unbanded paper does not contain these bands. NIST affirmed that these SRM 1196 properties were replicated in the new SRM 1196a, because the latter has a similar ignition strength, tobacco

column length and mass, it uses unbanded paper, and it has no filter. NIST began selling SRM 1196a in February 2020.

4. CPSC Staff Evaluation of SRM 1196a[1]

CPSC staff evaluated SRM 1196a in a pilot study and then a full-scale study to determine whether it is a comparable, safety-neutral replacement for SRM 1196.

CPSC staff conducted an initial pilot study in late 2019 to evaluate the suitability of SRM 1196a as a substitute for SRM 1196. The goal of the pilot study was to ensure the full-scale study met statistically robust and scientifically meaningful criteria. Staff evaluated the confidence interval and margin of error to use in the full-scale study, based on an examination of the 2010 transition from the original ignition source to SRM 1196, CPSC compliance data, and the number of test replicates required by the Standard. Based on this analysis and testing during the pilot study, staff subject matter experts determined that a 90 percent confidence interval and equivalence margin of 35 percent were appropriate.

CPSC staff then conducted a full-scale study in early 2020, to determine whether there is statistical equivalence between SRM 1196 and SRM 1196a. In the full-scale study, staff evaluated SRM 1196 and SRM 1196a and found statistically equivalent char length pass/fail patterns for all tested mattress substrates. Test results were within a 90 percent confidence interval and equivalence margin of 35 percent. Staff noted that NIST certified the ignition strengths of both SRMs to be comparable, based on a 95 percent confidence interval with a 5 percent margin in laboratory testing. Although the bounds found by CPSC staff are larger than the NIST confidence interval, staff determined that the NIST tests only examined the cigarette

[1] This final rule is based on information and analysis provided in the Staff Briefing Package, Final Rule: Amendment to 16 CFR Part 1632 Standard for the Flammability of Mattresses and Mattress Pads, available at **[INSERT LINK]**.

characteristics on substrates that have little variability. The CPSC testing included representative mattress materials that are inherently more variable than the benchmark substrates in the NIST cigarette tests. Furthermore, staff analysis of both SRM cigarettes found that the physical dimensions of SRM 1196 and SRM 1196a are nearly identical. Based on the evidence provided by the full-scale study, pilot study, and NIST certification, as well as examination of CPSC compliance data and data from the 2010 transition from the original ignition source to SRM 1196, CPSC staff's review showed that SRM 1196a cigarettes are statistically equivalent to SRM 1196. On these bases, the Commission finds that SRM 1196a is a comparable, safety-neutral replacement for SRM 1196.

B. Statutory Provisions

The FFA sets forth the process by which the Commission can issue or amend a flammability standard. 15 U.S.C. 1193. In accordance with those provisions, the Commission is amending the Standard to specify SRM 1196a as the ignition source for testing under the Standard. As required by the FFA, the Commission published a proposed rule containing the text of the ignition source revision, alternatives considered, and a preliminary regulatory analysis. 15 U.S.C. 1193(i); 85 FR 68803 (Oct. 30, 2020).

Before issuing a final rule, the Commission must prepare a final regulatory analysis and make findings concerning any relevant voluntary standard, the relationship of costs and benefits of the rule (in this case, the ignition source revision), and the burden imposed by the rule. 15 U.S.C. 1193(j). In addition, the Commission must find that the rule: (1) is needed to adequately protect the public against the risk of the occurrence of fire leading to death, injury, or significant property damage; (2) is reasonable, technologically practicable, and appropriate; (3) is limited to

fabrics, related materials, or products which present unreasonable risks; and (4) is stated in objective terms. *Id.* 1193(b).

The Commission also must provide an opportunity for interested persons to make an oral presentation concerning the rulemaking before the Commission may issue a final rule. *Id.* 1193(d). In the preamble to the proposed rule, the Commission requested that anyone who wanted to make an oral presentation concerning this rulemaking contact the Commission's Division of the Secretariat within 45 days of publication of the proposed rule. The Commission did not receive any requests to make an oral presentation.

C. Description of the Revised Ignition Source

Currently, the Standard requires that the ignition source for testing mattresses "shall be a Standard Reference Material cigarette (SRM 1196), available for purchase from the National Institute of Standards and Technology…." 16 CFR 1632.4(a)(2). CPSC is amending the Standard to require the use of SRM 1196a instead of SRM 1196 cigarettes.

D. Response to Comments on the Proposed Rule

The Commission received four public comments. One commenter supported amending the standard to update the SRM ignition source, citing the need for consistency in flammability performance and test methods. Three other commenters opposed the amendment. The issues raised in the comments are summarized and addressed below.

Comment: The cost of implementing SRM 1196a would negatively impact mattress manufacturers, due to the higher price charged for SRM 1196a over SRM 1196, and the cost increase associated with SRM 1196a over SRM 1196 should be considered substantial.

Response: The economic analysis of SRM 1196a shows that it will not have a significant economic impact on small domestic firms that supply the U.S. mattress market. The most

expensive testing scenario a firm might encounter would fall well below the threshold to be considered significant. Furthermore, because SRM 1196a is a safety-neutral replacement for SRM 1196, firms are not required to retest existing prototypes with SRM 1196a. So, for existing prototypes that firms intend to continue to offer for sale, there is no additional cost associated with this amendment. Additionally, although the price of SRM 1196a is more than the price of SRM 1196, the cost of SRM 1196a is determined by NIST using the actual costs incurred in the production of SRM 1196a and applicable overhead and surcharge rates. The Commission has determined that the cost increase of adopting SRM 1196a is not considered significant to even the smallest domestic suppliers in the United States.

Comment: The additional cost of SRM 1196a would be passed along to consumers, increasing the cost of mattresses nationwide.

Response: The increase in cost associated with adopting SRM 1196a could potentially be passed on to the consumer. Under the Standard's testing requirements, however, the cost of testing is born over the size of the production run for a given prototype. For a regular production run, the cost per mattress product that could be passed on to the consumer associated with adopting SRM 1196a as the ignition source is negligible. Furthermore, because SRM 1196a is a safety-neutral replacement for SRM 1196, firms are not required to retest existing prototypes. So, for existing prototypes that firms intend to continue to offer for sale, there is no additional cost associated with this amendment and no associated cost passed on to the consumer.

Comment: The U.S. market for mattress products faces challenges stemming from supply chain shortages and disruptions related to the COVID-19 pandemic and tariffs on trade.

Response: Preliminary data published by the U.S. Bureau of Labor Statistics (BLS) for the Mattress Manufacturing Industry (NAICS 337910) show that prices charged to producers to manufacture mattresses have increased by 2.2 percent since the start of the pandemic. The Producer Price Index data published by the BLS does not provide details on what causes industry production price changes. Nor does it attribute price increases to supply chain shortages or disruptions; but it does provide a reliable indication that production prices have increased. Although cost increases currently may be impacting industry, the cost associated with adopting SRM 1196a is small. The marginal cost increase associated with amending the Standard will not have a significant impact on suppliers. Delaying the rule, or electing not to adopt SRM 1196a as the standard ignition source, would not result in any significant cost savings.

Comment: The SRM ignition source is not representative of FSC cigarettes consumers can purchase. It is too strong to be a standardized ignition source for testing. The Commission should use FSC cigarettes as the ignition source for testing to the Standard.

Response: The SRM 1196a cigarette is a more appropriate test ignition source than FSC cigarettes for the following reasons:

• The SRM cigarette is a test instrument with calibration and traceability to NIST. Its ignition characteristics are more important than whether it looks like a consumer cigarette.

• Cigarette ignition of mattresses and bedding remains a substantial cause of residential fire deaths and injuries each year. Weakening the standard ignition strength would lower the threshold for smoldering ignition of these products, potentially increasing the incidence of these events. The SRM 1196a cigarette maintains the current level of safety because it is a safety-neutral replacement for SRM 1196.

• FSC cigarettes are intended to self-extinguish when not actively being smoked. The Standard states: "If a cigarette extinguishes before burning its full length on any mattress surface location . . . the test must be repeated with a freshly lit cigarette." Because FSC cigarettes are designed to reduce the amount of time a cigarette burns while unattended, testing with FSC cigarettes could lead to many test locations with an incomplete initial data point. In addition, it also could lead to substantially more repeated tests. This would require firms to use more cigarettes to complete a test and increase the time required to complete the test.

Comment: The Commission should consider SRM 1082, NIST's FSC Cigarette Ignition Strength Standard material.

Response: SRM 1082 is not a suitable replacement for SRM 1196 because it is an FSC cigarette. SRM 1082 would not provide the same level of safety, given its ignition strength of 15.8, compared to the ignition strength of SRM 1196a of 95.6 (on a scale of 0-100). SRM 1082 is also more expensive than SRM 1196a, with a cost of $405 for one carton, which is 85 percent costlier per cigarette than SRM 1196a ($437 for two cartons). Additionally, because SRM 1082 is an FSC cigarette, it could self-extinguish, requiring substantially more individual cigarettes to complete the testing.

Comment: It is not fair to obligate industry to procure SRM cigarettes from NIST, and NIST has a vested financial interest in revising the Standard.

Response: SRM cigarettes are available for purchase from NIST, and no other source. According to NIST's pricing policy published online, it establishes the prices of its measurement services in accordance with federal statutes. The prices of SRMs are determined by production costs, overhead, and surcharge rates incurred by NIST. Twice each calendar

year, SRMs may be re-priced taking into account updates for overhead and surcharge rates, as determined by NIST and the Department of Commerce.

Other Comments

We also received other comments that are out of scope in this rulemaking proceeding. Commenters stated that 16 CFR part 1632 should be revoked because 16 CFR part 1633 is a more robust standard. Another commenter raised an issue regarding flame retardants in health care products. The scope of this rulemaking is limited to revising the ignition source in the Standard. The Commission is not making any other changes to the Standard. Because the comments do not address the replacement of SRM 1196 with SRM 1196a, these comments fall outside the scope of this rulemaking. We note that CPSC separately published an advance notice of proposed rulemaking to consider the revocation or amendment of 16 CFR part 1632, and those issues are appropriately addressed in that proceeding. 70 FR 36357.

E. Final Regulatory Analysis

Section 4(j) of the FFA requires that the Commission prepare a final regulatory analysis when it issues a regulation under section 4 of the FFA and that the analysis be published with the rule. 15 U.S.C. 1193(j). The following discussion fulfills this requirement.

1. Market/Industry Information

The size of the U.S. mattress market increased from $17.4 billion in 2018, to $18.1 billion in 2019. Roughly 23.6 million mattress units shipped in 2018. Approximately 29 percent (6.8 million) of units shipped were imported products. Three industry sectors supply mattresses and mattress pads to the U.S. market, categorized under the North American Industry Classification System (NAICS): NAICS Sector 337910 – Mattress Manufacturing, NAICS

Sector 314120 – Curtain and Linen Mills, and NAICS Sector 423210 – Furniture and Merchant Wholesalers.

The Mattress Manufacturing Sector (337910) includes establishments primarily engaged in manufacturing innerspring, box spring, and non-innerspring mattresses. The Curtain and Linen Mills Sector (314120) comprises establishments primarily engaged in manufacturing household linens, bedspreads, sheets, tablecloths, towels, and shower curtains, from purchased materials. This sector includes mattress pad and mattress protector manufacturing. The Furniture and Merchant Wholesalers Sector (423210) is primarily engaged in the merchant wholesale distribution of furniture, except hospital beds and medical furniture. Importers of mattresses are typically categorized under NAICS code 423210.

According to the Small Business Administration (SBA), a firm in the Mattress Manufacturing sector (NAICS sector 337910) can be defined as "small" if the firm employs fewer than 1,000 workers. Under this definition, among the 250 firms identified by staff in the sector, 240 are small businesses that supply mattress products. The SBA defines a firm within the Curtain and Linen Mills Sector (NAICS sector 314120) as small if the firm employs fewer than 750 workers. Under this definition, among the 20 firms identified by staff, 19 firms are small and currently supply mattress products to the U.S. mattress market. Finally, a firm in the Furniture and Merchant Wholesale Sector (NAICS sector 423210) is defined as small if the firm employs fewer than 100 workers. All of the 88 firms identified in this sector meet this definition of small. Under SBA-provided definitions, the majority of firms supplying the U.S. market for mattresses and mattress pads are small businesses.

2. The Mattress Standard

The mattress standard at 16 CFR part 1632 requires premarket, full-scale prototype testing for each new mattress design. Prototype testing also must be performed for each change in materials of an existing design that may affect cigarette ignition resistance.

Under the Standard, four defined test procedures require the use of an SRM ignition source: the mattress test procedure, the mattress pad test procedure, the ticking classification test procedure, and the tape edge substitution test procedure. The number of test cigarettes required by these test procedures range from 18 SRM test cigarettes consumed during the ticking classification test, to 108 SRM test cigarettes consumed during the mattress or mattress pad test procedures. Furthermore, under the Standard only SRM test cigarettes from unopened packages can be selected for a series of tests, and if a cigarette extinguishes before burning its full length on any mattress surface location, the test must be repeated with a freshly lit cigarette. Therefore, mattress and mattress pad test procedures require, in practice, six packs of SRM cigarettes, the ticking classification test procedure requires in practice one pack of SRM cigarettes, and the tape edge substitution test requires, at a minimum, two packs of SRM cigarettes.

SRM 1196a is available for purchase from NIST at a minimum order of 2 cartons. A carton contains 10 packs, and each pack contains 20 cigarettes; therefore, two cartons from NIST will contain 400 SRM cigarettes. Based on information collected by staff from a selection of domestic third-party testing facilities, a third-party testing facility uses an average of 10 to 40 packs of SRM cigarettes (or between 200–800 test cigarettes) per month. These data provide insight into the number of test cigarettes used by third party testing facilities located in the United States, as an order of magnitude. A testing facility that uses 400 test cigarettes per month would need to purchase two cartons of SRM cigarettes from NIST every month.

3. Potential Benefits and Costs

The SRM 1196a cigarette would have approximately the same ignition strength characteristics as originally intended by the Standard. The use of SRM 1196a cigarettes would not change the flammability performance tests or test method required under the Standard.

a. Potential Benefits

Cigarette ignition of mattresses and mattress pads is a substantial cause of residential fire deaths and injuries each year. This rule will allow firms to comply with the Standard, with consistent and reliable results, preventing injury and death due to mattress fires. This rule is "safety-neutral," so mattresses that passed or failed under the existing Standard would be expected to generate similar results when SRM 1196a is used. The level of protection provided by the Standard would neither increase nor decrease as a result of the change from SRM 1196 to SRM 1196a. Thus, there would be no impact on the level or value of fire safety benefits derived from the Standard.

Because NIST has exhausted its supply of SRM 1196, adopting this rule to require the use of SRM 1196a will allow firms access to an ignition source that would permit them to continue testing mattresses and mattress pads to the Standard. This rule would thus provide significant benefits to firms, since failing to adopt this amendment would mean that the Standard would require firms to test using an ignition source that is no longer available for purchase.

As an interim measure in 2018, when NIST's stock of SRM 1196 cigarettes was depleted, CPSC's Office of Compliance issued guidance stating that testing to the Standard could be completed with commercial king-size, non-filtered FSC cigarettes. CPSC's Office of Compliance amended its Interim Enforcement Policy guidance, effective September 2020, to allow testing with either reserved stock of SRM 1196 or new stock of SRM 1196a. Accordingly, testing with FSC cigarettes to the Standard is no longer permitted.

SRM cigarettes provide a common ignition source for all laboratories, while commercially available FSC cigarettes do not offer that consistency. The ignition strength of FSC cigarettes vary from one brand to another. Because FSC cigarettes are required to have an ignition strength lower than 25 and are often much weaker, FSC cigarettes would have an ignition strength substantially lower than SRM 1196a. As a result, test results would vary between a test conducted with one brand of FSC cigarette and another, making testing, reporting, and enforcement inconsistent and unreliable.

Furthermore, FSC cigarettes are intended to self-extinguish when left unattended. Under the Standard, results from a cigarette that does not burn its full length are not accepted. Any cigarette which extinguishes before burning its full length on any mattress surface location must be retested with a freshly lit cigarette. As a result, use of the FSC cigarette as the ignition source would likely lead to an increase in the average number of cigarettes used for each complete test. FSC cigarettes would likely self-extinguish, requiring multiple freshly lit cigarettes to complete a test, thereby increasing the costs of testing and time burdens associated with testing.

In contrast to the inconsistency and unreliability of FSC cigarettes, SRM 1196a is a statistically equivalent replacement for SRM 1196, and will reduce the need for retesting and lighting fresh FSC cigarettes. Furthermore, SRM 1196a allows for consistency in reporting and testing between laboratories. This rule specifying SRM 1196a as a replacement cigarette will achieve consistency and prevent uncertainty for industry, testing laboratories, and CPSC.

b. Potential Costs

The cost increase associated with this rule is related to the SRM test cigarettes used as the ignition source for testing. A carton of SRM cigarettes contains 10 packs, and each pack contains 20 cigarettes; therefore, two cartons from NIST will contain 400 SRM cigarettes. Prices

for SRM 1196a are set by NIST. At the time the Commission published the proposed rule, NIST charged $400 to purchase a "unit" of two cartons of SRM 1196a. Since then, NIST increased the price for two cartons to $437. The current price of SRM 1196a reflects a number of increases in surcharges accrued over the last calendar year, which includes NIST personnel costs and NIST overhead. The price increase from the previous NIST listed price of $400 per unit of two cartons is a price increase of 9.25 percent. At the new per-unit price, the cost of a pack of SRM 1196a cigarettes increased from $20 per pack to $21.85.

Manufacturers and importers of mattresses will be responsible for ensuring that their mattress products are tested using SRM 1196a. If a supplier's mattress product does not comply with the requirements, they will need to either modify the product, or cease their manufacture or importation. Additionally, as required by the CPSIA and its implementing regulations, manufacturers and importers of youth mattresses would be required to certify that their mattresses intended for children comply with the requirements of the Standard. Many domestic manufacturers of youth mattresses are small entities as defined by SBA. The following analysis reviews possible impacts of using SRM 1196a in the Standard.

The annual cost of adopting the SRM 1196a test cigarette will vary among small firms. Different firms offer a variety of mattress products and have different operational procedures for mattress product development and testing. Among other considerations, the number of mattresses produced annually by small firms is not uniform. Furthermore, some firms perform testing procedures in-house, while others elect or are required to have testing performed by a CPSC-approved conformity assessment body. The number of new prototypes that a firm will bring to market, and the size of a production run by a small firm, is up to the firm to decide; but the cost per firm of the amendment would be impacted by these individual decisions.

Commission staff reviewed a variety of likely cost increases that may be faced by small firms in adopting SRM 1196a, in three separate testing scenarios. To determine the likely costs faced by small firms from use of SRM 1196a cigarettes, staff analyzed testing costs related to the Standard in a manner that is consistent with past economic analysis of the industry. The analysis uses commercial data published online for mattress manufacturing, bedding manufacturing, and wholesale mattress product importers acquired from Dun and Bradstreet. Staff also reviewed current mattress products available on the market from a variety of small domestic suppliers and received input from industry on the type and frequency of testing performed under the Standard.

The number of new prototypes that a small firm will bring to market is up to the individual firm to decide, but the cost per firm due to this rule would be impacted by these individual business decisions. A small firm may choose to make new prototypes every year and bring them to market, or it may elect to substitute ticking and modify existing models of mattress products that are selling well or are customer favorites.

The Commission previously published cost estimates for three testing scenarios. 85 FR 68806. To supplement that analysis, the following discusses the effect of the SRM 1196a price increase from $20 per pack to $21.85 per pack since publication of the proposed rule. The most expensive of the three testing scenarios was Scenario 1, which used 46 packs of SRM 1196a to test mattresses and mattress products annually. At $11.50 per pack, a firm's cost of using SRM 1196 would be $529 (46 packs x $11.50 per pack = $529). At $21.85 per pack for SRM 1196a, the same testing scenario would cost a firm $1,005.10 (46 packs x $21.85 per pack = $1,005.10). As a result of adopting SRM 1196a as the replacement SRM, at a price of $21.85 per pack, the firm would incur a cost increase of $476.10 ($1,005.10 - $529 = $476.10). This example of a cost impact is for the most expensive testing scenario a firm might reasonably choose. The

lowest reported annual revenue for any small domestic firm in the mattress manufacturing sector is $128,000. One percent of annual revenue for the firm is $1,280 ($128,000 x 1 percent). For this small domestic supplier, any impact smaller than $1,280 should be considered insignificant. Therefore, the cost increase of $476.10 of using SRM 1196a at the price of $437, as charged by NIST, would not be significant for even the smallest firm currently supplying the sector.

In summary, this rule is not expected to have a significant impact on expected benefits or costs of the Standard in 16 CFR part 1632. Both the expected benefits and costs of the amendment are small, and the likely effect on testing costs per new prototype mattress or ticking substitution would be minor, especially when the projected cost is allocated over a production run of complying mattresses.

4. Regulatory Alternatives

The Commission considered two basic alternatives: (1) allow for the use of FSC cigarettes as the ignition source; or (2) take no action on the smoldering ignition source issue.

Neither SRM 1196a nor FSC cigarettes (alternative one) would likely have a substantial economic impact. There would, however, be some relative differences in terms of resource costs and potential effects on the level of benefits the Standard affords. Alternative two would impose a significant economic impact, as it would require firms to use an ignition source that is no longer available, effectively making it impossible for firms to comply with the Standard. The advantages and disadvantages of these two basic alternatives are discussed below.

a. Allow for the Use of FSC Cigarettes

Under the first alternative, manufacturers and testers could conduct tests with any available FSC cigarettes.

A possible advantage of the Commission taking this alternative action is that some of the projected minor increase in resource costs of testing would not be incurred, since FSC cigarettes are less expensive than SRM 1196a. As noted, however, firms would likely have to use many more FSC cigarettes than SRM 1196a cigarettes due to the likelihood that FSC cigarettes would extinguish before testing is complete.

Disadvantages of the Commission taking this action include an increase in test result variability due to differences in cigarettes. Tests would be less reliable and results would vary depending on which cigarette was used. This would create uncertainty and confusion surrounding the reliability of tests for compliance with 16 CFR part 1632. Manufacturers and testing firms would have to conduct tests that are either wasteful (in terms of extra cigarettes required to complete a test due to cigarettes prematurely extinguishing) or have irreproducible and unreliable results.

b. No Action

If the Commission took no action, firms would be required to use an ignition source that is no longer available for purchase. Firms would be unable to comply with the Standard.

In summary, there are no readily available or technically feasible alternatives to SRM 1196a that would have lower estimated costs and still address the need for a consistent ignition source that retains the "safety-neutral" approach of this rule.

F. Regulatory Flexibility Act Certification

Under the Regulatory Flexibility Act (RFA), 5 U.S.C. 601 *et seq.*, an agency that engages in rulemaking generally must prepare initial and final regulatory flexibility analyses describing the impact of the rule on small businesses and other small entities. Section 605 of the RFA provides that an agency is not required to prepare a regulatory flexibility analysis if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.

This rule retains the current mattress test procedure, but requires that entities performing cigarette ignition tests (including the CPSC, other state agencies, and industry testing organizations) purchase and use SRM 1196a cigarettes at a higher cost than the price at which SRM 1196 cigarettes had been sold. No additional actions will be required of small entities. The costs associated with the rule will essentially be borne by mattress manufacturers and importers that perform (or pay fees for) compliance testing.

The Commission has determined that this rule will have little or no effect on small producers. The design and construction of existing, compliant mattress products will remain unchanged, and the resource cost increase of using SRM 1196a cigarettes will represent a minimal increase in total testing costs. We have addressed comments concerning the impact of this rule on small entities, and we are not aware of any other information that would change the conclusion that the rule will not have a significant impact on a substantial number of small businesses or other small entities.

Based on the information presented here, in the proposed rule, and in the staff briefing package, the Commission concludes that the rule will have little or no effect on small producers.

Thus, the Commission certifies that the rule will not have a significant impact on a substantial number of small businesses or other small entities.

G. Environmental Considerations

Pursuant to the National Environmental Policy Act, and in accordance with Council on Environmental Quality regulations and CPSC procedures for environmental review, the Commission has assessed the possible environmental effects associated with the rule. The Commission's regulations state that amendments to rules providing performance requirements for consumer products normally have little or no potential for affecting the human environment. 16 CFR 1021.5(c)(1). Nothing in this rule alters that expectation. Therefore, because this rule would have no adverse effect on the environment, neither an environmental assessment nor an environmental impact statement is required.

H. Preemption

The rule will modify a flammability standard issued under the FFA. With certain exceptions that are not applicable in this instance, "no state or political subdivision of a state may establish or continue in effect a flammability standard or other regulation" applicable to the same fabric or product covered by an FFA standard if the state or local flammability standard or other regulations is "designed to protect against the same risk of the occurrence of fire" unless the state or local flammability standard or regulation "is identical" to the FFA standard. 15 U.S.C. 1203(a). The rule will not alter the preemptive effect of the existing mattress standard. Thus, the rule will preempt nonidentical state or local flammability standards for mattresses or mattress pads designed to protect against the same risk of the occurrence of fire.

I. Effective Date

Section 4(b) of the FFA (15 U.S.C. 1193(b)) provides that an amendment of a flammability standard shall become effective one year from the date it is promulgated, unless the Commission finds for good cause that an earlier or later effective date is in the public interest, and the Commission publishes the reason for that finding. The Commission believes that an effective date of thirty days will give adequate notice to all interested persons for firms to obtain SRM 1196a cigarettes from NIST. Section 4(b) of the FFA requires that an amendment of a flammability standard shall exempt products "in inventory or with the trade" on the date the amendment becomes effective, unless the Commission limits or withdraws that exemption because those products are so highly flammable that they are dangerous when used by consumers for the purpose for which they are intended. This rule merely changes the ignition source, however, without any change to the test requirements of the Standard, so there is no relevant exemption for products in inventory or with the trade. The purpose of this rule is to allow manufacturers to replace SRM 1196 cigarettes which are no longer available. Accordingly, manufacturers are already purchasing SRM 1196a cigarettes as the SRM 1196 stock is depleted. Therefore, the Commission finds for good cause that the rule will become effective 30 days after publication in the *Federal Register*.

J. Congressional Review Act

The Congressional Review Act (CRA; 5 U.S.C. 801-808) states that, before a rule may take effect, the agency issuing the rule must submit the rule, and certain related information, to each House of Congress and the Comptroller General. 5 U.S.C. 801(a)(1). The submission must indicate whether the rule is a "major rule." The CRA states that the Office of Information and Regulatory Affairs (OIRA) determines whether a rule qualifies as a "major rule." Pursuant to the CRA, OIRA designated this rule as not a "major rule," as defined in 5 U.S.C. 804(2).

K. Findings

Sections 4(a), (b), and (j) of the FFA require the Commission to make certain findings when it issues or amends a flammability standard. The Commission must find that the standard or amendment: (1) is needed to adequately protect the public against the risk of the occurrence of fire leading to death, injury, or significant property damage; (2) is reasonable, technologically practicable, and appropriate; (3) is limited to fabrics, related materials, or products which present unreasonable risks; and (4) is stated in objective terms. 15 U.S.C. 1193(b). In addition, the Commission must find that: (1) if an applicable voluntary standard has been adopted and implemented, that compliance with the voluntary standard is not likely to adequately reduce the risk of injury, or compliance with the voluntary standard is not likely to be substantial; (2) that benefits expected from the regulation bear a reasonable relationship to its costs; and (3) that the regulation imposes the least burdensome alternative that would adequately reduce the risk of injury. These findings are discussed below.

The amendment to the Standard is needed to adequately protect the public against unreasonable risk of the occurrence of fire. The current Standard specifies as the ignition source cigarettes that are no longer being produced. In order for the Standard to continue to be effective (and for labs to test mattresses and mattress pads to determine whether they comply with the Standard), it is necessary to change the ignition source specification. Changing the ignition source to SRM 1196a, rather than FSC cigarettes, will ensure that testing is reliable and that results will not vary from one lab or manufacturer to another. Such variation would be likely if labs or manufacturers were able to use different ignition sources that have similar physical properties but different burning characteristics. The Commission finds that the amendment is

needed to adequately protect the public against unreasonable risk of the occurrence of fire leading to death, personal injury or significant property damage.

The amendment to the Standard is reasonable, technologically practicable, and appropriate. The amendment is based on technical research conducted by NIST and CPSC staff, which established that the SRM 1196a cigarette is capable of providing reliable and reproducible results in flammability testing of mattresses and mattress pads. The SRM 1196a ignition source represents an equivalent, safety-neutral ignition source for use in testing to establish compliance with the Standard. The Commission finds that the amendment is reasonable, technologically practicable and appropriate.

The amendment to the Standard is limited to fabrics, related materials, and products that present an unreasonable risk. The amendment will continue to apply to the same products as the existing Standard, so the Commission finds that it is limited to fabrics, related materials, and products that present an unreasonable risk, and it is stated in objective terms.

Voluntary standards. There is no applicable voluntary standard for mattresses. The rule amends an existing federal mandatory standard.

Relationship of benefits to costs. Amending the Standard to specify SRM 1196a cigarettes as the ignition source allows testing to the Standard to continue without interruption, maintains the effectiveness of the Standard, and will not significantly increase testing costs to manufacturers and importers of mattresses and mattress pads. Both expected benefits and costs of the amendment are small. The effect on testing costs will be minor. Thus, the Commission finds that there is a reasonable relationship between benefits and costs of the amendment.

Least burdensome requirement. No other alternative would allow the Standard's level of safety and effectiveness to continue. Thus, the Commission finds that the amendment imposes the least burdensome requirement that would adequately address the risk of injury.

L. Conclusion

For the reasons discussed above, the Commission finds that amending the mattress flammability standard (16 CFR part 1632) to specify SRM 1196a cigarettes as the ignition source is needed to adequately protect the public against the unreasonable risk of the occurrence of fire leading to death, injury, and significant property damage. The Commission also finds that the amendment to the Standard is reasonable, technologically practicable, and appropriate. The Commission further finds that the amendment is limited to the fabrics, related materials, and products that present such unreasonable risks.

List of Subjects in 16 CFR Part 1632

Consumer protection, Flammable materials, Labeling, Mattresses and mattress pads, Records, Textiles, Warranties.

For the reasons given above, the Commission amends 16 CFR part 1632 as follows:

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

1. The authority citation for part 1632 continues to read as follows:

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

2. Revise § 1632.4(a)(2) to read as follows:

§ 1632.4 Mattress test procedure.

(a) * * *

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

* * * * *

Alberta E. Mills,

Secretary,

Consumer Product Safety Commission.

Staff Briefing Package

Final Rule: Amendment to 16 CFR Part 1632 *Standard for the Flammability of Mattresses and Mattress Pads*

June 9, 2021

For additional information, contact:

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Directorate for Laboratory Sciences
Office of Hazard Identification and Reduction
U.S. Consumer Product Safety Commission
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Executive Summary

The *Standard for the Flammability of Mattresses and Mattress Pads* (Standard) is codified at 16 CFR part 1632. The Standard includes a test method that evaluates the smoldering ignition resistance of a mattress or mattress pad by exposing the surface to specified lighted cigarettes in a draft-protected environment. The standard ignition source specified at 16 CFR § 1632.4(a)(2) is a Standard Reference Material (SRM) cigarette, which is available for purchase from the National Institute of Standards and Technology (NIST).

NIST procured SRM 1196, *Standard Cigarette for Ignition Resistance Testing* in a single production run intended to last approximately 10 years from its introduction in 2010. In late 2018, the supply of the 2010 production run of SRM 1196 was depleted. Due to the depletion of the SRM 1196 cigarettes, the Consumer Product Safety Commission (CPSC) Office of Compliance issued several Interim Enforcement Policies for the mattress industry, providing testing guidance related to cigarette availability. The November 2018 Enforcement Policy allowed reduced testing of mattresses and mattress pads while there was a shortage of SRM 1196. When the supply was depleted in December 2018, CPSC issued a revised Enforcement Policy, permitting testing with commercial off-the-shelf (COTS), king-size, non-filtered Fire Standard Compliant (FSC) cigarettes. Subsequently, NIST procured and certified a new production run, which it introduced as SRM 1196a, in February 2020. CPSC staff's evaluation of SRM 1196a concluded that it is a comparable, safety-neutral replacement for SRM 1196, and the Office of Compliance has issued industry guidance on SRM 1196a.

In October 2020, CPSC issued a notice of proposed rulemaking (NPR) to amend 16 CFR part 1632, *Standard for the Flammability of Mattresses and Mattress Pads,* to require use of the updated standard ignition source, SRM 1196a. This briefing package addresses the elements required by the Flammable Fabrics Act (FFA) to promulgate a regulation, including a discussion of the public comments received in response to the NPR.

After review and consideration of the requirements of the FFA and the public comments, staff recommends that the Commission approve the amendment to update the standard ignition source specified at 16 CFR § 1632.4(a)(2) to Standard Reference Material 1196a available from the National Institute of Standards and Technology because it is the least-burdensome option that maintains the current level of safety for the smoldering resistance of mattresses and mattress pads subject to the standard.

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

This document has been electronically approved and signed.

Memorandum

Date: June 9, 2021

TO: The Commission
Alberta E. Mills, Secretary

THROUGH: Jennifer Sultan, Acting General Counsel

Mary T. Boyle, Executive Director

DeWane Ray, Deputy Executive Director for Safety Operations

FROM: Duane E. Boniface, Assistant Executive Director
Office of Hazard Identification and Reduction

Lisa Scott, Project Manager, Directorate for Laboratory Sciences
Office of Hazard Identification and Reduction

SUBJECT: Draft Proposed Amendment to 16 CFR Part 1632
Standard for the Flammability of Mattresses and Mattress Pads

Introduction

In October 2020, the Consumer Product Safety Commission (CPSC) issued a notice of proposed rulemaking (NPR) to amend 16 CFR part 1632, *Standard for the Flammability of Mattresses and Mattress Pads,*[i] to include an updated standard ignition source from the National Institute of Standards and Technology (NIST). This memorandum addresses the elements required by the Flammable Fabrics Act (FFA) to promulgate a regulation, including a discussion of the public comments received in response to the NPR.

After review and consideration of the requirements of the FFA and the public comments, staff recommends that the Commission publish the final rule amending the ignition source specified at 16 CFR § 1632.4(a)(2) to standard reference material (SRM) 1196a available for purchase from NIST.

Background

The Standard for the Flammability of Mattresses and Mattress Pads (Standard) is codified at 16 CFR part 1632. The Standard includes a test method that measures the smoldering ignition resistance of a mattress or mattress pad by exposing the surface to specified lighted cigarettes in a draft-protected environment. The standard ignition source specified at 16 CFR § 1632.4(a)(2) is a Standard Reference Material (SRM) cigarette that is available for purchase from the National Institute of Standards and

Technology (NIST). The proposed amendment updates the reference, from the current SRM 1196, to a comparable, safety-neutral replacement, SRM 1196a.

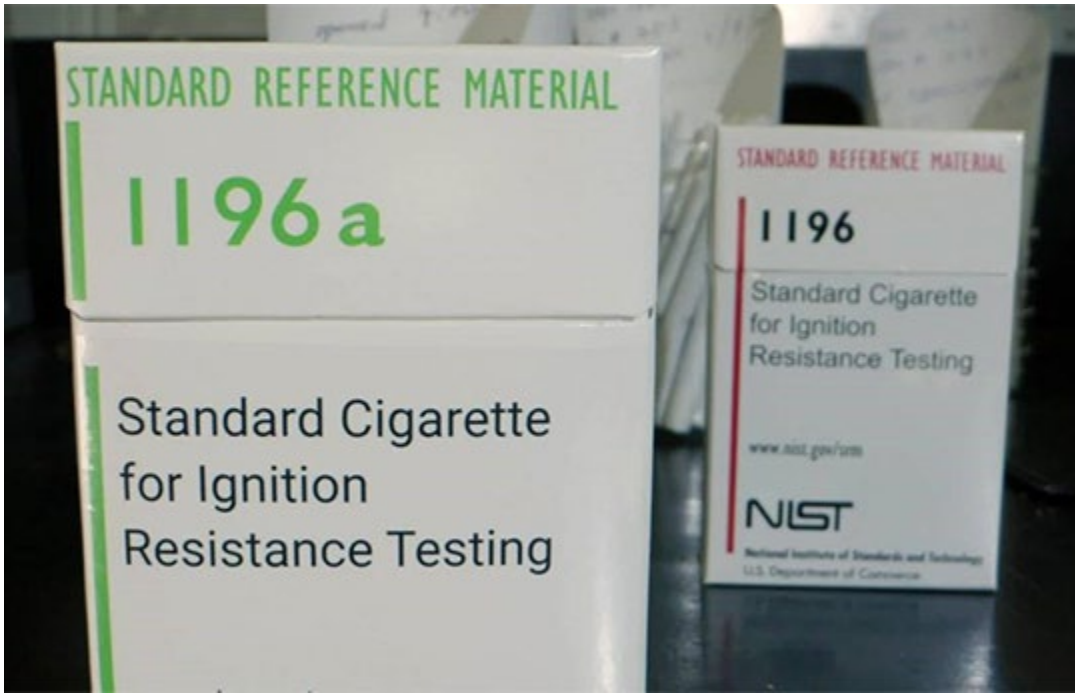

Image of a single pack of SRM 1196a (foreground) and SRM 1196 (background). Photo Credit: NIST

When issued under the FFA in 1972, the original specification for the ignition source included physical characteristics of a conventional, commercially available, non-filtered, king-sized cigarette. Although no specific brand was identified in the standard, a Pall Mall Red cigarette, manufactured by R. J. Reynolds Tobacco Company (RJR), was commonly known to meet the specifications. In early 2008, RJR notified the CPSC that the company intended to convert its production of Pall Mall Red cigarettes to be Fire Standard Compliant (FSC) to meet an increasing number of states' so-called "fire-safe cigarette" requirements.[1]

In 2008, CPSC sought to find an alternate ignition source and contracted with NIST to develop an ignition source with an ignition strength equivalent to the conventional Pall Mall Red cigarette. The ignition strength[2] value is on a scale from 0 to 100, and it is analogous to the percentage of full-length burns (PFLB) on a laboratory substrate. Lower values indicate a cigarette is more likely to self-extinguish when not actively being smoked; higher values indicate that a cigarette is more likely to remain lit while unattended. The Pall Mall Red ignition strength varied by vintage, from a measured low of 35, to a high of 95, most often falling at the higher end of the range. FSC cigarettes are required to have an ignition strength lower than 25, and in practice, they are often much weaker, to ensure uniform compliance.

[1] Fire Standard Compliant refers to cigarettes that have been tested using the test method in ASTM E2187, *Standard Test Method for the Ignition Strength of Cigarettes*. FSC cigarettes are designed to reduce the amount of time that a cigarette continues to burn when it is not actively being smoked.
[2] Ignition strength is determined using the test method in ASTM E2187, *Standard Test Method for the Ignition Strength of Cigarettes.*

Through the 2008 CPSC contract with NIST, NIST developed SRM 1196, *Standard Cigarette for Ignition Resistance Testing*. NIST made SRM 1196 available for purchase starting in September 2010. On November 1, 2010, CPSC proposed the use of the SRM 1196 cigarette as the standard ignition source in an NPR. 75 Fed. Reg. 67047. On September 23, 2011, the CPSC issued a final rule amending the Standard to specify SRM 1196 as the standard ignition source, which became effective on September 23, 2012. 76 Fed. Reg. 59014.

NIST procured all of the SRM 1196 cigarettes in one production run, with a supply estimated to last approximately 10 years. NIST staff made several attempts to procure a new batch of SRM 1196 cigarettes as the supply dwindled. However, in late 2018, the supply of SRM 1196 was depleted before NIST could complete a new procurement.

As an interim measure, the CPSC's Office of Compliance issued several Interim Enforcement Policies to permit the industry to continue to produce new products until a consistent replacement for SRM 1196 became available. The November 2018 Interim Enforcement Policy[ii] allowed reduced testing of mattresses and mattress pads while there was a shortage of SRM 1196. CPSC issued the December 2018 Interim Enforcement Policy[iii] when the NIST supply of SRM 1196 was depleted. It permitted testing with commercial off-the-shelf (COTS), king-size, non-filtered FSC cigarettes.

In February 2020, NIST procured and subsequently certified a replacement for SRM 1196, named SRM 1196a.[iv] NIST affirmed that SRM 1196 properties were replicated in the new SRM 1196a, because the cigarette has a similar ignition strength, tobacco column length and mass,[3] uses unbanded paper,[4] and has no filter. CPSC staff also evaluated SRM 1196a, and staff concluded that it is an appropriate replacement for SRM 1196 to test under the requirements of 16 CFR part 1632. NIST began selling SRM 1196a in February 2020. CPSC's Office of Compliance amended its Interim Enforcement Policy guidance to allow testing with either reserved stock of SRM 1196, or new stock of SRM 1196a, effective September 2020.[v]

In October 2020, an NPR published in the *Federal Register* that proposed to amend 16 CFR part 1632, *Standard for the Flammability of Mattresses and Mattress Pads,*[vi] to update the reference in 16 CFR § 1632.4(a)(2) to SRM 1196a.

FFA Regulatory Analysis

Section 4(j)(1) of the FFA requires the Commission to prepare a final regulatory analysis (FRA) of the regulation. The FRA must contain three elements: a description of the potential benefits and potential costs of the regulation, a description of any alternatives, and a summary of the public comments received during the public comment period.

[3] Tobacco column length is the length of the cigarette that contains tobacco. For a non-filtered cigarette, this is the full length of the cigarette.

[4] FSC cigarettes often employ "banded paper" to meet the FSC requirements. This paper has two to four thicker bands of paper along the length of the cigarette that function as "speed bumps" to slow the combustion when not actively being smoked. Non-FSC cigarettes use unbanded paper.

Description of the Potential Benefits and Potential Costs of the Regulation

As discussed in Tab A, the economic analysis projects that the cost of amending the specified ignition source is expected to be minimal. Although the cost per unit of two cartons of SRM cigarettes represents a price increase from SRM 1196 to SRM 1196a, staff found that the material cost of the cigarettes is too low to have any significant impact on mattress firms. In addition, for firms that will continue to sell mattresses based on existing prototypes,[5] there is no additional cost for those prototypes.

Because NIST and CPSC's analyses concluded that SRM 1196a is an equivalent replacement for SRM 1196 (See Tab C),[vii] firms are able to continue to sell mattresses based on existing prototypes, without additional required testing.

Staff also evaluated the benefits of the proposed regulation. Cigarette ignition of mattresses and mattress pads is a substantial cause of residential fire deaths and injuries each year. (See Tab B). Adopting the proposed regulation would allow firms to comply with the Standard, with consistent and reliable results, preventing injury and death due to mattress fires.

Description of Alternatives to the Final Regulations

Amending the ignition source reference to the safety-neutral replacement SRM 1196a is the most beneficial and least costly option available. Other options considered include:

- Not amending the ignition source: This would result in a standard with a specified ignition source that can no longer be procured. Firms would not be able to test new prototypes; only existing prototypes would be allowed to be offered for sale.
- Amending the ignition source to an FSC cigarette: This could lower the level of smoldering ignition protection in mattresses and mattress pads, resulting in a reduction in safety. Any reduction in safety is not appropriate, given the persistence of these fire incidents. Furthermore, FSC cigarettes are not compatible with the test method in the Standard. The test involves allowing the ignition source to burn its full length on the product being tested. FSC cigarettes are designed to self-extinguish when not actively being smoked. This would likely require additional resources for the firm to test with additional cigarettes. Because commercial FSC cigarettes are not standardized, this could lead to different test results, depending on which cigarette is used.

Summary of Public Comments and Assessment of Issues Raised by Comments

CPSC received four public comments in response to the NPR. One commenter supported amending the standard to update the SRM ignition source, citing the need for consistency in flammability performance and test methods.

[5] The standard defines a "mattress" (or "mattress pad") prototype as a "mattress (or mattress pad) of a particular design, sharing all materials and methods of assembly, but excluding differences in mattress size." A manufacturer must have acceptable prototype testing results before any mattress or mattress pad manufactured in accordance with the prototype may be sold.

Three other commenters opposed the amendment as discussed here. Two of these comments were submitted anonymously and will be referenced by the comment identification numbers assigned when the comments were submitted. Several comments are deemed to be out of scope for this amendment. This amendment is narrowly focused on updating the standard ignition source specified in 16 CFR § 1632.4(a)(2).

Comment: The SRM ignition source is not representative of the cigarettes consumers can purchase in any state in the United States, Canada, and the European Union. It is too strong to be a standardized ignition source for testing.

Commenters: Anonymous-003, Stevenson-004

Response: Staff determined that the SRM 1196a cigarette is a more appropriate test ignition source than an FSC cigarette, for the reasons below:

- The SRM standard ignition source should be viewed as a "test instrument" with calibration and traceability to NIST. That it looks and feels like a consumer cigarette is secondary to its ignition characteristics.

- Cigarette ignition of mattresses and bedding remains a substantial cause of residential fire deaths and injuries each year. (See memorandum at Tab B.) Weakening the standard ignition strength would lower the threshold for smoldering ignition of these products, potentially increasing the incidence of these events. The SRM 1196a cigarette maintains the current level of safety because it is a safety-neutral replacement for SRM 1196.

- Consumer FSC cigarettes, by design, are intended to self-extinguish when not actively being smoked. Section 1632.4(d) *Testing* states: "If a cigarette extinguishes before burning its full length on any mattress surface location . . . the test must be repeated with a freshly lit cigarette." Because FSC cigarettes are specifically designed to reduce the amount of time that a cigarette continues to burn while unattended, testing with FSC cigarettes could lead to many test locations with an incomplete initial data point. In addition, it also could lead to substantially more repeated tests. This would require firms to use more cigarettes to complete a test and increase the time required to complete the test.

Comment: Commenter Stevenson-004 suggested that because SRM 1082 is certified and traceable to NIST, it may provide a consistent FSC option.

Response: Staff agrees that SRM 1082, a specific standardized FSC cigarette, would be more consistent than commercially available FSC cigarettes. However, staff cannot recommend using SRM 1082 because it is an FSC cigarette. It would not provide the same level of safety currently available, given its ignition strength is 15.8, compared to the ignition strength of SRM 1196a of 95.6 (on a scale of 0-100). An FSC cigarette could require substantially more individual cigarettes to complete the testing). Furthermore, the cost of SRM 1082 ($405 for one carton) is 85 percent costlier per cigarette than SRM 1196a ($437 for two cartons[viii]), even if no additional tests are required because of a self-extinguishing test location.

Comment: Two commenters raised concerns about the cost of SRM 1196a.

Commenters: Anonymous-003, Stevenson-004

Response: CPSC staff's economic analysis (included in Tab A) shows that the cost of SRM 1196a will not have a significant economic impact on small domestic firms that supply the U.S. mattress market. The analysis found the most expensive testing scenario a firm might encounter would fall well below the threshold to be considered significant.

Furthermore, because SRM 1196a is a safety-neutral replacement for SRM 1196, firms are not required to retest existing prototypes with SRM 1196a. So, for existing prototypes that firms intend to continue to offer for sale, there is no additional cost associated with this amendment to the standard.

Out-of-Scope Comments

Comment: Revoke 16 CFR part 1632, because 16 CFR part 1633 is a more robust standard.

Commenters: Anonymous-003, Stevenson-004, Anonymous-005

Response: CPSC separately published an advance notice of proposed rulemaking (ANPR) to consider the revocation or amendment of 16 CFR part 1632, which is ongoing. 70 Fed. Reg. 36357. The amendment at issue here, however, has a limited scope: it is a technical amendment to address the unavailability of SRM 1196, the ignition source specified in the standard, so firms can continue to produce, test, and distribute mattresses and mattress pads with the same level of safety as legacy products produced before this change in SRM ignition source.

In the ANPR docket, staff has requested submissions of specific data to support the commenters' position that part 1632 can or should be revoked. Staff also requested submissions to support specific amendments to part 1632 to reduce the burden while maintaining the existing level of safety for the subject products, including mattress pads and ticking and tape edge components. Staff will continue to review and evaluate the submissions in that proceeding.

Comment: The Healthier Hospitals Initiative aims to remove flame retardants (FRs) from healthcare products.

Commenter: Anonymous-005

Response: This amendment is limited in a very narrow way to address only the change in ignition source. The change in ignition source will not affect the FR status of any prototype because it is a safety-neutral replacement with nearly matched ignition strength.

However, staff notes that the standard does not prescribe the use of FR chemicals to meet the performance requirements. Staff is aware of many compliant prototype designs for both mattresses and mattress pads that do not use FR chemicals in their designs.

Staff notes this commenter also stated that healthcare facilities do not permit smoking on the premises and that these facilities are sprinkler protected. Staff notes that mattresses that are medical devices

regulated by the Food and Drug Administration (FDA) are not included in the scope of 16 CFR part 1632. Furthermore, many residential settings do not have the added active protection of residential fire sprinklers. Cigarette ignition of mattresses and bedding remains a substantial cause of residential fire deaths and injuries each year. (See memorandum at Tab B.).

FFA Regulatory Findings

Section 4(j)(2) of the FFA also requires the Commission to make three regulatory findings: (1) whether any relevant voluntary standards exist to address the same risk and an evaluation of any such standard; (2) whether the expected benefits bear a reasonable relationship to the costs; and (3) whether the regulation imposes the least burdensome requirement to address the associated risk.

The staff recommends that the Commission find:

- The proposed amendment relates to an existing regulation. There is no alternative voluntary standard that applies to the risk presented by the smoldering ignition of mattresses and mattress pads.

- As noted in the economic analysis in Tab A, the cost associated with this amendment is expected to be minimal. The expected benefit is noted above and in Tab B. Cigarette ignition of mattresses and bedding remains a substantial cause of residential fire deaths and injuries each year. Weakening the standard ignition strength would lower the threshold for smoldering ignition of these products, potentially increasing the incidence of these events. The SRM 1196a cigarette maintains the current level of safety because it is a safety-neutral replacement of SRM 1196. The benefits expected from the regulation bear a reasonable relationship to its costs.

- The proposed amendment is the least burdensome option that addresses the risk. Other options that were considered would either prevent firms from being able to complete the required testing because SRM 1196 is no longer available, or the other options potentially would require additional testing with FSC cigarettes that are designed to self-extinguish when not actively being smoked and would create unreliable and inconsistent test results.

Conclusion

Given the requirements of FFA section 4(j), staff has prepared a final regulatory analysis of the regulation, including a description of the potential benefits and potential costs, a description of the alternatives that were considered, and a response to the four comments received after publication of the NPR. In addition, in evaluating the proposed rule under the Regulatory Flexibility Act, staff has found that the proposed rule will not have a significant economic impact on a substantial number of small entities.

Staff recommends that the Commission approve the amendment to update the standard ignition source specified at 16 CFR § 1632.4(a)(2) to SRM 1196a available from NIST because it is the least-burdensome option that maintains the current level of safety for the smoldering resistance of mattresses and mattress pads subject to the standard.

[i] U.S. Consumer Product Safety Commission Notice of Proposed Rulemaking, Standard for the Flammability of Mattresses and Mattress Pads, October 30, 2020, https://www.regulations.gov/document/CPSC-2020-0024-0001.

[ii] Interim Enforcement Policy for Mattress Pads Subject to 16 CFR part 1632, November 2018. https://cpsc.gov/s3fs-public/Mattress%20Pads_Interim%20Enforcement%20Policy%2011.9.18%20Final%20%28002%29_0.pdf?kS3RljSlb5mNPYDi0.DxpbXebBI6A7RC.

[iii] Updated Interim Enforcement Policy for Mattresses and Mattress Pads Subject to 16 CFR part 1632, December 2018. https://www.cpsc.gov/s3fs-public/Updated-Interim-Enforcement-Policy-for-Mattresses-and-Mattress-Pads-Dec2018.pdf?bELowyEfQz9JuMUX6Ww.J0JoU1knh.jE.

[iv] NIST Releases a New Standard Cigarette for Testing the Flammability of Mattresses and Furniture, February 2020. https://www.nist.gov/news-events/news/2020/02/nist-releases-new-standard-cigarette-testing-flammability-mattresses-and

[v] 2020 Interim Enforcement Policy for Mattresses and Mattress Pads Subject to 16 CFR part 1632, March 2020. https://cpsc.gov/s3fs-public/2020InterimEnforcementPolicyforMattressesandMattressPadsUpdateDuetoCOVID19_032020.pdf.

[vi] U.S. Consumer Product Safety Commission Notice of Proposed Rulemaking, Standard for the Flammability of Mattresses and Mattress Pads, October 30, 2020, https://www.regulations.gov/document/CPSC-2020-0024-0001.

[vii] T. Massie, Mattress Ignition Equivalence Testing and Results Comparing New SRM 1196a to SRM 1196 Cigarette, July 2, 2020. This memo remains unchanged from the NPR. No additional information is required regarding the comparison of SRM 1196 and SRM 1196a.

[viii] https://www-s.nist.gov/srmors/viewTableV.cfm?tableid=164 Page visited 3/24/2021.

Tab A – Regulatory Flexibility Analysis

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

Memorandum

Date: April 6, 2021

TO : Lisa Scott,
Project Manager
Mattress Flammability Standard Briefing Package

THROUGH : Gregory B. Rodgers, Ph.D.
Associate Executive Director,
Directorate for Economic Analysis

Robert Franklin
Senior Staff Coordinator
Directorate for Economic Analysis

FROM : Cynthia Gillham
Economist
Directorate for Economic Analysis

SUBJECT : Final Regulatory Flexibility Analysis for SRM 1196a, Standard for the Flammability of Mattresses and Mattress Pads

Introduction

On October 30, 2020, the U.S. Consumer Product Safety Commission (CPSC) published a notice of proposed rulemaking (NPR) in the *Federal Register* (85 FR 68803) to amend the *Standard for the Flammability of Mattresses and Mattress Pads* (the Standard). The Standard includes a test method that evaluates the smoldering ignition resistance of a mattress or mattress pad by exposing the surface to specified lighted cigarettes, called Standard Reference Material (SRM) cigarettes. The ignition source specified at 16 CFR § 1632.4(a)(2) is an SRM cigarette. SRM cigarettes are available for purchase from the National Institute of Standards and Technology (NIST). The Standard currently requires the use of an SRM 1196 cigarette. However, that cigarette is no longer available, and NIST has replaced it with SRM 1196a. The NPR proposed to adopt Standard Reference Material (SRM) 1196a as the replacement reference material used for testing to the Standard.

CPSC received four public comments during the open comment period. This memorandum addresses the comments related to the economic feasibility of adopting the proposed rule.

Staff recommends that the CPSC issue a final rule that adopts SRM 1196a as the replacement reference material for SRM 1196. Staff finds that amending the Standard to adopt SRM 1196a as the standard

ignition source will not have a significant economic impact on small domestic firms that supply the U.S. mattress market.

Requirements of Applicable Statutes

Section 4(j)(1) of the FFA requires that the Commission prepare a final regulatory analysis when it promulgates a regulation under the FFA and specifies publishing the analysis with the regulation, 15 U.S.C. § 1193(j). The analysis must include:

- a description of the potential benefits and potential costs of the regulation, including any benefits or costs that cannot be quantified in monetary terms, and an identification of those likely to receive the benefits and bear the costs;
- a description of any alternatives to the proposed regulation, together with a summary description of their potential benefits and costs, and a brief explanation of the reasons why these alternatives were not chosen; and
- a summary of any significant issues raised by comments submitted during the public comment period in response to the preliminary regulatory analysis, and a summary of the assessment by the Commission of such issues.

Section 4(j)(2) of the FFA also requires that the Commission must find, and include such findings in the regulation:

- that the benefits expected from the regulation bear a reasonable relationship to its costs; and
- that the regulation imposes the least burdensome requirement which prevents or adequately reduces the risk of injury for which the regulation is being promulgated.

In addition, under the Regulatory Flexibility Act (RFA), the Commission is required to describe potential effects of the amendment on small businesses and other small entities. As required by the RFA, this memorandum evaluates the potential economic impact on small entities, including small businesses, that would result from adopting the final rule. Section 604 of the RFA, 5 U.S.C. § 604, requires that agencies prepare a final regulatory flexibility analysis (FRFA) and make it available to the public when the final rule is published, unless the head of the agency certifies pursuant to Section 605(b) of the RFA, 5 U.S.C. § 605(b), that the rule will not have a significant economic impact on a substantial number of small entities.

The FRFA must describe the impact of the rule on small entities and identify significant alternatives that accomplish the statutory objective and minimize any significant economic impact. Specifically, the FRFA must contain:

1. A description of the need for, and objectives of, the rule;
2. A statement of any significant issues raised by the public comments in response to the initial regulatory flexibility analysis for the proposed rule, and a description of any changes made by the agency in response to those comments;
3. The response of the agency to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration in response to the proposed rule, and a description of any changes made by the agency in response to those comments;

4. A description of and an estimate of the number of small entities to which the rule will apply (where feasible), or an explanation of why no such estimate is available;
5. A description of the projected reporting, recordkeeping, and other compliance requirements of the rule, including an estimate of the classes of small entities subject to the requirements and the type of professional skills necessary for the preparation of reports or records; and
6. A description of the steps the agency has taken to minimize the significant economic impact on small entities, including a statement of why any alternatives considered by the agency that would have a significant impact on small entities were rejected.

Objectives of the rule

The proposed amendment seeks to update the reference in 16 CFR § 1632.4(a)(2), from the current SRM 1196 to SRM 1196a. The stated ignition source cigarette approved for testing used in the Standard, SRM cigarette 1196, is no longer available for purchase and can no longer be obtained. Therefore, the stated ignition source in the Standard must be updated to one that is suitable and procurable. SRM 1196a is a suitable replacement for testing to the Standard, and it is procurable from NIST. The proposed amendment does not change any reporting, recordkeeping, or other compliance requirements of the rule or the type of professional skills necessary for the preparation of reports or records.

Product Information

"Mattresses" are defined in the Standard as "a ticking filled with a resilient material used alone or in combination with other products intended or promoted for sleeping upon." 16 CFR § 1632.1(a). This includes, but is not limited to, adult mattresses, youth mattresses, crib mattresses (including portable crib mattresses), bunk bed mattresses, futons, and water beds or air mattresses which contain upholstery material between the ticking and the mattress core.[6] *See* 16 CFR § 1632.1(a)(1). Mattresses used in or as part of upholstered furniture are also included. Examples include convertible sofa bed mattresses, corner group mattresses, day bed mattresses, roll-away bed mattresses, high risers, and trundle bed mattresses. The Standard also applies to all "mattress pads," a term that means a thin flat mat or cushion, and/or ticking filled with resilient material for use on top of a mattress. *See* 16 CFR § 1632.1(b). For the rest of this memorandum, all mattresses and mattress pads to which the Standard applies will be collectively referred to as "mattress products."

Market Information

According to data available from the 2019 Mattress Industry Trends Report (2019 Report), published by the International Sleep Products Association (ISPA[7]), roughly 30.4 million mattress units shipped in 2019. Approximately 23 percent (6.9 million) of units shipped were imported products.[8]

[6] Mattresses that are medical devices regulated by the FDA are not subject to CPSC regulations.
[7] ISPA represents the mattress manufacturing industry. ISPA's Statistics Committee collects annual data about the mattress industry. ISPA publishes an annual report of sales and trends.
[8] International Sleep Products Association (ISPA) Industry Report, 2019.

Table 1. U.S. Mattress Shipments, domestically manufactured and imported

	Mattress Units Shipped (in thousands)		
	U.S. Manufactured	Imported	Total Units
2017	23,469	5,411	28,880
2018	23,628	6,815	30,443
2019	23,471	6,949	30,420

Source: Compiled 2018, 2019 ISPA Mattress Industry reports.

Industry Trends

The 2019 Report states that online sales of mattresses sold to consumers now account for well over 20 percent of total sales. Although Amazon and Wayfair have emerged as major players in the sector, there are more than 100 mattress specialty e-retailers currently supplying the market. One of the best-known specialty mattress e-retailers, accounted for 2.3 percent of total mattress market share in the United States in 2019.[9]

According to ISPA, the market share of mattress specialty Internet retailers is projected to grow. Traditional retailers in malls and department stores have downsized, while mass merchants, like Target and Walmart, have expanded into mattress sales in store and online. Notably, improved logistics making home delivery possible and practical, continue to support industry sales.

Industry Classification

Three industry sectors supply mattresses and mattress pads to the U.S. market, categorized under the North American Industry Classification System (NAICS):

1. NAICS Sector 337910 – Mattress Manufacturing
2. NAICS Sector 314120 – Curtain and Linen Mills
3. NAICS Sector 423210 – Furniture and Merchant Wholesalers.

The Mattress Manufacturing sector (337910) comprises establishments primarily engaged in manufacturing innerspring, box spring, and non-innerspring mattresses. The Curtain and Linen Mills sector (314120) comprises establishments primarily engaged in manufacturing household linens, bedspreads, sheets, tablecloths, towels, and shower curtains, from purchased materials. This sector includes mattress pad and mattress protector manufacturing. The Furniture and Merchant Wholesalers sector (423210) is primarily engaged in the merchant wholesale distribution of furniture, except hospital beds and medical furniture. Importers of mattresses are typically categorized under NAICS code 423210.

[9] Euromonitor International Limited 2020 © All rights reserved. (June 25, 2020). "*USA Mattress Market Share, 2014-2019.*" Retrieved from: https://www.portal.euromonitor.com/.

Small entities

According to the Small Business Administration (SBA), a firm in the Mattress Manufacturing sector (NAICS sector 337910) can be defined as "small" if the firm employs fewer than 1,000 workers.[10] Under this definition, among the 223 firms identified by staff in the sector, 211 are considered small businesses. The SBA defines a firm within the Curtain and Linen Mills Sector (NAICS sector 314120) as "small" if the firm employs fewer than 750 workers.[11] Under this definition, among the 43 firms identified by staff in this sector, 40 firms are considered small businesses. Finally, a firm in the Furniture and Merchant Wholesale Sector (NAICS sector 423210) is defined as "small" if the firm employs fewer than 100 workers. Under this definition, among the 78 firms identified by staff in this sector, 77 firms are considered small businesses. Under SBA-provided definitions, staff finds that more than 90 percent of firms supplying the U.S. market with mattresses and mattress pads are considered small businesses.

As explained below, the impact of the change for even the smallest domestic firms that currently supply the U.S. market with mattress products is likely to amount to less than 1 percent of the firm's expected annual revenue and would not be significant. The increase in price associated with adopting SRM 1196a as the replacement reference material for the Standard would amount to less than one percent of even the smallest firm's expected annual revenue, and therefore, this increase could not be considered significant.

However, after CPSC staff completed the initial regulatory flexibility analysis, NIST raised the unit price of SRM 1196a from $400 to $437 for two cartons. Therefore, the FRFA discusses the additional price increase and sets out the analysis reaffirming that the $437 per-unit price for SRM 1196a will not have a significant economic impact on even the smallest firms supplying the U.S. market.

Minimizing the Economic Impact on Small Entities

To ensure viable testing capabilities for entities obligated to test mattress products using the stated ignition source cigarette, CPSC's Office of Compliance issued Interim Enforcement Policies to continue to support the testing of new mattress products until a consistent replacement for SRM 1196 became available, minimizing the impact on entities. In late 2018, while the supply of SRM 1196 was depleted and before NIST was able to complete a new procurement, CPSC's November 2018 Interim Enforcement Policy[12] allowed reduced testing of mattresses and mattress pads, given the shortage of SRM 1196. Later, the December 2018 Interim Enforcement Policy[13] permitted testing with commercial off-the-shelf (COTS), king-size, non-filtered Fire Standard Compliant (FSC) cigarettes, when the NIST supply of SRM 1196 was depleted. In September 2020, the Interim Enforcement Policy guidance was amended again to provide additional flexibility and allow for testing with either reserved stock of SRM 1196, or new stock of SRM 1196a,[14] after NIST and CPSC staff's assessments showed that SRM 1196a was a suitable safety-neutral replacement for SRM 1196.

Throughout the period of shortages and the ultimate depletion of SRM 1196, CPSC adopted timely alternatives for entities subject to the Standard. Interim Enforcement Policies, supported informed

[10] The size guidelines are established by the U.S. Small Business Administration (SBA).
[11] Ibid.
[12] Interim Enforcement Policy for Mattress Pads Subject to 16 CFR part 1632, November 2018.
[13] Updated Interim Enforcement Policy for Mattresses and Mattress Pads Subject to 16 CFR part 1632, December 2018.
[14] 2020 Interim Enforcement Policy for Mattresses and Mattress Pads Subject to 16 CFR part 1632, March 2020.

decision-making by industry on testing using available test materials. In addition, because SRM 1196a is a safety-neutral replacement for SRM 1196, the amendment to the Standard does not require firms to retest existing prototypes with SRM 1196a. Therefore, the adoption of SRM 1196a as the replacement for SRM 1196 will minimize the impact of the amendment on all firms with existing mattress and mattress pad prototypes that they intend to continue to offer for sale, including small entities subject to the Standard.

Analysis of Additional Price Increase

At the time of the IRFA, NIST charged $400 to purchase a "unit" of two cartons of SRM 1196a. Since then, NIST increased the price for two cartons to $437.

According to the Director's Office of Reference Materials at NIST, as of March 15, 2021, the current price of SRM 1196a reflects a number of increases in surcharges accrued over the last calendar year. In an email from NIST, the Director indicated the costs most likely to impact the NIST price of 1196a would be the replacement surcharge, which includes NIST personnel costs and the NIST overhead rate.[15]

Price Analysis

Currently, SRM 1196a – "Standard Cigarette for Ignition Resistance Testing" is available for sale from NIST at a unit price of $437.[16] The unit of issue is 2 cartons (400 cigarettes). The price increase from the previous NIST listed price of $400 per unit of 2 cartons is a price increase of 9.25 percent. As shown in Table 1, at the new per-unit price, the cost of a pack of SRM 1196a cigarettes increased from $20 per pack to $21.85.

Table 2. NIST price for SRM cigarettes

SRM	NIST unit price	Price per carton (2 cartons per unit)	Price per pack (10 packs per carton)	Price per cigarette (20 cigarettes per pack)
1196	$230	$115	$11.50	$0.575
1196a	$400	$200	$20	$1
1196a	$437	$218.50	$21.85	$1.0925

The price charged by NIST for 2 cartons of SRM 1196 was $230 ($11.50 per pack). As indicated in the initial regulatory flexibility analysis (IRFA), this standard reference material is no longer available for purchase. In the IRFA, staff provided cost estimates for three testing scenarios. The most expensive of the scenarios was Scenario 1, which used 46 packs of SRM 1196a to test mattresses and mattress products annually. [17]

[15] NIST Director Office of Reference Materials, email subject "SRM1196a." Received by Cynthia Gillham, March 15, 2021.
[16] https://www-s.nist.gov/m-srmors/view_detail.cfm?srm=1196a.
[17] A small firm that produces 20 new mattress models per year could produce 5 new mattress model prototypes, 14 models using new ticking substitutions, and one model requiring a tape edge substitution. Such a firm would consume 46 packs of test cigarettes annually *(5 mattress tests x 6 packs + 14 ticking tests x 1 pack + 1 tape substitution test x 2 packs = 30 packs + 14 packs + 2 packs = 46 packs).*

At $11.50 per pack, a firm's cost of using SRM 1196 would be $529 (46 packs x $11.50 per pack = $529). At $21.85 per pack, the same testing scenario would cost a firm $1,005.10 (46 packs x $21.85 per pack = $1,005.10).

As a result of adopting SRM 1196a as the replacement SRM, at a price of $21.85 per pack, the firm would incur a cost increase of $476.10 ($1,005.10 - $529 = $476.10). This example of a cost impact is for the most expensive testing scenario a firm might reasonably choose.

According to the IRFA, the lowest reported annual revenue for any small domestic firm in the mattress manufacturing sector was $128,000. One percent of annual revenue for the firm is $1,280 ($128,000 x 1 percent). For this small domestic supplier, any impact smaller than $1,280 should be considered insignificant. Therefore, the cost increase of $476.10 of using SRM 1196a at the price of $437, as charged by NIST, would not be significant for even the smallest firm currently supplying the sector.[18]

Economic Issues Raised in the Public Comments

The Commission received several comments on the NPR related to the cost increase associated with adopting SRM 1196a as the ignition source cigarette for testing used in the Standard. Specifically, commenters were concerned with the 74-percent listed price increase of SRM 1196a over SRM 1196, even though SRM 1196 is no longer available for purchase.

Concerns over the large percentage increase in price for the reference material included: (1) the size of the price increase, (2) the passed-on cost to the American consumer, (3) external factors facing the industry other than the price increase, and (4) the motivations of NIST for the SRM price increase. Generally, commenters characterized the increase in price of adopting SRM 1196a as significant and substantial. One comment recommended the Commission consider NIST SRM 1082 or commercially available FSC cigarettes as an alternative to adopting SRM 1196a.

Responses to Public Comments on the IRFA

I. One commenter asserted that the cost of implementing SRM 1196a would negatively impact mattress manufacturers, citing the higher price charged for SRM 1196a, of $400, over that of SRM 1196, $230. Another commenter noted that the cost increase associated with SRM 1196a, over SRM 1196, should be considered substantial.

   Generally, staff concurs that the percentage increase in the cost of SRM 1196a over that for SRM 1196 appears to be large. For example, the 2010 price of $230 for SRM 1196 if inflated to 2021 dollars would be roughly $280[19], an increase in price of approximately 22 percent. The price increase of SRM 1196a over SRM 1196 is 74 percent, greater than a simple inflation

[18] The cost increase of adopting SRM 1196a under staff's testing scenarios 2 and 3, which require 15 and 36 packs, respectively, are also not significant.

[19] U.S. Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers (CPI-U) U.S. city average series for all items, not seasonally adjusted. https://www.bls.gov/cpi/tables/supplemental-files/historical-cpi-u-202102.pdf Retrieved on March 31, 2020. This data represents changes in the prices of all goods and services purchased for consumption by urban households.

adjusted price of the previous SRM. However, the cost of SRM 1196a as determined by NIST is not tied to inflation. NIST determined the price of the SRM using the actual costs incurred in the production of SRM 1196a and applicable overhead and surcharge rates.[20]

Although staff agrees that the increase in price of adopting SRM 1196a is a large percentage increase in price, the cost increase of adopting SRM 1196a cannot be considered significant to even the smallest domestic suppliers in the United States, based on analysis provided in this memorandum and in the IRFA which used sales data available for domestic suppliers.

II. One commenter asserted that the additional cost of SRM 1196a ultimately would be passed along to consumers, thereby increasing the cost of mattresses nationwide.

Staff agrees that the increase in cost associated with adopting SRM 1196a as the ignition source for testing to the Standard could potentially be passed on to the consumer. Section 1632.2(a)(1) states the Standard's purpose: "This standard prescribes requirements of testing of prototype designs of mattresses and mattress pads before the sale in commerce or the introduction in commerce of any mattress or mattress pad which is subject to the standard." Under such testing requirements, the cost of testing is born over the size of the production run for a given prototype, while the size of a given production run is determined by the manufacturer.

According to the most recent ISPA Mattress Industry Trends Report, the average price of a mattress sold in the United States was $314.46 in 2019. Staff finds that for a regular production run, the cost per mattress product that could be passed on to the consumer, as associated with adopting SRM 1196a as the ignition source, must be negligible. Furthermore, because SRM 1196a is a safety-neutral replacement for SRM 1196, firms are not required to retest existing prototypes with SRM 1196a. So, for existing prototypes that firms intend to continue to offer for sale, there is no additional cost associated with this amendment and no associated cost passed on to the consumer.

III. One commenter asserted that the U.S. market for mattress products currently faces many challenges stemming from supply chain shortages and disruptions related to the COVID-19 pandemic and tariffs on trade.

Reviewing preliminary data published by the U.S. Bureau of Labor Statistics (BLS) for the Mattress Manufacturing Industry (NAICS 337910), staff finds prices charged to producers to manufacture mattresses have increased by 2.2 percent since the start of the pandemic.[21] The Producer Price Index data published by the BLS does not provide detail on what causes industry production price changes. Nor does it attribute price increases to supply chain shortages or disruptions, but it does provide a reliable indication that production prices have increased in the Mattress Manufacturing sector.

However, although staff agrees that cost increases may be currently impacting industry, the cost associated with adopting SRM 1196a is small. The marginal cost increase associated with amending the Standard will not have a significant impact on suppliers. Delaying the proposed

[20] https://www.nist.gov/srm/ordering-policies-and-pricing/pricing-policy
[21] U.S. Bureau of Labor Statistics, Producer Price Index for Mattress manufacturing, not seasonally adjusted.

rule, or electing not to adopt SRM 1196a as the standard ignition source would not have any appreciable effect on costs borne by industry.

IV. Another commenter asked the Commission to consider SRM 1082, NIST's Cigarette Ignition Strength Standard material, or commercially available FSC cigarettes for testing to the Standard, as a proposed alternative.

Staff finds that SRM 1082 would not provide the same level of safety given its ignition strength is 15.8, compared to the ignition strength of SRM 1196a of 95.6 (on a scale of 0-100), and it is more expensive than SRM 1196a.[22] Therefore, SRM 1082 should not be considered as a more economical alternative. Furthermore, the cost of using additional FSC cigarette materials in laboratories and the time burden associated with repeating the test by trained professionals reduces any benefit of self-extinguishing FSC cigarettes as an alternative, as determined in the IRFA.

SRM cigarettes provide a common ignition source for all laboratories; however, commercially available FSC cigarettes do not offer that consistency. The ignition strength of FSC cigarettes varies from one brand to another. As stated in the IRFA, the use of FSC for compliance testing would cause test results to vary between a test conducted with one brand of FSC cigarette and another. Therefore, testing with FSC cigarettes would result in making testing, reporting, and enforcement less consistent.

V. Finally, one commenter stated that they do not believe it is fair to obligate industry statutorily to procure SRM cigarettes from NIST, and expressed the belief that NIST has a vested financial interest in revising the Standard.

Staff concurs that SRM cigarettes are available for purchase from NIST, and no other source. According to NIST's pricing policy published online, it establishes the prices of its measurement services in accordance with federal statutes.[23] The prices of SRMs are determined by the production costs, overhead, and surcharge rates incurred by NIST. Twice each calendar year, SRMs may be re-priced taking into account the updates for overhead and surcharge rates as determined by NIST and the Department of Commerce. The increase in the unit price charged by NIST from $400 to $437 for SRM 1196a is discussed in a previous section of this memorandum.

FFA Discussion of Benefits and Costs

Revising the Standard as proposed will enable NIST to continue to provide standardized cigarettes for mattress testing. Meanwhile, it will not result in any noteworthy costs to producers. There are benefits to industry in adopting SRM 1196a, which include no required retesting of existing prototypes using the safety-neutral replacement for SRM 1196. Although, as described above, there are some costs to industry in the purchasing of the replacement SRM, no significant impacts for small domestic firms were found. Likewise, staff finds any costs to consumers, if any, will probably be small. Therefore, staff finds that the benefits expected from the regulation bear a reasonable relationship to its cost.

[22] As of March 12, 2020, the cost for NIST SRM 1082 was $405 per unit of 1 carton (200 cigarettes), for a cost of $2.025 per cigarette.
[23] NIST "Standard Reference Materials Pricing", https://www.nist.gov/srm/ordering-policies-and-pricing/pricing-policy.

At this time, there are no reasonable alternatives to the adoption of SRM 1196a. The SRM standard ignition source should be viewed as a "test instrument" with calibration and traceability. SRM 1196a is the only test instrument available with calibration and traceability to the current ignition strength.[24] Testing with FSC cigarettes could lead to many more mattress and mattress pad surface test locations with an incomplete initial data point. This would add testing material costs by requiring more cigarettes to complete a test and increase the time required to complete the smoldering test.

Conclusion

In this memorandum, staff has provided a summary of economic issues raised by comments submitted during the public comment period in response to the preliminary regulatory analysis, along with a summary of the assessment of such issues. Staff finds amending the rule will not have a significant economic impact on a substantial number of small entities. Additionally, no reasonable alternatives to adopting SRM 1196a are currently available.

[24] The ignition strength of SRM 1196a is 95.6, on a scale of 0 to 100.

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Tab B – Fire Loss Estimates

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

Memorandum

Date: April 6, 2021

TO: Lisa Scott
16 CFR Part 1632 Mattress Standard Project Manager
Senior Fire Protection Engineer
Directorate of Laboratory Sciences

THROUGH: Stephen Hanway
Associate Executive Director
Directorate for Epidemiology

Risana Chowdhury
Division Director
Division of Hazard Analysis

FROM: David Miller
Division of Hazard Analysis

SUBJECT: Mattress and Bedding Fire Loss Estimates

Introduction

This memorandum was originally written in July 2020, to support the Consumer Product Safety Commission's Notice of Proposed Rulemaking (NPR) for amending CPSC's Standard for the Flammability of Mattresses and Mattress Pads (16 CFR part 1632). The update is for a new standard reference material (SRM) cigarette. The memorandum provides fire loss estimates related to mattress fires, focusing on the fires where smoking materials provided the heat source for the fire. The most recent year for which CPSC staff has these fire loss estimates was 2017. That is still the most recent year for which CPSC staff has these estimates (2018 estimates will not be available until summer 2021); so currently, there are no updates of these estimates. Thus, the NPR memo for Mattress and Bedding Fire Loss Estimates, previously dated July 28, 2020, follows in its entirety below.

Purpose

This memorandum provides estimates of deaths and injuries associated with mattress fires with an emphasis on casualties from fires where the heat source is smoking materials. The data are from the National Fire Incident Reporting System (NFIRS). This will show whether the hazard from smoldering mattress fires continues to be sizable. This is important when considering amending the Consumer Product Safety Commission's (CPSC) Standard for the Flammability of Mattresses and Mattress Pads (16 CFR part 1632) to update for a new standard reference material (SRM) cigarette.

Background

The Standard addresses fires where cigarettes ignite mattresses (or mattress pads). This standard sets forth a test to determine the ignition resistance of a mattress or mattress pad when exposed to a smoldering cigarette. Thus, the test is designed to exclude smolder-prone mattresses from the market to prevent deaths and injuries from fires where smoking materials ignite mattresses. The testing for this standard involves placing lit cigarettes directly on mattresses and on top of a layer of sheeting on mattresses. The standard originally called for using a commercial cigarette with specific physical characteristics in the tests. When that cigarette was no longer available, the standard was amended to require an SRM cigarette (SRM 1196) for the testing. The supplies of SRM 1196 have now been depleted. A new SRM cigarette, SRM 1196a, has been produced to be used in part 1632 testing.

CPSC is considering amending the Standard to require the SRM 1196a cigarette to be used in testing. There continues to be a large number of smoking material-ignited mattress and bedding fire deaths and injuries in the United States. If there was no smolder testing of mattresses, this could lead to more smolder-prone mattresses on the market and in U.S. homes, which could lead to higher numbers of smoking material mattress and bedding deaths and injuries.

Estimates

NFIRS data, in conjunction with the NFPA's national fire loss estimates, are used to produce estimates of residential structure fires and associated losses where a mattress or bedding was the *Item First Ignited*. NFIRS has a variable called *Item First Ignited,* and the following codes are counted as mattress and bedding fires:

"31 – Mattress, pillow"
"32 – Bedding; blanket, sheet, comforter"

When there is a mattress or bedding fire, it is difficult for the fire investigator to determine whether it was the mattress or bedding that ignited first. This is especially true of the more serious fires that lead to deaths or injuries. For this reason, CPSC staff does not distinguish between the codes for mattress (31) or bedding (32) in their estimates. These two codes are combined as "Mattress and Bedding."

NFIRS also has a variable called *Heat Source* with codes for things that ignite the *Item First Ignited*. CPSC staff groups the *Heat Source* codes into "Smoking Materials," "Small Open Flame," and "Other." There are three *Heat Source* codes that comprise the "Smoking Materials" codes:

'61 – Cigarette'[25]
'62 – Pipe or cigar'
'63 – Heat from undetermined smoking material'

There are a different set of three *Heat Source* codes that make up the "Small Open Flame" codes:

[25] A large majority of the NFIRS 'Smoking Material' fires (and fire deaths and injuries) are ones where the *Heat Source* is '61 – Cigarette.'

‘64 – Match’
‘65 – Cigarette lighter’
‘66 – Candle’

All of the other *Heat Source* codes, including codes like ‘12 – Radiated, conducted heat from operating equipment,’ and ‘13 – Arcing,’ fall into the ‘Other’ category.

These CPSC staff estimates exclude intentionally set fires (except for child play fires) and non-civilian casualties. The estimates are also restricted, as NFIRS is, to fires attended by the fire service. Tables 1, 2, and 3 include fire, death, and injury estimates from the three most recent years, 2015 – 2017, for which CPSC staff has estimates.

Table 1. Mattress and Bedding Fires, 2015 - 2017

Year	Total M&B Fires	Smoking Materials	Small Open Flame	Other Ignitions
2015	6,900	**1,300**	1,200	4,400
2016	6,500	**1,400**	1,100	4,100
2017	6,500	**1,400**	1,100	4,000
2015–2017 Avg.	6,700	**1,400**	1,100	4,200

Note: Estimates are made using data from NFIRS. Fire estimates are rounded to the nearest 100. Estimates from different Heat Sources may not add exactly to the total due to rounding.

Table 2. Mattress and Bedding Fire Deaths, 2015 - 2017

Year	Total M&B Deaths	Smoking Materials	Small Open Flame	Other Ignitions
2015	270	**180**	10	80
2016	360	**250**	20	90
2017	340	**180**	30	120
2015–2017 Avg.	320	**200**	20	100

Note: Estimates are made using data from NFIRS. Fire death estimates are rounded to the nearest 10. Estimates from different Heat Sources may not add exactly to the total due to rounding.

Table 3. Mattress and Bedding Fire Injuries, 2015 - 2017

Year	Total M&B Injuries	Smoking Materials	Small Open Flame	Other Ignitions
2015	910	**280**	160	470
2016	860	**310**	180	370
2017	950	**340**	160	450
2015–2017 Avg.	910	**310**	160	430

Note: Estimates are made using data from NFIRS. Fire injury estimates are rounded to the nearest 10. Estimates from different Heat Sources may not add exactly to the total due to rounding.

For 2015 through 2017, an estimated annual average of 200 deaths and 310 injuries were caused by smoking materials igniting mattresses or bedding. The deaths are an estimated 8.8 percent of the total number of residential structure fire deaths. The only combination of *Heat Source* and *Item First Ignited* codes with a larger estimated number of annual average deaths, from 2015 through 2017, is Smoking Material-Upholstered Furniture fire deaths (220), which is 9.4 percent of the total deaths.

Table 4 and Figure 1 show the NFIRS Mattress and Bedding Total fire death estimates, as well as the Smoking Material death estimates from 2000 through 2017. They both use 3-year average estimates.

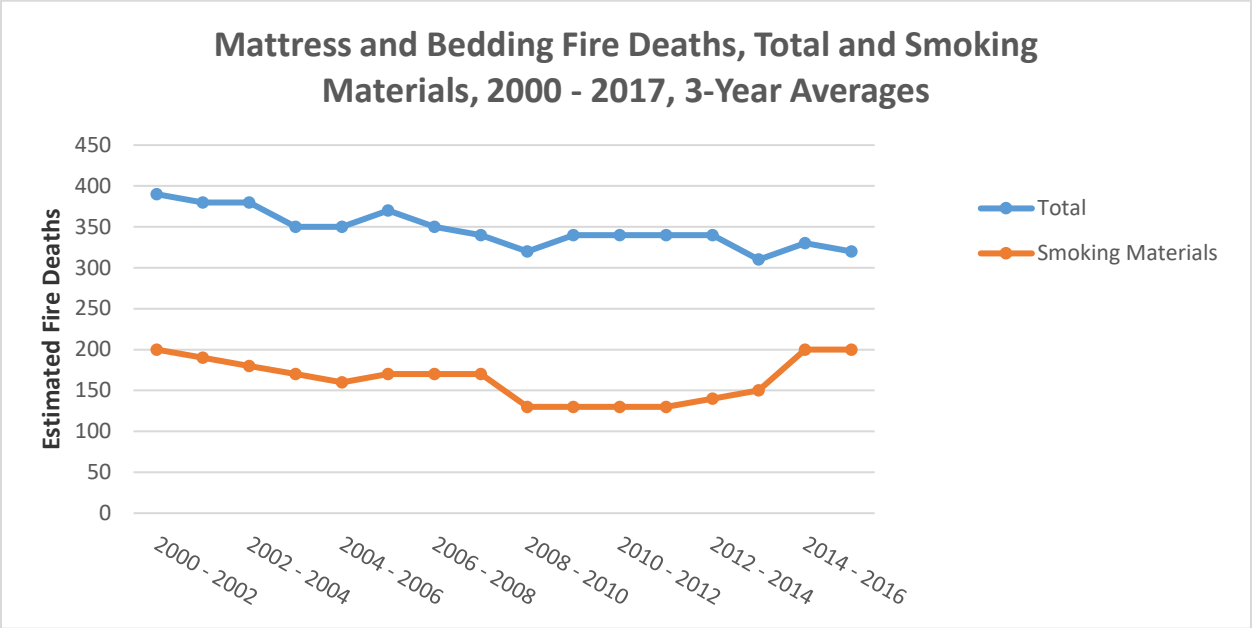
Table 4. Mattress and Bedding Deaths, Total and Smoking Materials, 2000–2017 3-Year Averages

Years	Total Mattress and Bedding Deaths	Smoking Materials
2000 – 2002 Avg.	390	**200**
2001 – 2003 Avg.	380	**190**
2002 – 2004 Avg.	380	**180**
2003 – 2005 Avg.	350	**170**
2004 – 2006 Avg.	350	**160**
2005 – 2007 Avg.	370	**170**
2006 – 2008 Avg.	350	**170**
2007 – 2009 Avg.	340	**170**
2008 – 2010 Avg.	320	**130**
2009 – 2011 Avg.	340	**130**
2010 – 2012 Avg.	340	**130**
2011 – 2013 Avg.	340	**130**
2012 – 2014 Avg.	340	**140**
2013 – 2015 Avg.	310	**150**
2014 – 2016 Avg.	330	**200**
2015 – 2017 Avg.	320	**200**

Note: Estimates are made using data from NFIRS. Fire death estimates are rounded to the nearest 10.

For the 3-year average of 2000 through 2002, Smoking Material – Mattress, Bedding fire deaths comprised an estimated 7.9 percent of all residential structure fire deaths. In 2015 through 2017, Smoking Material – Mattress, Bedding fire deaths were an estimated 8.8 percent of the total residential structure fire deaths.

Figure 1. Mattress and Bedding Deaths, Total and Smoking Materials, 2000 – 2017 3-Year Averages



Beginning with 2015 data, CPSC staff has been performing a specific type of quality control editing that can affect the 'Smoking Material' and 'Other' death estimates. CPSC staff began assigning to CPSC Field investigators all fatal incidents with a *Heat Source* code of '43 – Hot ember or ash' or '60 – Heat from other open flame or smoking materials.' These investigations, in many cases, led to editing of the data. Many of the incidents originally coded with a *Heat Source* of '43 – Hot ember or ash,' were actually miscodes of cigarette fires. Many of the fires, originally coded as '60 – Heat from other open flame or smoking materials,' were ones where the specific *Heat Source* was unknown. These edits, particularly the ones for the '43 – Hot ember or ash' incidents, tend to increase the estimates for 'Smoking Material' fire deaths and decrease the estimates for 'Other' fire deaths.

To assess the effect of the editing on the Mattress and Bedding fire death estimates for 2015 through 2017, CPSC staff also produced estimates using the pre-edited data. This led to the same total annual average estimate of Mattress and Bedding fire deaths (320), but a decrease of 40 (from 200 to 160) for 'Smoking Material' deaths and an increase of 40 (from 100 to 140) for 'Other' deaths. The 'Small Open Flame' annual average estimate remained the same at 20. Because this editing was not done until the 2015 data, it is logical to believe that before 2015, the 'Smoking Material' deaths were underestimated, and the 'Other' deaths were overestimated.

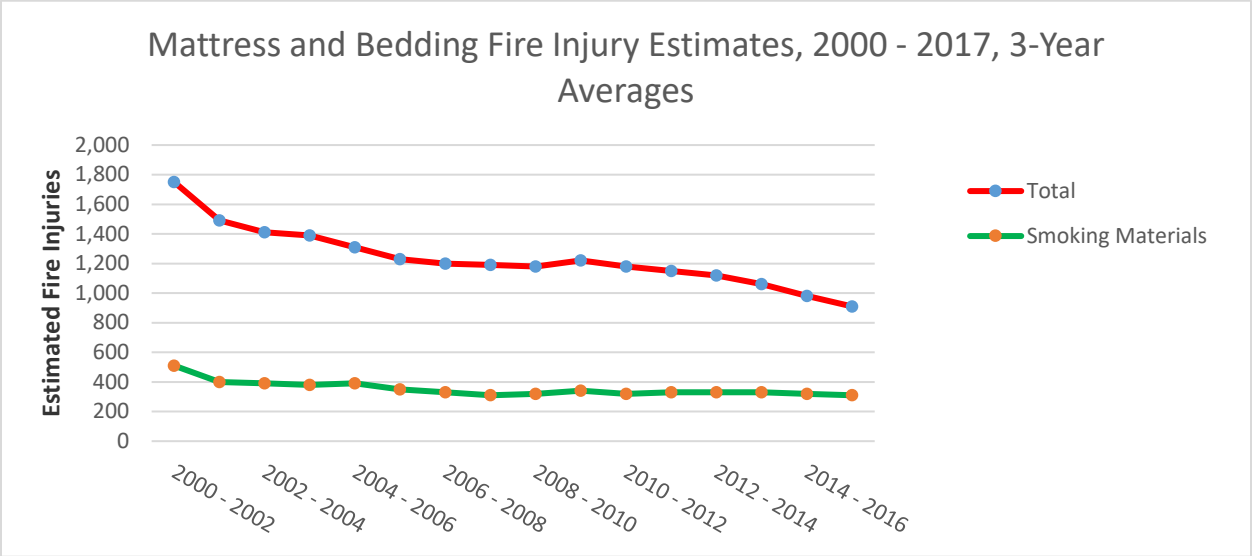
Table 5 and Figure 2 show the Mattress and Bedding-Total and Smoking Material nonfatal fire injury estimates from 2000 to 2017. Again, 3-year averages are used.

Table 5. Mattress and Bedding Injuries, Total and Smoking Materials, 2000 – 2017

Years	Total Mattress and Bedding Injuries	Smoking Materials
2000 – 2002 Avg.	1,750	**510**
2001 – 2003 Avg.	1,490	**400**
2002 – 2004 Avg.	1,410	**390**
2003 – 2005 Avg.	1,390	**380**
2004 – 2006 Avg.	1,310	**390**
2005 – 2007 Avg.	1,230	**350**
2006 – 2008 Avg.	1,200	**330**
2007 – 2009 Avg.	1,190	**310**
2008 – 2010 Avg.	1,180	**320**
2009 – 2011 Avg.	1,220	**340**
2010 – 2012 Avg.	1,180	**320**
2011 – 2013 Avg.	1,150	**330**
2012 – 2014 Avg.	1,120	**330**
2013 – 2015 Avg.	1,060	**330**
2014 – 2016 Avg.	980	**320**
2015 – 2017 Avg.	910	**310**

Note: Estimates are made using data from NFIRS. Fire injury estimates are rounded to the nearest 10.

Figure 2. Mattress and Bedding Injuries, Total and Smoking Materials, 2000 – 2017 3-Year Averages



Conclusions

Based on CPSC staff's NFIRS estimates, deaths and injuries continue to be a substantial hazard from smoking materials igniting mattresses and bedding. Annual average estimates for mattresses and bedding from the most recent 3 years of NFIRS (2015 – 2017) are of 320 deaths and 910 injuries. Smoking material ignitions account for 200 of these deaths and 310 of these injuries. The estimated 200 deaths from smoking material ignitions of mattresses and bedding are 8.8 percent of the estimated total residential structure fire deaths (2,290) for this time period. This proportion is even higher than it was in the 3-year period from 2000 through 2002, when it was 7.9 percent.

It is difficult for fire investigators to determine whether the *Item First Ignited,* in a particular bed fire, is the mattress, a sheet, a blanket, a comforter, pillow, etc. For this reason, CPSC staff combine fires where the *Item First Ignited* is '31 – Mattress, pillow' and ones where it is '32 – Bedding; blanket, sheet, comforter' into one group called 'Mattress and Bedding.' The Standard for the Flammability of Mattresses and Mattress Pads, 16 CFR part 1632, addresses fires where smoking materials ignited mattresses or a sheet on top of a mattress. As can be seen from the data, over the last two decades, the estimated number of Smoking Material - Mattress and Bedding injuries has declined, while the estimated number of deaths has held fairly steady. There continues to be a large number of smoking material-ignited mattress and bedding fire deaths and injuries in the United States.

Tab C – CPSC Staff Equivalence Study

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

Memorandum

Date: July 2, 2020

TO: Lisa Scott
16 CFR Part 1632 Mattress Standard Project Manager
Senior Fire Protection Engineer
Directorate of Laboratory Sciences

THROUGH: Stephen Hanway
Associate Executive Director
Directorate for Epidemiology

Risana Chowdhury
Division Director
Division of Hazard Analysis

FROM: Tammy Massie
Division of Hazard Analysis

SUBJECT: Mattress Ignition Equivalence Testing and Results Comparing New SRM 1196a to SRM 1196 Cigarettes

Purpose

This memorandum presents summary results from an analysis based on laboratory testing data establishing statistical equivalence of two Standard Reference Material (SRM) cigarettes: SRM 1196a and SRM 1196.[26] The conclusions from the data and associated statistical analysis provide evidence to support the comparability of the two cigarettes and demonstrate that the new cigarette SRM 1196a is a suitable replacement for SRM 1196. Furthermore, specific results from staff studies, as well as the totality of evidence from these studies, supports CPSC staff's proposed technical amendment to 16 CFR part 1632, *Standard for the Flammability of Mattresses and Mattress Pads* (Standard).

Background

The National Institute of Standards and Technology (NIST) developed and maintains SRM 1196 *Standard Cigarette for Ignition Resistance Testing.* This cigarette is the specified ignition source for 16 CFR part 1632, *Standard for the Flammability of Mattresses and Mattress Pads* (Standard). A new

[26] Note: An important note about statistical equivalence is that equivalence does NOT mean identical, it means the difference is less than a predetermined difference delta "Δ."

standardized cigarette, SRM 1196a, will be replacing a previous version of the cigarette, SRM 1196, after the NIST supply of SRM 1196 was depleted in December 2018.

NIST has proposed the use of SRM 1196a cigarettes in place of SRM 1196 and performed testing on the cigarettes to verify comparability using the ASTM E 2187[27] test method. CPSC staff reviewed the two types of cigarettes to assess whether the char patterns on mattress materials, which are correlated to mattress flammability, are consistent, regardless of the cigarette ignition source, SRM 1196 or SRM 1196a. CPSC staff examined these two cigarettes to evaluate their burn characteristics and to determine if the two cigarettes are statistically equivalent. The statistical equivalence was based on the pass/fail rates of the cigarettes based on the criterion in the CPSC regulatory standard. Specifically, 16 CFR Section 1632.3(b) *Test Criterion* requires that the char length on the mattress or mattress pad not exceed 2 inches (5.1 cm) in any direction from the nearest point of the lit cigarette. The pass/fail rates were based on char created when lit cigarettes were placed on select individual mattress substrates: Mattress, Mattress Pad and Ticking-material commonly used to cover mattresses (collectively to be referred to as "mattress substrates").

The testing was done in two stages: a pilot study and a full-scale study.

Pilot Study

From late November through mid-December 2019, an experimental pilot study was performed by CPSC staff on each of the mattress substrates to characterize the char/smolder patterns from the two cigarettes: SRM 1196a and SRM 1196. These pilot study data were used to identify the metric to be measured, as well as to determine a preliminary assessment of the CPSC regulatory standard based on the two cigarettes: SRM 1196a and SRM 1196 on each of the mattress substrates. In the pilot study, staff tested 18 cigarettes of each type on a single mattress, three cigarettes of each type on two types of ticking and four cigarettes of each type on a single mattress pad with 0 percent to 100 percent failure rates, depending on the substrate.

The pilot study confirmed that the dichotomous response of pass/fail indicated in the Standard was the practicable metric given testing constraints of limited resources including cigarettes, time, and mattress materials to use as substrates.

The pilot study provided insight to identify the criteria for establishing the comparability of the two cigarettes. The goal of the pilot study included computing sample size and power analysis[28] to ensure the full-scale study met statistically robust and scientifically meaningful criteria. Staff took into account a retrospective examination of the 2010 transition from the original ignition source to SRM 1196, CPSC Compliance data, and the number of test replicates required by the Standard to identify and confirm the confidence interval (CI) and associated margins (90% CI +/- 35%).

[27] ASTM E 2187 Standard Test Method for Measuring the Ignition Strength of Cigarettes.
[28] The statistical power of a study (sometimes called sensitivity) is how likely the study is to distinguish an actual effect from a product of chance. The analysis helps determine what sample sizes would be sufficient for detecting differences.

Full-Scale Study

From mid-December 2019 through January 2020, CPSC staff launched a full-scale study on each mattress substrate. The primary goal of the full-scale study was to determine if there is statistical equivalence between the two cigarettes, SRM 1196 and SRM 1196a.

Staff designed this study based on all available data, including data from the pilot study. Staff utilized an experimental study design that included sample size/power calculations and block randomization schemes[29] for each of the mattress substrates to ensure a quality study that would be able to demonstrate the statistical equivalence of the two cigarettes, which would then ensure the exchangeability of the two cigarettes in the mattress flammability test. The primary endpoint of interest was the pass/fail criterion related to the char/smolder pattern described in 16 CFR Section 1632.3(b) *Test Criterion*, and the goal was to determine whether the char patterns from the two SRM cigarettes were statistically equivalent based on these outcome measures and the criteria listed below. In other words, staff determined whether each tested mattress passed or failed when tested to the Standard with both SRM 1196 and SRM 1196a cigarettes, and then analyzed the resulting data to determine whether SRM 1196 and SRM 1196a are statistically equivalent.

Measure of Equivalence

To determine whether SRM 1196 and 1196a are statistically equivalent, staff used an equivalence margin of 35 percent with a 90 percent Confidence Interval (CI). Staff determined that a 90 percent CI around the difference between the likelihood of passing based on a char length of less than 2 inches on each mattress substrate for the two different cigarettes would be bounded by [-35%, 35%]. Differences bounded by greater than 35 percent or less than 35 percent would signal that the results produced by the two kinds of cigarettes would be too different to consider the cigarettes statistically equivalent. Staff subject matter experts further determined that a 90 percent CI and equivalence margin of 35 percent were appropriate, based on staff's analysis of Compliance data, as well as historical data collected and examined by CPSC staff in the 2011 amendment to the Standard from the original ignition source to SRM 1196.[30] This 90 percent CI with a +/-35% margin criterion were identified and clearly specified by staff well in advance of the full-scale study tests in a proposal submitted to both the statistical and laboratory sciences personnel and management.

Staff also used two additional "secondary/tertiary" criteria to support the equivalence of the two cigarettes, which were also pre-specified by staff prior to the full-scale study. These secondary/tertiary criteria were defined as follows:

[29] Block randomization works by randomizing participants within blocks such that an equal number are assigned to each treatment. An advantage of randomization is that it controls for factors that may be important, but are not identified in advance.

[30] Standard for the Flammability of Mattresses and Mattress Pads; Technical Amendment, 76 FR 59014, September 23, 2011. https://www.govinfo.gov/content/pkg/FR-2011-09-23/pdf/2011-24482.pdf

- Zero would be included within the 90 percent CI. In other words, when a 90 percent CI was placed around the difference between the two cigarettes, the range of values within the interval would overlap with a value of 0 percent (*i.e.*, no difference between the two kinds of cigarettes).
    - By including "0" within the CI, the two cigarettes include the potential to be identical or equal.
- The absolute value of the point estimate of the difference of the success/failure rates between the two cigarettes would be less than 25 percent. Instead of considering the variability of the difference, this criterion focuses on the observed difference in the number of pass/fail results.
    - This ensures the mean (or average) difference of the pass/fail rates of the two cigarettes on each substrate is no larger than 25 percent.

The study was designed to test the primary hypothesis of equivalence, which is that the 90 percent CI of the difference being bounded between -35 percent and 35 percent, *i.e.*, the two cigarettes would be statistically "equivalent" using these criteria. However, the two secondary/tertiary hypotheses were pre-specified and included to provide additional supportive evidence of the comparability of the two cigarettes. These two additional criteria provide supportive evidence of the similarity and comparability of the two cigarettes based on observed char patterns.

Summary of Results

In the full-scale study, each mattress substrate had thirty-six (36) SRM 1196 and thirty-six (36) SRM 1196a cigarettes placed in a randomized block design and the char/smolder patterns were noted to be passes or failures. Table 1) illustrates the results of the full-scale study, including the failure rates, the 90 percent CI of the difference between the failure rates of the two cigarettes, and whether the pre-specified criteria for equivalence were met. The results in Table 1) illustrate that for each of the three mattress substrate categories, the point estimates all meet the pre-specified requirement by falling between -13 percent and 11 percent. Furthermore, each 90 percent CI falls within the pre-specified range [-0.35, 0.35]. Thus, the cigarettes yield similar char length pass/fail patterns for all mattress substrates within the full-scale study and the primary and secondary/tertiary criteria for equivalence were met, which establishes the comparability of the two cigarettes SRM 1196 and SRM 1196a.

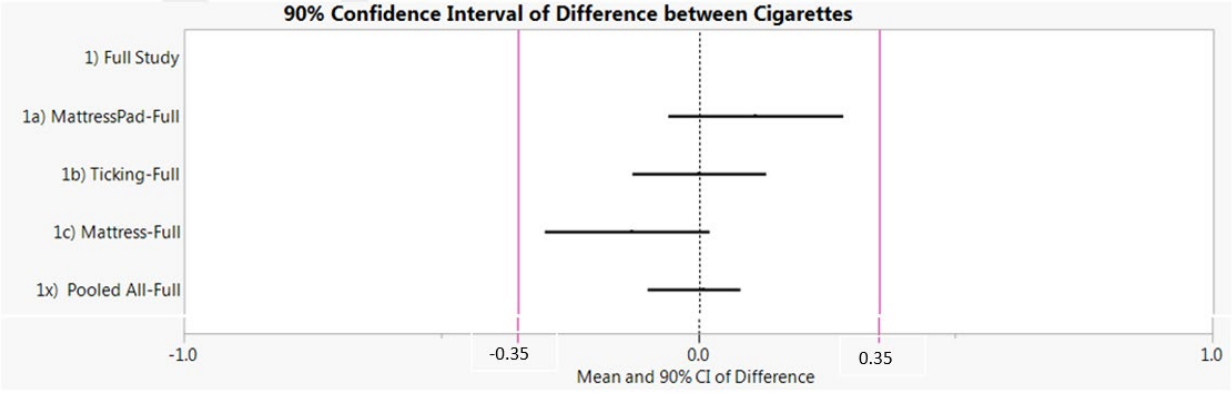
Table 1) Tabulation of Results for Full-Scale Char/Smolder Pattern Study-All Mattress Substrates

Substrate	Cigarette Failure Rate Percent (Fail/Total)		Point Estimate of % Difference	90% CI of Difference	Pre-specified Primary and Secondary/Tertiary Criteria to Support Equivalence		
	Old: 1196	New: 1196a			90% CI	0 in 90% CI	|Diff| <25%
Mattress Pad	58.3% (21/36)	69.4% (25/36)	11%	[-0.06, 0.28]	√	√	√
Ticking	97.2% (35/36)	97.2% (35/36)	0.0%	[-0.13, 0.13]	√	√	√
Non-compliant Mattress	88.9% (32/36)	75.0% (27/36)	-13%	[-0.30, 0.02]	√	√	√
TOTAL	81.4% (88/108)	80.6% (87/108)	0.9%	[-0.10, 0.08]	√	√	√

Note: The 90% CI within [-0.35, 0.35] are the primary criteria for equivalence.

Figure 1) illustrates the results presented in the above table; it includes the scientifically meaningful 90 percent CI of the difference between likelihood of failures observed in the full-scale study for the various mattress substrates for the two cigarettes: SRM 1196 and SRM 1196a. Within the graphic, the margins pre-specified to establish equivalence: [-0.35, 0.35] or +/- 35percent are noted with a solid pink line. As long as the 90 percent CI of the difference falls within this bound, the two cigarettes are considered equivalent. Based on both the tabulation above and the graphic below, the cigarettes are comparable.

Figure 1) Plot Summarizing the 90 Percent CI of Difference in Failure Percentages between Tests Using SRM 1196 and SRM 1196a



These results based on the full-scale study are supported by additional analysis that considers the totality of evidence. This pooled analysis, while not statistically rigorous, combines the pilot study and full-scale study as well as all data for all mattress substrates and is presented below. It provides supportive evidence of the comparability of the two cigarettes based on char patterns on various mattress substrates.

A summary of all results of this combined analysis for all comparative data collected to date is included in Table 2. Within Table 2 it can be observed that 162 of each the new SRM 1196a and old SRM 1196

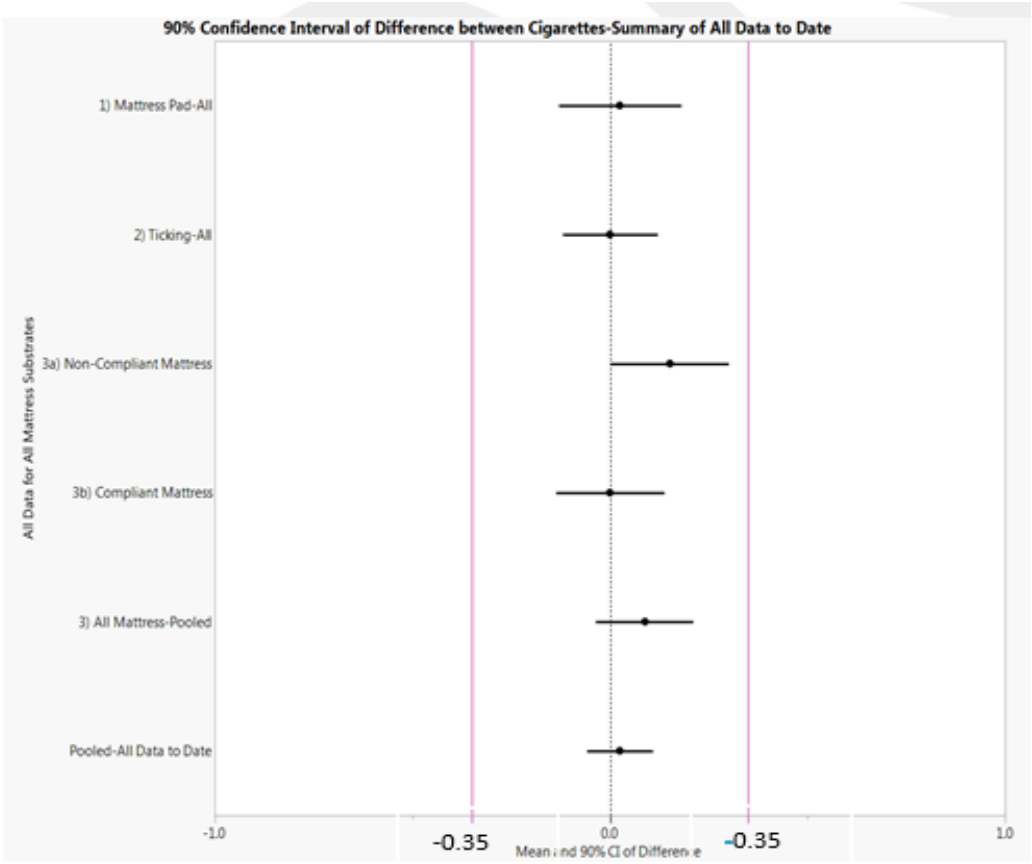
cigarettes were exposed to a variety of mattress substrates. Although the difference in failure rates varied from -15 percent to 8 percent depending on the substrate and number of cigarettes exposed, the pooled analysis of these data demonstrated that the criteria for equivalence were still met.

Table 2) Tabulation of Results for the Char/Smolder Pattern-All Data Collected for All Mattress Substrates

Substrate	Cigarette Failure Rate Percent Fail (Total)		Point Estimate Difference	Pre-specified Criteria to Support Equivalence		
	Old: 1196	New: 1196a		90% CI	0 in 90% CI	|Diff| <25%
All Mattress Pads	63% (41)	71% (41)	7%	√	√	√
Ticking	98% (42)	98% (42)	0.0%	√	√	√
All Non-compliant Mattresses	85% (46)	70% (46)	-15%	√	√	√
All Compliant Mattresses	0% (33)	0% (33)	0%	√	√	√
All Mattresses	49% (79)	41% (79)	8%	√	√	√
TOTAL	65% (162)	63% (162)	2%	√	√	√

Figure 2 illustrates the results presented in the above table. It shows the 90% CI of the difference between likelihood of failures observed in all data collected including: the pilot study, the full-scale study, and additional tests on a compliant mattress. Similar to the previous figure denoting the 90% CI for each mattress substrate, within this graphic, the margins pre-specified to establish equivalence: [-0.35, 0.35] or +/- 35 percent are noted with a solid pink line.

Figure 2) Plot Summarizing the 90 Percent CI of Difference between SRM 1196 and SRM 1196a Failure Percentages for All Data Collected for all Mattress Substrates



Conclusion

Based on the evidence provided within the full-scale study, pilot study and NIST certification, CPSC staff concludes that the SRM 1196 and SRM 1196a cigarettes met the pre-specified statistical tests of equivalence. Thus, the two cigarettes are comparable and the replacement of the SRM 1196 cigarette with the SRM 1196a cigarette is acceptable.

Acknowledgements

The author would like to thank the following Directorate for Laboratory Sciences staff who were instrumental in collecting the CPSC data upon which this analysis is based. These staff conducted over 200 individual cigarettes tests between November 2019 and January 2020 at the National Product Testing and Evaluation Center (NPTEC): Drew Bernatz, Jonathan Kent, Andrew Lock, Greg Masenheimer, and Lisa Scott. David Miller from the Division of Hazard Analysis also contributed to this analysis.