Briefing Package

Status Update: 16 CFR Part 1610 Rule Update and Consideration for Adding Spandex Fibers to the List of Currently Exempted Fibers from Testing

September 30, 2020

The views expressed in this report are those of the CPSC staff, and they have not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

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Executive Summary

As part of its authority under the Flammable Fabrics Act (FFA), the U.S. Consumer Product Safety Commission (CPSC) codified the Standard for the Flammability of Clothing Textiles at 16 CFR part 1610. All textile fabrics and related material in a form or ready for use in an article of wearing apparel are required to meet the standard (16 CFR § 1610.1(e)). The standard provides a method of testing the flammability of clothing textiles, establishes three classes of flammability, and specifies whether each class can be used for clothing. The standard

also exempts certain fibers from flammability testing, based on a history of consistently acceptable test results.

CPSC has considered ways to reduce the burdens associated with 16 CFR part 1610, including changes to reduce burdens and updates to make compliance with the standard easier. Staff has identified two general categories of potential changes: (1) exempting spandex fabric from the requirements in the standard, and (2) updating equipment and procedural requirements in the standard to provide greater clarity and make compliance easier. On April 23, 2019, the Commission issued a Request for Information (RFI) about reducing burdens associated with the Standard for the Flammability of Clothing Textiles in 16 CFR part 1610 (84 FR 16797). The RFI requested information about the possibility of adding spandex to the list of fabrics that are exempt from testing requirements, as well as information about equipment and procedures in the standard that could be updated to reduce burdens. The comment period on the RFI closed on June 24, 2019, and CPSC received seven[1] comments. This briefing package reviews the comments received from the RFI and recommends next steps for addressing the topics raised in the RFI.

CPSC staff has reviewed the data provided from the RFI for spandex and concluded that the data do not provide a sufficient body of results to justify an exemption from flammability testing for the various types of spandex-containing products that would be subject to an exemption. Staff is also aware of research suggesting that spandex may increase the burning behavior of fabrics, which may make it inappropriate to exempt spandex from testing. Therefore, staff does not recommend exempting spandex from 16 CFR part 1610 flammability testing at this time. Staff will continue to look at exempting spandex, working with stakeholders to develop sufficient data to do a complete flammability analysis of spandex.

Based on the comments received from the RFI, CPSC staff recommends pursuing testing to identify potential alternatives to update equipment and procedures in the standard that are no longer available or need clarifying, and pursuing rulemaking to propose updates. Specifically, staff recommends updating the requirements regarding the stop thread in the test apparatus, the refurbishing procedure (both dry cleaning and laundering), and test result codes. The stop thread requirements have generated confusion about the appropriate thread to use and the thread CPSC has used, which complies with the standard, is no longer identifiable on the market. Accordingly, clarifying and updating the requirement would provide for more consistent testing and results. The required refurbishing equipment, including dry cleaning solvent and washing machines, have limited availability, or are being phased out; so suitable replacements should be identified that are readily available. Finally, the test results codes are not clear, and they need to be clarified for industry members to use them properly and effectively. Staff recommends additional testing and analysis to determine appropriate updates for the stop thread, refurbishing, and test code requirements. Staff is proposing testing and analysis in the FY21 Operating Plan of the stop thread and refurbishing procedures for the next fiscal year and will consider changes to the burn codes. Depending on the results, staff may recommend issuing a notice of proposed rulemaking (NPR) in the future to update these requirements.

[1]We received a small amount of additional spandex testing information from Health Canada but, at Health Canada's request, this was for internal use only. Due to the limited amount of data provided, staff's recommendations are not based on this information.

Briefing Memorandum

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

This document has been electronically approved and signed.

Memorandum

Date: September 30, 2020

TO:	The Commission Alberta E. Mills, Secretary
THROUGH:	John G. Mullan, 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 Paige Witzen, Project Manager, Directorate for Laboratory Sciences, Office of Hazard Identification and Reduction
SUBJECT :	Status Update: 16 CFR Part 1610 Rule Update and Final Action for Exempting Spandex from Testing

Introduction

As part of the Commission's efforts to reduce burdens associated with regulatory requirements, CPSC staff considered potential revisions that could reduce burdens associated with the Standard for the Flammability of Clothing Textiles at 16 CFR part 1610. To this end, the Commission published a Request for Information (RFI) in 2019, requesting input on several potential revisions to the standard. These potential revisions to the standard included changes to equipment and procedures in the standard and a possible exemption of spandex. Potential equipment and procedural changes include: (1) clarifying the description of the stop thread in the test apparatus; (2) updating the solvent used for the dry cleaning procedure due to accessibility issues; (3) updating the equipment for the laundering procedure due to limited availability; and (4) clarifying the burn codes for reporting test results. The goal of the potential revisions is to clarify regulatory requirements, providing for repeatable and consistent test results to be able to classify fabrics by their flammability, as well as prevent dangerously flammable fabrics from entering the market.

In addition, industry members have requested that the Commission add spandex to the list of exempted fibers in 16 CFR § 1610.1(d). To add spandex to the list of exempted fibers, there must be sufficient data demonstrating that fabric containing solely spandex, or any blend of spandex with other already exempted fibers, will not exhibit rapid and intense burning, which poses a danger to consumers. Alternately, if a more limited exemption to a certain range of fabrics containing spandex and other exempted fibers were to be considered, there must be sufficient data demonstrating that fabric containing a sufficient representation of that range of fabrics, will not exhibit rapid and intense burning, which poses a danger to consumers.

Statutory and Regulatory Requirements

This section summarizes relevant portions of the Flammable Fabrics Act (FFA; 15 U.S.C. §§ 1191-1204) and the Standard for the Flammability of Clothing Textiles in 16 CFR part 1610 to provide context for the updates discussed in the RFI and this briefing package.

As part of its authority under the FFA, the Commission codified the Standard for the Flammability of Clothing Textiles at 16 CFR part 1610. The FFA authorizes the Commission to issue flammability standards for fabrics, products (including articles of wearing apparel[2]), and related materials, when necessary to "protect the public against unreasonable risk of the occurrence of fire leading to death or personal injury, or significant property damage" (§ 1193(a)). The FFA prohibits importing, manufacturing for sale, or selling in commerce any fabric, product, or related material that does not comply with regulations the Commission adopts under the statute (§ 1192).

The purpose of the standard is "to reduce danger of injury and loss of life, by providing, on a national basis, standard methods of testing and rating the flammability of textiles and textile products for clothing use, thereby discouraging the use of any dangerously flammable clothing textiles" (16 CFR § 1610.1). All clothing textiles and fabrics used or intended for use as clothing textiles are required to meet the standard (16 CFR § 1610.1(e)[3]). The standard specifies test methods, test apparatus, and materials required for testing the flammability of clothing textiles; establishes three classes of flammability; and specifies whether each class can be used for clothing. Burn time and other burning characteristics determine within which of the three classes the fabric falls. Fabrics that fall in Class 1- Normal Flammability, are acceptable for use in clothing. Fabrics that fall in Class 2- Intermediate Flammability (which applies only to raised-fiber surface fabrics), can be used for clothing. Fabrics that fall in Class 3- Rapid and Intense Burning, are considered dangerously flammable and are prohibited from being used for clothing. The standard identifies the most dangerously flammable items, but it still allows a range of textile apparel choices for the consumer.

The standard also exempts certain fabrics from testing (§ 1610.1(d)) based on consistent acceptable results, meaning that they do not exhibit rapid and intense burning behaviors when tested in accordance with the standard. These fabrics are exempt from testing to classify their flammability behavior and show that they meet the standard. These fabrics include:

- Plain surface fabrics, regardless of fiber content, weighing 2.6 ounces per square yard or more; and
- All fabrics, both plain surface and raised-fiber surface textiles, regardless of weight, made entirely from any of the following fibers or entirely from a combination of the following fibers: acrylic, modacrylic, nylon, olefin, polyester and wool.

[2] The FFA defines an "article of wearing apparel" as "any costume or article of clothing worn or intended to be worn by individuals" (§ 1191(d)).
[3] The requirements in part 1610 apply to "textile fabrics or related material in a form or state ready for use in an article of wearing apparel, including garments and costumes finished for consumer use" (1610.1(e)).

CPSC Activities Regarding Burden Reduction and 16 CFR Part 1610

Several CPSC actions have involved burden reduction and the Standard for the Flammability of Clothing Textiles in 16 CFR part 1610. The industry association, American Apparel and Footwear Association (AAFA), has shown interest in adding fabrics containing spandex to the list of fibers for which fabrics are exempted from testing in 16 CFR § 1610.1(d) for many years.

In 2017, the Commission published an RFI, seeking comments on ways to reduce burdens and costs associated with existing regulations, and requested information and data in support of any suggestions (82 FR 27636 (June 16, 2017))[4]. In response to the RFI, AAFA asked the Commission to add spandex to the list of fibers for which fabrics are exempted from 16 CFR part 1610 testing. AAFA's comment did not include any data and thus staff could not make any of the required determinations.

In 2019, the Commission issued an RFI, focused on reducing burdens associated with the Standard for the Flammability of Clothing Textiles in 16 CFR part 1610 (84 FR 16797 (April 23, 2019)). Given the lack of data provided in response to previous requests, in that RFI, the Commission requested information about the following possibilities for reducing the burdens associated with the standard:

- **Exempting Spandex.**
    - **Data.** The Commission requested information and data about spandex fibers that would help CPSC determine whether spandex fabrics "consistently yield[s] acceptable results when tested in accordance with the Standard" (as required for exempted fabrics under 16 CFR § 1610.1(d)). The RFI specifically requested test data from a range of fabric constructions, weights, and fiber blends.[5]
    - **Burden and Cost**. The Commission requested information about the test burden and cost associated with testing fabric containing spandex fibers, including how much testing is required, the cost of that testing, and the types of fabrics and garments that require testing.
- **Stop Thread.** The flammability test apparatus must include as stop thread "a spool of No. 50, white, mercerized, 100% cotton sewing thread" (§ 1610.5(a)(2)(ii)). The RFI noted that this thread has limited availability, the numbering may be outdated, and thus, requested information about how testers confirm whether available thread meets the specification.
- **Refurbishing Procedure.** The test procedure in the standard includes two steps: (1) fabric must be tested in its original state; and (2) it must be tested after it has been refurbished according to certain procedures (§ 1610.6). The refurbishing procedures include the following:
    - **Dry Cleaning.** Samples must be dry cleaned in commercial-grade perchloroethylene solvent (§ 1610.6(b)(1)(i)). The RFI noted that this solvent has limited availability,

[4] https://www.federalregister.gov/agencies/consumer-product-safety-commission

[4] As examples of helpful information, the RFI requested: (1) plain surface fabrics with spandex blended with one or a combination of the exempted fibers listed in 16 CFR §1610.1(d)(2) weighing less than 2.6 ounces per square yard; and (2) raised surface fabrics, regardless of weight, that contain spandex with one or a combination of the exempted fibers listed in 16 CFR §1610.1(d)(2).

and there are legal restrictions on its use. Accordingly, the RFI requested comments on the burden and cost of performing the dry cleaning procedure with this solvent, and potential alternatives.

- **Laundering.** Samples must be laundered in washing and drying machines that meet certain conditions in accordance with American Association of Textile Chemists and Colorists (AATCC) Test Method 124-2006, *Appearance of Fabrics After Repeated Home Laundering* (§1610.6(b)(1)(ii)). The RFI noted that washing and drying machines that meet this standard have limited availability, and therefore, requested information about the burden and cost of performing this laundering, and identify potential alternatives.

- **Test Result Codes.** The standard also lists test result codes that describe the burning behavior of fabrics, which must be used to record the flammability results for each specimen and help determine the proper classification for the sample (§1610.8(b)(2)). The RFI noted that CPSC has received input that these codes are confusing, and thus, requested comments on the use and needed clarification of the codes.

The RFI also requested any additional information about reducing burdens associated with 16 CFR part 1610. CPSC received seven comments in response to the RFI. These comments are addressed below.

Incident Data

In the memorandum in Tab D, CPSC staff reviewed its National Electronic Injury Surveillance System (NEISS) and its Consumer Product Safety Risk Management System (CPSRMS) database for clothing fire incidents between 2005 and 2010 [6] The NEISS estimates for emergency room-treated clothing fire injuries are as follows:

Year	Estimated Clothing Fire Injuries
2005	3,800
2006	3,400
2007	3,700
2008	4,200
2009	4,100
2010	4,900

The CPSRMS data review found a total of 2,714 in-scope clothing burn incidents. Some of these incidents are fatal incidents, some are nonfatal injury incidents, and some do not involve injuries. Some of the incidents involve multiple victims.

[6]The incidents looked at in this report surround the previous update to 16 CFR part 1610 in 2008. Additional analysis will be conducted in the follow up work in FY21 and beyond.

CPSC staff reviewed National Electronic Injury Surveillance System (NEISS) and CPSRMS clothing fire data from 2000 through 2019, in search of incidents involving spandex clothing. This search found two CPSRMS incidents involving spandex clothing; one involving pajamas in 2011, and another in 2017, involving a jacket. Staff did not find any NEISS clothing fire cases involving spandex. Notably, in many of the incidents found in NEISS and CPSRMS, the type of fabric is unknown or not mentioned.

Market Information and Economic Considerations

Many types of fabric are manufactured in "Textile mills," which are classified under the North American Industry Classification System (NAICS) code 313.[7] Manufacturers of apparel products are classified as "Apparel manufacturing" under NAICS code 315; this code includes manufacturers of apparel products containing spandex, among others. According to the U.S. Department of Commerce, Office of Textiles and Apparel, the United States imported roughly $111.2 billion in total textile and apparel goods in 2019, and exported $22.9 billion,[8] resulting in trade deficit of $88.3 billion. The Office of Textiles and Apparel, also known as OTEXA, does not provide separate estimates for spandex fabric, but does track categories for various blends of man-made fibers. Spandex is an elastic fiber produced from polyether-polyurea copolymer[9] and is most often used in combination with other man-made fibers in fabrics, such as nylon and/or polyester, or natural fibers, such as cotton, to create a fiber blend fabric. This information can be found in the memorandum in Tab E.

Addressing Comments from the RFI

On April 23, 2019, the Commission issued an RFI about reducing burdens associated with the Standard for the Flammability of Clothing Textiles in 16 CFR part 1610 (84 FR 16797). The RFI requested information about the possibility of adding spandex to the list of fabrics that are exempt from testing requirements, as well as information about equipment and procedures in the standard that could be updated to reduce burdens. The comment period on the RFI closed on June 24, 2019, and CPSC received seven[10] comments. Most of the comments supported making changes and updates to the standard.

[7] The NAICS is a system for classifying all industries.
[8] U.S. Department of Commerce, Office of Textiles and Apparel: https://otexa.trade.gov/msrpoint.htm. Accessed August 7, 2020.
[9] Kunal, A. and Rawat, A., Global Market Insights "Americas Spandex Market Size by Application," Report ID GMI4518, February 2020. https://www.gminsights.com/industry-analysis/americas-spandex-Market . Accessed May 29, 2020.
[10] We received a small amount of additional spandex testing information from Health Canada, but at Health Canada's request, this was for internal use only. Due to the limited amount of data provided, staff's recommendations were not based on this information.

Spandex

Staff received three comments, one in support of, one against, and one neutral about adding spandex to the list of exempted fibers. The commenter provided some data in support of exempting spandex.

Comments:

One commenter, a trade organization, provided some data in support of exempting spandex. The data included test reports from its various members, with the majority of fabrics tested being legwear (hosiery, socks, tights). The commenter stated that its members have conducted extensive testing and that products containing spandex blended with other exempted fibers have not failed the flammability standard. It also stated that exempting spandex would reduce the financial burden associated with testing spandex. As an example, it indicated that testing may cost about $50,000 annually for a mid-sized hosiery company that primarily sells products with plain surface, lightweight fabrics containing a blend of spandex and exempted fibers.

Another commenter stated that it does not have data regarding spandex, and it does not support any changes in the standard that would reduce the level of fire safety currently provided in the standard. The commenter stated that it would support "possible exemptions from testing for plain surface fabrics or raised surface fabrics only where definitive and convincing test data are available that support a testing exemption for Spandex."

One additional commenter stated to the best of its knowledge, it has no reason to believe that 100 percent spandex fabrics and fabrics containing spandex, and currently exempted fibers, would produce acceptable test results. The commenter supports the Commission continuing to work and collect data that could lead to an exemption in the future.

Response:

As stated in 16 CFR § 1610.1(d), a fabric is appropriate to exempt from testing when "testing in accordance with the Standard demonstrates" that the fabric "consistently yields acceptable results when tested in accordance with the Standard." The current available data do not adequately cover the range of all possible spandex blends and types of fabric (raised and plain surface). The data are also missing many fabric weights, consist of incomplete testing, no testing data at all, or the data are for spandex fabrics containing other fibers that are currently not exempted and would still require testing if spandex were exempt.

Issues with the data CPSC has received to date are detailed in Tab A. Due to the lack of complete data, staff cannot currently determine whether 100 percent spandex fabrics, and spandex blends containing fabrics that are currently exempted fiber types, would consistently perform as Class 1 or 2 fabrics, and therefore, cannot establish whether they would be potentially appropriate to exempt from the standard at this time. Due to the same limitations in the submitted data, staff also lacks sufficient information to consider a partial exemption for specific fabric blends with a limited range of spandex fiber content. Staff does not have confidence that the available data provided captures all types of fabrics that would be included in a spandex exemption and, therefore, cannot be confident that an exemption would adequately protect consumers from dangerously flammable fabrics. Staff plans to continue to work with industry to further develop this data set to better understand if it can support any such determinations for possible exemptions.

Stop Thread

Staff received two comments in support of, and one against, updating the stop thread description.

Comments:

One commenter stated that it does not have a source for the required stop thread and has difficulty sourcing the correct number/size of thread. In addition, the commenter stated that there are variations in the ply of the threads, and is unclear about which ply is required.

Another commenter stated: "the thread industry converted its size numbering system several years ago from Ticket Sizes to Tex Sizes," adding that "the General Services Administration authorized the use of Tex sizes and lists the companion Ticket sizes in commercial item description A-A52094A dated March 30, 2007." The commenter recommended updating the regulation to specify a stop thread of Tex size 40, which the commenter stated is consistent with the current terminology adopted by the thread industry and would require the same thread as the regulation.

Another commenter stated they have no problem finding thread to meet the description in the standard, and they use "yarn linear density in Tex," which is checked according to the Italian standard UNI 9275 Woven fabrics, Determination of linear density of yarn removed fabric.

Response:

Based on these comments, staff believes that the specification of "No. 50" in the description of the stop thread is unclear and should be updated to provide greater clarity. Staff would need to conduct testing and analysis to identify appropriate updates to the current stop thread description to ensure that it will not alter the consistency of the test results.

Information regarding the comments on stop thread is discussed in more detail in Tab B of this briefing package.

Refurbishing

Dry Cleaning

Staff received one comment in support of changing the dry cleaning procedure.

Comments:

One commenter stated that perchloroethylene solvent in the dry cleaning procedure in the standard could be replaced with a solvent or cleaning procedure using standard *EN ISO 3175-3 Textiles - Professional care, drycleaning and wetcleaning of fabrics and garments - Part 3: Procedure for testing performance when cleaning and finishing using hydrocarbon solvents*, and *EN ISO 3175-4 Textiles - Professional care, drycleaning and wetcleaning of fabrics and garments - Part 4: Procedure for testing performance when cleaning and finishing using simulated wetcleaning*. The commenter also stated that the procedure in the standard should be in line with the manufacturer's instructions, on the basis of standardized processes, instead of requiring a particular type of washing, such as dry cleaning and washing at 49° C (as the standard requires).

Response:

The use of the solvent perchloroethylene is being restricted and banned in certain parts of the United States, which may impact future access to the solvent needed to comply with testing to the standard. Staff has considered several options to replace this requirement in the standard; these options are discussed in detail in Tab C of this briefing package. Comparison testing, where flammability testing is done on the same samples after both the current refurbishing procedure and potential new dry cleaning procedures, would be necessary to show whether the potential changes to the test procedure would be consistent with current testing and results.

Laundering

Staff received one comment in support of changing the laundry procedure.

Comments:

A commenter recommended revising the current reference to AATCC TM124-2006, which would update the reference to the Standard Washing Procedure in AATCC LP1, *Home Laundering: Machine Washing*. The commenter stated that the washing machine specifications in AATCC LP1 are similar to those in AATCC TM124-2006; that machines meeting AATCC LP1's requirements are available; and neither the standard, nor the machine is not expected to change in the near future.

Response:

Washing machines that meet the specifications in the standard are no longer available, as they have been replaced by more modern machines. Accordingly, the standard should be updated to include washing machines that are available. Staff has considered several options to replace this requirement in the standard; these options are discussed in detail in Tab C of this briefing package. Staff will need to conduct comparison testing where flammability testing is done on the same samples after both the current refurbishing procedures and potential new laundering procedures to determine whether the potential changes to the standard would be consistent with current testing and results.

Burn Code Clarification

Staff received two comments in support of clarifying the burn codes.

Comments:

One commenter stated that the test result codes for raised-surface fabrics are confusing and that it is sufficient to describe the behavior, record the time of combustion, and use the plain-surface fabric codes.

Another commenter stated that the test result codes for raised surface fabrics are confusing and noted that some scenarios are not covered by the codes.

Response:

Based on these comments, staff believes that the test result codes for raised surface fabrics should be clarified. Updating the description of the burn codes would address confusion and enhance consistency in reporting results for 16 CFR part 1610.

Additional Comments

Staff received one additional comment requesting that silk be added to the exempted fibers list.

Comments:

A commenter requested that the Commission add silk to the list of exempted fibers, stating that it is less flammable than spandex and that samples of silk it has tested that are below 2.6 oz/yd^2 have yielded results as Class 1 fabrics.

Response:

In 2015, staff responded to a petition submitted to the Commission for rulemaking,[11] seeking to modify the conditioning requirements in 16 CFR part 1610, particularly for silk textiles (Petition FF15-1). As noted in staff's response to that petition, some silk fabrics receive a Class 3 classification when tested in accordance with the standard. The Commission denied the petition.[12]

Discussion, Options and Recommendations

Spandex

To add spandex as an exempted fiber type, there must be sufficient data demonstrating that any fabric containing solely spandex fibers, and any blend of spandex with other already-exempted fiber types, will not exhibit rapid and intense burning that poses a danger to consumers (*i.e.*, Class 3).

CPSC has received some test data, submitted from AAFA, regarding spandex, but it lacks the variety and quantity of information that would be necessary for staff to assess whether spandex meets the criteria for exemption. For example, some data did not include test reports to verify the results; many samples would be ineligible for an exemption because they contained fibers other than spandex that are not exempted; and the data did not include an adequate number of samples from a variety of fabric weights, a variety of garment types, raised-surface fabrics, different percentages of spandex content (relative to other exempt fabrics), or different types of fabric construction.

Staff would need additional information, noted below, to determine whether spandex fibers consistently yield acceptable results under the standard:

- Fabric weight, for all testing data and reports related to plain surface fabrics. Fabric weight is important for plain surface fabric because it plays an important role in the flammability performance of the fabric. Staff would need to have results for the range of

[11] A.I.U.F.F.A.S.S. Petition to Amend the Standard for the Flammability of Clothing Textiles (16 CFR part 1610) Regarding Silk Products (Feb. 4, 2015) is available at: https://cpsc.gov/s3fs-public/pdfs/PetitionFF151ClothingTextiles032615.pdf.

[12] The Record of Commission Action, indicating the Commission denied the petition, is available at: https://cpsc.gov/content/rca-draft-letter-to-petitioner-regarding-denial-of-petition-for-rulemaking-under-the.

fabric weights of plain surface fabrics for which exemption is requested (from x to 2.6 oz/yd^2).
- Representation of the full range of percent of spandex fiber blended with the other exempt fibers (1-99% spandex), and ideally 100 percent spandex fabric. Alternately, a limited or partial exemption for certain fabrics containing a percentage of spandex fiber blended with currently exempted fibers could be considered based on sufficient data.
- Range of fabric construction. This would include yarn properties (*e.g.*, z vs. s twist, boucle), knits (*e.g.*, jersey, tricot), woven fabrics, and different ways to create raised surface fabrics (*e.g.*, velvet, brushed, terry).
- Data on both plain and raised surface fabrics.

This information is necessary for staff to determine whether the various products that contain spandex would yield burning behaviors that are acceptable under the standard. This is because different weights and types of fabric affect flammability performance and can yield different test results under the standard. Specifically, staff needs test data for the range of exemptions requested, covering the dimensions noted above (*e.g.*, for a particular weight, raised/plain, percent spandex and type of construction).

Staff is aware that current commercially available fabrics containing spandex do not cover all possible percentages of blends and fabric construction. Fabric may need to be created to simulate all possible combinations of the currently exempted fibers and spandex, including 100 percent spandex fabrics. At this time, if the Commission were to exempt spandex from testing, then these higher-percentage spandex blends would also be exempt, unless a limited, partial exemption were granted. A partial exemption would be possible if sufficient data for a range of the types discussed above were available and showed that a significant range of weights, finishes, surface types and blends could be specified with assurance that such an exemption would be justified.

The Commission requested this information in the 2019 RFI, but did not receive sufficient data. Staff has also requested this information informally from industry members, but did not received sufficient data.

Based on the limited data CPSC has received, staff considered whether there was support for a partial exemption for spandex in certain fiber blends where sufficient data exist. The data that are usable contain mostly nylon/spandex blends; however, with only 17 usable data points of nylon/spandex blend, the data are still insufficient and not statistically significant to proceed with a partial exemption. Other factors that affect flammability such as fabric weight, the blend, knit vs. woven, and finishes used would have to be considered.

Additionally, there is some research to indicate that the burning behavior of spandex may not be appropriate to exempt the fabric from testing requirements. There is a peer-reviewed study published in Advanced Materials Research called, “Investigation of Flammable Behavior of Nylon 6 fabrics with and without Spandex Using Cone Calorimeter Test and Vertical Burning Test.” This study found that the addition of spandex fibers to nylon fabric accelerates the combustion behavior compared to 100 percent nylon fabric. Although the study does not follow 16 CFR part 1610 test procedure, it does cause concern that the addition of spandex fibers could increase the flammability of fabric and pose a danger to consumers.

Recommendation:

Staff reviewed the data and concluded that the data are incomplete and not sufficient to exempt spandex from part 1610 flammability testing at this time. Staff is willing to look at exempting spandex in the future, if enough data become available to do a complete analysis.

Stop Thread

The Standard specifies the test apparatus and materials needed for testing. One element of these requirements is the stop thread used in the test apparatus. The standard specifies that No. 50, white, mercerized, 100 percent cotton sewing thread shall be used as the stop thread for testing. However, the stop thread specified in the standard is no longer clearly understood, based on thread that is currently available on the market. CPSC has received some information, including through the RFI, indicating that industry members have difficulty obtaining the appropriate thread or determining whether thread is compliant with the standard. A clear specification of the thread size required by the standard is needed so testing labs around the world can purchase the correct cotton thread to conduct the testing and so that labs obtain consistent test results.

CPSC has a stock of stop thread that is labeled "No. 50" that complies with the standard. However, the thread currently used at the CPSC National Product Test and Evaluation Center (NPTEC) was purchased many years ago, and the NPTEC is not able to get the same thread any longer, because apparently it is no longer on the market. Staff is aware of another thread that is currently available, which is also labeled "No. 50," but it is a different Tex from the thread that complies with the standard. Tex is a measure of yarn linear density and is defined as the weight in grams of 1,000 meters of yarn. Because of this confusion, it is necessary to update the stop thread description in the standard to specify a product that is available for purchase, and to update the wording in the standard so that the required thread type is clear.

One option for providing clearer wording is to use a Tex size, which most countries now use to define yarn linear density. Staff has conducted some preliminary testing to identify the Tex size that would correspond to the "No. 50" thread CPSC currently uses for testing and that complies with the standard. CPSC staff stocks a supply of the thread currently used for the regulation for consistent compliance testing. The availability of the specified thread is unclear. The size of the thread recently purchased from the market is 44 Tex; although, it is labeled as #50. This testing indicated that the thread CPSC uses, which is no longer available, is Tex 36. This is similar to the Canadian standard, which specifies sewing thread R 35 Tex/3 (No. 50, 3-ply) mercerized cotton as the stop thread for testing.[13] This thread appears to be essentially the same one as the thread the CPSC lab currently uses, as determined by measurement.

Recommendation:

Staff has identified potential alternative stop thread specifications. However, staff must test the potential alternative stop thread to determine the effect of these alternatives on the flammability testing results. In addition, staff must assess the availability of these options on the market. Staff recommends continuing with testing in FY21, to identify appropriate options for

[13] The Canadian General Standards Board standard CAN/CGSB-4.2 No. 27.5, titled, Textile Test Method Flame Resistance - 45° Angle Test – One-Second Flame Impingement.

replacing the current thread specification, and to consider future rulemaking to address this issue, if appropriate.

Refurbishing

The standard specifies that samples must be tested before and after a specified refurbishing procedure. The refurbishing procedure includes a dry cleaning step, followed by laundering. There have been some concerns that these specified processes are becoming outdated.

Dry Cleaning:

The dry cleaning procedure specified in the standard requires perchloroethylene. Due to increased environmental regulations and bans of perchloroethylene in recent years, there is concern over the future availability of commercial drycleaners able to meet the requirements in the current standard.

Staff has considered several options. One option is to not change the dry cleaning procedure, which would give reproducible and consistent flammability test results; however, there is concern over future availability. Another potential option is to change to another commercial dry cleaning solvent. It should be noted that this entails not simply switching one solvent for another in existing process machinery, but changing the whole process, which requires different dry cleaning machines. As such, parameters like wash times, extraction times, drying times, and temperatures, and even detergent type, may need to be changed to ensure compatibility with new solvent process equipment. Some alternative solvents, such as hydrocarbons, may impact flammability results because they are flammable.

Another option is a laboratory extraction process. Solvents could be selected that would dissolve similar finishes as perchloroethylene. However, a small-scale laboratory process would not be ideal for testing labs working with large numbers of samples. Another option is to eliminate the dry cleaning requirement. This would offer the greatest burden reduction, but poses the most risk of potentially reducing safety. For options other than retaining existing dry cleaning procedures, staff would need to develop comparison testing studies where flammability testing is done on the same samples after the current dry cleaning procedure and potential new procedure to evaluate each option and to ensure that they provide reproducible data consistent with the current method.

Recommendation:

Staff recommends conducting comparison testing studies to evaluate the options in FY21. Once potential alternatives are identified from testing, staff recommends seeking additional comment from industry to determine the need to change the dry cleaning procedure in the standard to a proposed alternative, because, at present, the solvent currently used in the standard, perchloroethylene, is still widely used. However, because perchloroethylene is being phased out in some places, staff believes that it is appropriate to explore options for replacing it and seek additional input from industry, and to consider future rulemaking to address this issue if appropriate.

Laundering:

The washing machine specification in the standard is outdated given that no commercial washers currently on the market are capable of meeting the specification in the standard. Home washing machines have changed substantially over the past decade, designed to reduce water use and make machines more energy efficient. Due in part to these changes, washing machines that meet the current laundering procedure for 16 CFR part 1610 are no longer commercially available.

Staff identified several options to consider for updating the laundering requirements in the standard, which are listed below. Option 1, no change, would give reproducible and consistent flammability test results. However, new machines are not currently available, and as existing machines eventually fail, CPSC and testing labs will lose the capability of testing to the standard. Option 2 is to reduce required agitation speed from 179 to 120 strokes per minute (spm), keeping other parameters the same. This option has the fewest changes from the current standard. Option 3 is to follow AATCC Laboratory Procedure 1. This is already a method used in industry, and testing labs are already able to meet the specifications of AATCC LP1. Option 4 is to eliminate the laundering requirement. This option would offer the greatest burden reduction, but it poses the most risk of potentially reducing safety. For options 2, 3, and 4, staff would need to develop comparison testing studies where flammability testing is done on the same samples after the current laundering procedure and potential new procedures to determine the best option that would give reproducible and consistent data with no reduction in safety.

Although the RFI also requested comments on the availability of dryers, there are currently no known issues with meeting machine drying requirements, and CPSC did not receive any comments on dryers.

Recommendation:

Given that machines meeting the current laundering standard are not available, staff recommends changing the standard. Staff recommends pursuing comparison testing in FY21to consider options and ensure that alternative laundering methods have reproducible flammability test results, produce data consistent with the current method, and have no reduction in safety provided by the standard, and to consider future rulemaking to address this issue, if appropriate.

Burn Code Clarification

In 2008, the Commission published a final rule to update 16 CFR part 1610 on several topics, including updating the test result interpretation and reporting.[14] The purpose of this update was to address the issue that there were not burn codes available to report complex test results. In this update, CPSC added to the regulation the burn codes from the lab manual and also added definitions for "surface flash" and "base burn." The goal was to provide uniform result codes that would facilitate reporting accuracy and consistency, understand flammability performance, and resolve test result differences among laboratories. Over the years, staff has received comments, in addition to those received in the RFI, stating that the added burn codes

[14] *Federal Register* Notice: https://www.federalregister.gov/documents/2008/10/20/E8-24712/standard-for-the-flammability-of-clothing-textiles-corrections#:~:text=S.%20Consumer%20Product%20Safety%20Commission%20published%20in%20the,some%20incorrect%20typographical%20symbols%20and%20other%20inadvertent%20errors.
Staff Recommendations: https://www.cpsc.gov/s3fs-public/pdfs/blk_pdf_textiles.pdf

and definitions have caused confusion in the test result reporting. Using the correct burn codes consistently is important because they help to determine the class of the fabric, which determines whether the fabric may be used in clothing or not.

Recommendation:

Staff agrees with the comments received that the burn codes for 16 CFR part 1610, particularly for raised surface burn codes, can be difficult to interpret. Staff recommends reviewing these burn codes in FY21to make the descriptions clearer to use for part 1610 testing for better consistency across all test reports and to collect feedback on options for updating the burn codes, and to consider future rulemaking to address this issue, if appropriate.

Conclusions

Currently, staff does not have the data, as outlined above, to support moving forward with adding spandex to the list of exempted fibers. Staff has and will continue to pursue additional data and when such data are available, staff will consider the potential exemption. Based on the comments received on updating the stop thread description, refurbishing procedures, and clarifying the burn codes, staff recommends additional testing and analysis to determine appropriate updates for the stop thread, refurbishing, and test code requirements. Staff will propose testing and analysis of the stop thread and refurbishing procedures for the next fiscal year and will also consider changes to the burn codes in FY21. Depending on the results, staff may recommend issuing a notice of proposed rulemaking (NPR) in the future to update these requirements.

Tab A: Directorate of Laboratory Sciences Memo on Spandex

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

Memorandum

Date: August 27, 2020

TO : Allyson Tenney, Director
Division of Engineering

FROM : Paige Witzen, Textile Technologist
Division of Engineering
Directorate for Laboratory Science

SUBJECT : 16 CFR Part 1610 and Possible Exemption of Spandex Fibers

Introduction

The *Standard for the Flammability of Clothing Textiles* in 16 CFR part 1610 is a mandatory federal standard, adopted under the Flammable Fabrics Act (FFA). All clothing textiles and fabrics used or intended for use as clothing textiles are required to meet the standard before entering commerce. The FFA prohibits the distribution of dangerously flammable textiles. Dangerously flammable textiles exhibit rapid and intense burning behavior when tested in accordance with the standard.

The standard specifies test procedures that determine the relative flammability of textiles and fabrics used in apparel, using three classes of flammability: (1) Class 1- Normal Flammability, (2) Class 2- Intermediate Flammability (applies only to raised-fiber surface fabrics), and (3) Class 3- Rapid and Intense Burning. Class 1 fabrics are acceptable for use in clothing, Class 2 fabrics may be used for clothing, and Class 3 fabrics are prohibited from being used for wearing apparel.

The standard provides specific exemptions from testing in § 1610.1(d). Testing in accordance with the standard demonstrates that certain fabrics consistently yield acceptable results, meaning that they do not exhibit rapid and intense burning behaviors when tested in accordance with the standard. These fabrics are exempt from testing to classify their flammability behavior and show that they meet the standard.

Industry approached CPSC staff asking staff to consider adding fabrics containing spandex fibers to the list of exempted fabrics. This memorandum presents information on the considerations relevant to adding spandex to the list of exemptions. It covers the history of the

exemptions listed in 16 CFR § 1610.1(d), discusses previous requests to add spandex to the listed exemptions, reviews data submitted from the RFI, and provides a recommendation regarding whether to go forward with adding spandex to the list of exempted fabrics.

Summary of Existing Exemptions in § 1610.1(d)

In 1982, the Commission published an NPR proposing amendments to part 1610, regarding the requirements for testing and recordkeeping to support guaranties. Two of the changes proposed included exempting from any testing requirements: (1) plain surface fabrics, regardless of fiber content, weighing 2.6 oz/yd^2 or more, and (2) all fabrics, both plain surface and raised-fiber surface, regardless of weight, made entirely from acrylic, modacrylic, nylon, olefin, or polyester fibers, or entirely from combinations of these fibers. The Commission published an additional notice in 1983, proposing to also add wool fibers to the list of exempted fibers, and the final rule was published in 1984. The data to support these exemptions came from laboratory test results from the Federal Trade Commission (FTC), CPSC, industry and independent laboratories, and National Bureau of Standards (NBS) publications.

The current regulation exempting certain fabrics from testing under the standard provides (§ 1610.1(d)):

> *Specific exemptions.* Experience gained from years of testing in accordance with the Standard demonstrates that certain fabrics consistently yield acceptable results when tested in accordance with the Standard. Therefore, persons and firms issuing an initial guaranty of any of the following types of fabrics, or of products made entirely from one or more of these fabrics, are exempt from any requirement for testing to support guaranties of those fabrics:
>
> (1) Plain surface fabrics, regardless of fiber content, weighing 2.6 ounces per square yard or more; and
>
> (2) All fabrics, both plain surface and raised-fiber surface textiles, regardless of weight, made entirely from any of the following fibers or entirely from combination of the following fibers: acrylic, modacrylic, nylon, olefin, polyester, wool.

This means that exempted fabrics must have robust test data demonstrating that they consistently yield acceptable flammability results (Class 1 or 2) under the standard. Moreover, the only two groups of exempted fabrics are plain surface fabrics with a specific minimum weight, and fabrics made entirely from acrylic, modacrylic, nylon, olefin, polyester, wool, or a combination of those fibers. Accordingly, a fabric made of one of the exempted fiber types in combination with a non-exempted fiber type, is not exempted.

Spandex and Possible Exemption

"Spandex" (also known as elastane) is defined as "Fibre composed of at least 85% by mass of a segmented polyurethane and which, if stretched to three times its unstretched length,

rapidly reverts substantially to the unstretched length when the tension is removed."[15] Since spandex was invented in 1963, and due to its elongation and recovery properties, its use has grown considerably, and can be found in a large number of products, especially apparel.

The industry association, American Apparel and Footwear Association (AAFA), has shown interest about the possibility of adding fabrics containing spandex to the list of exemptions from testing in 16 CFR § 1610.1(d) for years. In 2017, the Commission published an RFI, seeking comments on ways to reduce burdens and costs associated with existing regulations, and requested information and data in support of any suggestions (82 FR 27636 (June 16, 2017)).[16] In response to the RFI, AAFA asked the Commission to add spandex to the list of fibers for which fabrics are exempted from 16 CFR part 1610 testing. AAFA's comment did not include any data and thus staff could not make any of the required determinations.

In 2019, the Commission published an RFI, asking for comments on ways to reduce burdens and costs associated with existing regulations, and requested information and data in support of any suggestions (84 FR 16797 (April 23, 2019)). The RFI specifically asked about data regarding spandex test results and the burden and cost associated with testing spandex. In response to the RFI, AAFA provided comments reiterating its interest in adding spandex to the list of fibers exempted in § 1610.1(d) as well as test data.

Data

AAFA provided formal comments in response to the RFI published in 2019. In support of its position, AAFA provided test data. CPSC staff reviewed the data provided and found that the data were limited and insufficient.

AAFA provided flammability data for 216 examples. CPSC staff determined that 26 of the 216 examples contained sufficient information for staff to assess whether those examples provided support for justifying an exemption for spandex fabrics. To determine whether data examples for spandex would provide information that could be used to support an exemption, staff needs to know the fabric type (plain/raised), weight, and fabric blend percentages of all test samples, as well as results of testing after refurbishing (which includes dry cleaning and laundering). Fabric weight is a particularly important factor in the flammability of a fabric because, typically, the lighter and more open a fabric is, the more flammable it is. In addition, research and additional analysis on the fabric characteristics, finishes and construction are necessary. For example, CPSC staff would need testing data on the range of percentages of spandex, including blends of spandex with currently exempted fiber types, as well as the range of surfaces, finishes and construction for which exemptions are requested. However, the data CPSC has received are limited in fabric type. Most of the tests were conducted on knit hosiery fabrics blended with nylon. Furthermore, many of the test reports were missing fabric weights, a range of fabric constructions or results of testing after refurbishing. There were a very small number of data points that were raised surface fabrics. Some of the data submitted contained samples that, based on garment photos and staff experience, appeared to be already exempt from testing under the weight exemption for plain surface fabrics (in 16 CFR § 1610.1(d)(1)). The data also included samples that contained cotton, which are not informative because, even if the

[15] ISO 2076: 2013(E) Textiles - Man-Made fibers – Generic names
[16] https://www.federalregister.gov/agencies/consumer-product-safety-commission

Commission exempted spandex, spandex/cotton blends would not be exempt because cotton is not one of the currently exempted fibers. Staff explained these gaps in the data to AAFA and indicated the specific information that would be necessary to assess whether to exempt spandex, which includes:

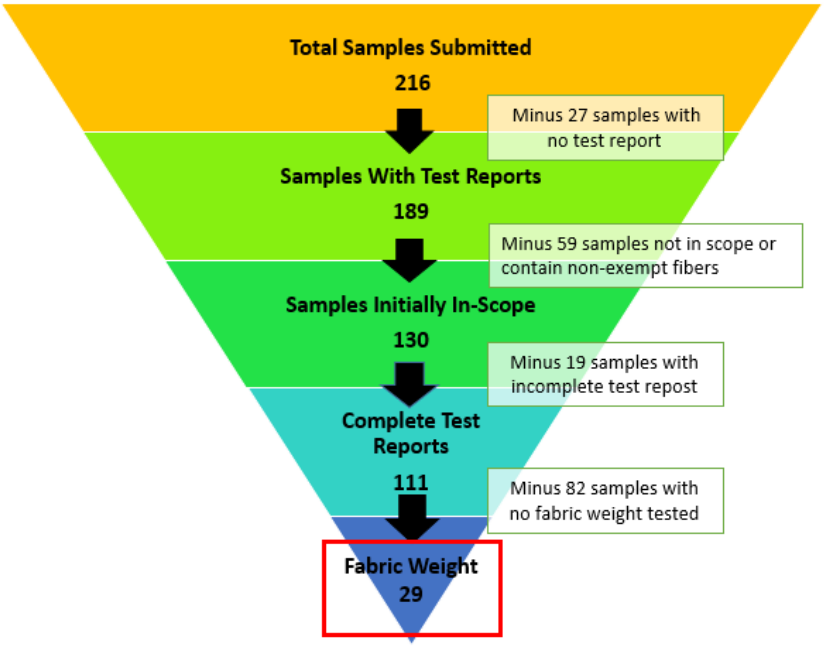
- Fabric weight, for all testing data and reports related to plain surface fabrics. Fabric weight is important for plain surface fabric because it plays an important role in the flammability performance of the fabric. Staff would need to have results for the range of fabric weights of plain surface fabrics for which exemption is requested (from x to 2.6 oz/yd^2);
- Data on both plain and raised surface fabrics;
- Representation of the full range of percent of spandex fiber blended with the other exempt fibers (1-99% spandex), and ideally 100 percent spandex fabric. Alternately, a more limited or partial exemption for certain fabrics containing a percentage of spandex fiber blended with currently exempted fibers could be considered based on sufficient data;
- Range of fabric construction. This would include yarn properties (*e.g.*, z vs. s twist, boucle), knits (*e.g.*, jersey, tricot), woven fabrics, and different ways to create raised surface fabrics (*e.g.*, velvet, brushed, terry); and
- Complete test results in both original state and after refurbishing.

AAFA responded that they would provide additional data and the missing data staff specified, but CPSC has not yet received this information.

Of the 216 data results for samples of fabrics containing spandex fibers that staff received, for all but 26 samples, the following information was either missing, or the samples were not appropriate for determining whether spandex could qualify to be exempt from flammability testing under 16 CFR part 1610. Of the 216 samples, 27 did not include a test report to verify or explain the test results. An additional 59 sample data reports did not provide usable data because the fabrics reported on would not qualify for an exemption even if staff proposed exempting spandex. For example, many of these samples had cotton in the blend, and as explained above, a combination fabric that contains a currently non-exempted fabric (*e.g.*, cotton under the weight exemption) would not be exempted. For staff to assess whether spandex meets the criteria to be exempted from testing, staff needs test results for spandex alone, and spandex in combination with other fibers that are already exempted, in a range of blends.

For an additional 19 samples, testing was incomplete, because the samples were not tested after refurbishing, which is a requirement in the standard (*i.e.*, the test procedure in section 1610.6 specifies that fabrics must be tested in their original state and after refurbishing, including dry cleaning and laundering). Another 82 samples that were plain surface fabrics did not provide fabric weight. Fabric over 2.6 oz/yd2 are exempt from flammability and these samples may have included exempt fabric weights, which does not provide information to justify an exemption for lighter fabrics This left 29 samples for staff to consider. (See Fig. 1)

Figure 1: Initial Spandex Data Analysis



Test reports that were lacking necessary information, and therefore, not considered in staff's data analysis for the exemption of spandex fibers

Of these 29 samples, 20 were plain surface fabrics, and nine were raised surface. The fabric weight of the plain surface fabrics ranged from 0.7 to 2.49 oz/yd.^{2} Fiber content consisted of mostly nylon/spandex or polyester/spandex blended fabric and had very limited samples of spandex blended with the other exempt fibers (*i.e.*, polypropylene, acrylic and/or wool) (See Fig. 2). Of the raised surface fabric samples, all were brushed to create the raised surface. We did not receive any velvet or terry cloth fabric blends with spandex. Different types of raised surface fabric have different flammability performance and staff needs data capturing all possible types. Of the 29 samples, the garment types were 14 hosiery, five intimates, five socks, two sweaters, and 3 unknown.

Figure 2: Spandex Blends with exempt fibers from Usable Data Set

% Spandex	Nylon	Polyester	Polyolefin	Acrylic	Wool
0-5	5	6		2	2
5-10	1	2			
10-15	13		1		1
15-20	2				
20-25	3				
> 25	No Data				

Notes on Spandex Blends with Exempt Fibers (AAFA Usable Data Set of 29)

- *Some of the samples are blended with multiple exempt fibers (3-way blends); these appear multiple times in the chart. This is why the numbers total to 38, rather than 29.*
- *Data cover a limited range of fabric weights, weave type, and surface finish specifications - all of which can affect flammability behavior.*
- *Although there are some complete data (13% of total submitted), there is still an insufficient amount of data that prevents staff from determining what, if any, type of blend or content range may be appropriate*.

Discussion

For spandex to be added to the list of exemptions, the appropriate technical rationale and support are needed. To add spandex as an exempted fiber type, there must be robust data demonstrating that the fabric "consistently yields[s] acceptable results when tested in accordance with the Standard" (16 CFR § 1610.1(d)). That is, staff needs robust test data showing that any fabric containing solely spandex fibers and any blend of spandex with other already-exempted fiber types will not exhibit rapid and intense burning (*i.e.*, Class 3), because that poses a danger to consumers. This requires that staff have test reports for various types of fabrics containing spandex, including a variety of fabric constructions, weights, blends, fabric finishes, and refurbishing data, and that staff have a large sample size of reports for each of these varieties.

Part 1610 is an individual fabric test and not a garment test. This means that once a fabric is tested, it can be used to make many different garments. However, this makes it hard to tell if data submitted from multiple companies are unique, or whether these data points are duplicate tests of the same fabric used to make different garments. Staff needs information on the following properties of each individual fabric to be considered for the exemption of spandex fibers for 16 CFR part 1610:

- Fabric weight, for plain surface fabrics. This is very important for plain surface fabric because fabric weight plays an important role in the flammability performance of the fabric. This also makes sure that plain surface fabrics are not already exempt for the weight of the fabric. Fabric weight is not required for raised surface fabrics, but it helps staff understand other properties of the fabric, like density of pile.
- Data on both plain and raised surface fabrics.
- Representation of the full range of percent of spandex fiber blended with the other exempt fibers (1%-99% spandex), and ideally 100 percent spandex fabric. Alternately, a more limited or partial exemption for certain fabrics containing a percentage of spandex fiber blended with currently exempted fibers could be considered based on sufficient data. This would allow staff to determine that no matter the blend of spandex fibers, the fabric would not be Class 3 and pose a danger to consumers.
- Range of fabric construction. This would include yarn properties (*e.g.*, z vs. s twist, boucle), knits (*e.g.*, jersey, tricot), woven fabrics, different ways to create raised surface fabrics (*e.g.*, velvet, brushed, terry). This could be achieved with detailed photos and/or descriptions of the fabric.

In addition to these data, which are necessary to determine whether spandex fabrics meet the criteria for exemption, more information is necessary for staff to conduct a full analysis to determine if spandex should be added to the list of exempted fibers. Although current blends of fabrics with spandex that are on the market and that require testing do not exceed ~30 percent spandex, it is possible that future uses of spandex and blends with spandex could change and include blends up to 99 percent. If the Commission were to exempt spandex from testing, then these higher-percentage spandex blends would also be exempt, unless a limited, focused exemption were granted. A partial exemption would be possible if sufficient data for a range of the types discussed above were available and showed that a significant range of weights, finishes, surface types and blends could be specified with assurance that such an exemption would be justified. As such, staff would like to understand the burning behavior of a variety of spandex blends to ensure consumer safety. To consider a general exemption within § 1610.1(d)(2), fabric may need to be created to simulate all possible combinations of the currently exempted fibers and spandex, including 100 percent spandex fabrics. Additionally, for some samples, more replicates of the sample are needed, particularly if the test results are borderline to a Class 3 fabric. For example, if multiple tests of a specimen yield borderline Class 3 results, an additional set of specimens must be tested to validate the results. Staff would also need to know if there are any finishes on the fabric that could affect the flammability performance of the fabric.

Finally, there is some research to indicate that the burning behavior of spandex may not be appropriate to exempt the fabric from testing requirements. There is a peer-reviewed study published in *Advanced Materials Research* called, "Investigation of Flammable Behavior of Nylon 6 fabrics with and without Spandex Using Cone Calorimeter Test and Vertical Burning

Test."[17] This study found that the addition of spandex fibers to nylon fabric accelerates the combustion behavior compared to 100 percent nylon fabric. Although the study does not follow 16 CFR part 1610 test procedure, it does cause concern that the addition of spandex fibers could increase the flammability of fabric and pose a danger to consumers. Additional analysis would need to be done to understand the relationship between the addition of spandex fibers to fabrics containing currently exempted fibers and flammability performance.

Recommendation

CPSC staff does not recommend exempting spandex at this time. There is insufficient data currently to support an exemption. Staff has reviewed the data and concluded that the data do not provide information on the wide variety of products, blends, weights, and/or finishes on fabrics that contain spandex and would be subject to an exemption nor sufficient replicates to assure consistency. Moreover, there is research suggesting that spandex could increase the flammability of fabrics. Therefore, staff does not recommend continuing to consider a potential exemption for spandex at this time. If industry members provide the necessary information in the future, then staff could conduct a complete flammability analysis of spandex and appropriately consider exempting spandex at that time.

[17] Luo, S. L., Zhang, H. L., Zhan, Z. C., Mao, B. H., Jiang, Z. J., & Yan, Y. R. (2014). Investigation of Flammable Behavior of Nylon 6 Fabrics with and without Spandex Using Cone Calorimeter Test and Vertical Burning Test. Advanced Materials Research, 852, 644–647. https://doi.org/10.4028/www.scientific.net/amr.852.644

Tab B: Directorate for Laboratory Sciences Memo on Stop Thread

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

Memorandum

Date: August 12, 2020

TO : Paige Witzen, Textile Technologist
Allyson Tenney, Director
Division of Engineering

FROM : Weiying Tao, Textile Technologist
Division of Engineering
Directorate for Laboratory Sciences

SUBJECT : Measurement and Specification of Threads used to Conduct Tests for Standard for the Flammability of Clothing Textiles -16 CFR Part 1610

Introduction

The Standard for the Flammability of Clothing Textiles – codified at 16 CFR part 1610 (Standard) provides testing procedures and requirements for the flammability of textiles and clothing made of those textiles. The Standard specifies test methods, test apparatus and materials required for testing. One component of the Standard specifies the stop thread that must be used in the test apparatus. Section 1610.5(a)(2)(ii) states that the stop thread supply, "consisting of a spool of **No. 50**, white, mercerized, 100% cotton sewing thread, shall be fastened to the side of the chamber and can be withdrawn by releasing the thumbscrew holding it in position." However, there is no further explanation or specific definition in the Standard for "No. 50" thread. There are several ways this specification could be interpreted. For example, it could be a yarn number, cotton count, or ticket number. The current thread reference is outdated, making it unclear as to what exact thread must be used for the test. Using thread other than what is specified could potentially introduce variability in the testing.

Currently, most countries are using the Tex system to define thread size. "Tex" is defined as the weight in grams of 1000 meters of yarn. If a stop thread with a Tex value is specified in the Standard, testing labs around the world can purchase the specified/equivalent cotton thread to conduct the testing for repeatable and reliable results. This memorandum summarizes the possible interpretations of the "No. 50" thread specified in the Standard, as well as potential alternatives that could provide greater clarity to the thread specifications.

Types of Cotton Thread – Ticket number and Tex

The Standard specifies the thread as No 50. The staff is aware of several types of cotton thread that include "No. 50" in their descriptions, however, what this number refers to is unclear. One possibility, offered by a long-time industry member familiar with the thread industry, is that the No.50 is a ticket number used by manufacturers, which now corresponds to Tex size 40[1]. The numbering system for thread evolved over the years from ticket numbers to the Tex system. Most countries currently use the Tex system to define yarn linear density. To address the changes in thread numbering, the General Services Administration lists the corresponding Tex values to ticket numbers in the Commercial Item Description A-A-52094A[2]. In this description, the General Services Administration classifies 5 types of cotton thread:

- Type I – Machine thread, soft finish,
- Type II – Machine thread, glazed finish,
- Type III – Machine thread, mercerized finish,
- Type IV – Shoe thread, soft finish, and
- Type V – Shoe thread, glazed finish.

In this description, there is a ticket number for each Tex value for each type of cotton thread. For Type I and II, ticket number 50 cotton thread is a thread of 40 Tex, however, type I and type II are not mercerized cotton. The stop thread specified in The Standard for the Flammability of Clothing Textiles – 16 CFR Part 1610 is a mercerized cotton thread, which is Type III. There is no ticket number 50 for type III cotton thread listed in this commercial item description. Therefore, 40 Tex does not appear to be equivalent to the thread named in the regulation.

Evaluation of possible thread/options

The Tex system is a current method for specifying thread size throughout the world. Because most countries use the Tex system to define yarn linear density, this is one option for providing greater clarity in the standard for the stop thread. For staff to determine the Tex value of the cotton threads currently used for testing or available on the market, the thread must be measured to determine its linear density. There are two cotton threads labeled No.50 or size 50 that staff is aware of for evaluation. These threads include:

1. Specified Test Thread - Size 50, white mercerized 100% cotton sewing thread

   Staff believes this is the thread specified in the Standard. CPSC staff maintains a supply of this thread and uses this cotton thread for testing. This is a 3-ply thread. It is widely agreed that this cotton thread is the correct stop thread that should be used for testing, as specified in the Standard. However, staff is not able to find this thread on the market at this time, and further research is needed to determine the availability of this thread.

2. Commercially available thread

   This thread is labeled: Item Code 1502002, CFR1610, #50 mercerized cotton thread, lot 12308. This is also a 3-ply thread. This thread is not used in testing in the CPSC lab, but it is believed to be used by commercial laboratories and manufacturers when testing to the Standard. It is sold by the vendor as an appropriate thread for testing to the Standard, and it is available on the market.

Because, unlike the thread above, this thread is available on the market, it may be an option for updating the stop thread required in the Standard. To determine whether this thread may be an

appropriate option for the Standard, testing is necessary. However, as indicated below, when tested, this thread is not equivalent to the thread CPSC's lab currently uses to test under the Standard. In addition, updating the Standard to include a Tex reference should provide greater clarity about the type of thread that meets the Standard, which would provide consistency for test results. For these reasons, staff examined the Tex values of these thread options.

Tex Determination:

Staff tested the two threads listed above to determine their Tex values. Tex is determined by physical measurement and mathematical conversion.

Measurement:

Twenty pieces of cotton thread of one meter were cut and conditioned for 24 hours at 70°F and 65% RH. Tex is determined by measuring and weighing the cotton threads. The results are listed in Table 1.

The result shows that, although both threads are labeled size 50, their Tex values are different. This supports staff's assertion that a clear definition of the thread size is needed to conduct tests consistently. The thread used in the CPSC lab for testing was purchased many years ago, and the CPSC lab has used this same thread for testing since the regulation became effective. Therefore, a thread size with Tex value close to 36 would correspond to the No. 50 stop thread specified in the Standard.

Mathematical Conversion:

Linear Density is also calculated by mathematical conversion. Although the meaning of No. 50 is not stated in the Standard, it could mean yarn number or cotton count. Yarn number is defined as the number of standard hanks per pound of yarn. Standard hank for cotton yarns is measured by an 840 yd (756m) hank. By this definition, a No. 50 cotton is a yarn in which 50 hanks, each 840 yards long, weighs one pound, so that each hank weighs only 1/50 lb (9g). The higher the yarn number, the finer the yarn.

Assuming No. 50 or size 50 means yarn number or cotton count to convert No. 50 to Tex:

Tex = (590.5/yarn number) * plies = (590.5/50) * 3 = 35 for 3 ply yarn.

This converted Tex value of the cotton thread is close to the value of measured size of the thread used at the CPSC lab, which is 36 Tex, as listed in Table 1.

Table 1. Cotton Thread Weight and Size

Thread Specified in Standard	Thread Commercially Available
Weight (gram/meter)	Weight (gram/meter)
0.0379	0.0438
0.0380	0.0442
0.0392	0.0427
0.0354	0.0440
0.0362	0.0438
0.0350	0.0422
0.0330	0.0442
0.0348	0.0436
0.0341	0.0439
0.0360	0.0454
0.0348	0.0440
0.0332	0.0446
0.0378	0.0435
0.0374	0.0426
0.0363	0.0435
0.0360	0.0438
0.0359	0.0443
0.0366	0.0436
0.0339	0.0438
0.0352	0.0436
Average: 0.0358	Average: 0.0438
Tex (g/1000meters) 36	**Tex (g/1000meters) 44**

Tex is the linear density of a yarn expressed as the weight (grams) of 1,000 meters of sample

Another option for updating the standard would be to follow the approach in the Canadian standard. The Canadian General Standards Board Standard CAN/CGSB-4.2 No. 27.5, titled Textile Test Method Flame Resistance - 45° Angle Test – One-Second Flame Impingement, is a standard similar to The Standard for the Flammability of Clothing Textiles in 16 CFR part 1610. This Canadian standard specifies sewing thread R 35 Tex/3 (No. 50, 3-ply) mercerized cotton as the stop thread for testing. This thread is essentially the same thread that the CPSC staff currently uses for testing, as determined by measurement. It is also consistent with the mathematical conversion shown above.

Recommendation

CPSC staff stocks a supply of the thread currently specified in the Standard for consistent compliance testing. However, the availability of thread that meets the specifications is unclear. Staff identified a thread that is currently available on the market that is labeled No. 50. However, the size of the thread has been measured to be 44 Tex, which is not the same as the thread that meets the Standard, which is about 36 Tex. The current specification "No. 50" in the Standard is confusion, making it unclear what type of cotton thread to be used for testing. To ensure test consistency and clarify the stop thread definition, CPSC staff recommends updating the thread specifications in the Standard because the current thread reference in the Standard is outdated and confusing.

Thread evaluation and current industry practice support a specification using the Tex system. Thread required by Health Canada to meet CAN/CGSB-4.2 No.27.5 is a 35 Tex, 3-ply cotton thread, which is essentially the same as the thread currently used by CPSC staff. This thread specification may be an appropriate option for the Standard. With this option, the stop thread size would remain the same, and the Tex size would provide clarity to ensure consistent thread is used for testing. CPSC staff needs to conduct further analysis to confirm the most accurate method of specifying the test thread and ensure that testing labs around the world would be able to purchase the specified thread to conduct testing. Before proposing an alternative size, testing needs to be done to determine the effect of stop thread size on the flammability testing results. CPSC staff recommends additional thread analysis in FY21and, based on the work done, propose appropriate options, and may recommend that the Commission initiate rulemaking to propose an updated, clear thread specification.

References:

1. CPSC historical files, meeting logs, and industry discussions.

2. Commercial Item Description, Thread, Cotton, A-A- 52094A, March 30, 2007. http://www.everyspec.com.

Tab C: Directorate for Laboratory Sciences Memo on Refurbishing

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

Memorandum

Date: August 25, 2020

TO : Paige Witzen, Textile Technologist
Allyson Tenney, Director
Division of Engineering

FROM : Emily Maling, Textile Technologist
Division of Engineering
Directorate for Laboratory Science

SUBJECT : Dry Cleaning and Laundering Methods for Standard for the Flammability of Clothing Textiles -16 CFR part 1610

Introduction

The Standard for the Flammability of Clothing Textiles, 16 CFR part 1610 (Standard), is a regulation under the Flammable Fabrics Act (FFA) that prescribes methods for flammability testing of textiles used for wearing apparel. The Test procedure in the Standard includes refurbishing procedures for dry cleaning and laundering, in section 1610.6(b). The Standard requires that samples be tested before and after a specified refurbishing procedure. The refurbishing procedure includes a dry cleaning step, followed by laundering.

There have been some concerns that these specified processes are becoming outdated. The dry cleaning procedure specified in the standard requires perchloroethylene, which, in recent years, has seen increased environmental regulations and even plans to ban the use of perchloroethylene for dry cleaning in some states. The washing machine specification in the standard is already outdated given that no commercial washers currently on the market are capable of meeting the specification in the standard. In consideration of these changes, staff began researching alternatives and the Commission published a Request for Information (RFI) in the *Federal Register* on April 23, 2019, asking for comments on the burden, cost, and potential alternatives for both dry cleaning and laundering in addition to other burden reduction topics (84 FR 16797).[1] This memorandum addresses the refurbishing comments received from the RFI and lays out options and steps forward in the processes of looking for an updated method that produces consistent results with no reduction in safety.

Dry Cleaning Background

Early commercial drycleaners of the 19th and early 20th century, used mostly flammable solvents. Concerns over the flammability of these solvents and shortages of petroleum-based solvents during World War II led to the use of chlorinated solvents, such as carbon tetrachloride and perchloroethylene. By the 1950's, perchloroethylene became the most popular dry cleaning solvent in the United States.[2] In recent years, more environmentally friendly dry cleaning solvent alternatives have become available, however, studies show perchloroethylene is still the most widely used solvent in the commercial dry cleaning industry with estimates that 70-85% of drycleaners in the United States use perchloroethylene.[3, 4]

In 2007, California announced a plan to completely ban the use of perchloroethylene in the dry cleaning industry by 2023.[5] California's ban does not prescribe an alternative method, but the state does offer incentives for carbon dioxide and water-based dry cleaning. Nonetheless, hydrocarbon solvents are becoming the most popular and cost-effective alternative for the dry cleaning industry because other methods can be more expensive due to both high equipment cost and running costs.[6, 7, 8] Although drycleaners using perchloroethylene are still available, other states may follow California's example and ban perchloroethylene, thus limiting availability. Currently, section 1610.6(b)(1)(i) specifies a commercial dry cleaning process using perchloroethylene as the solvent. Changes in availability of drycleaners using perchloroethylene would affect testing laboratories' ability to meet the standard.

Discussion of Dry Cleaning RFI Comments

In light of increasing regulations and bans on perchloroethylene, on April 23, 2019, the Commission published an RFI in the *Federal Register*, asking for comments on the burden and cost of dry cleaning and potential alternatives, in addition to other burden reduction topics (84 FR 16797).[1] CPSC received only one comment, from a testing laboratory, addressing dry cleaning.

The comment suggested that test specimens be washed and dry cleaned to the manufacturer's care recommendations, instead of specifying a mandatory care procedure in the standard. In other words, items not meant to be dry cleaned by the manufacturer should not be dry cleaned for flammability testing. The refurbishing process specified in the standard is intended as a repeatable process to remove any finishes or processing chemicals that may affect the flammability of the fabric. The intent of the refurbishing step is not to simulate how individual garments would be cared for by consumers. Therefore, a consistent refurbishing procedure for all samples is necessary, rather than all garments being washed and dry cleaned according to their manufacturer care labels.

The comment suggested ISO 3175-4 for professional wet cleaning as an alternative to dry cleaning with perchloroethylene. A professional wet cleaning procedure would add little to the refurbishing procedure as any water-soluble finishes should be removed in the laundering process. As the intent of the refurbishing process is to remove finishes and the samples are already exposed to a water-based cleaning method under the separate laundering requirements in the standard, a non-water-based dry cleaning method would be more consistent with current

requirements, and would be more appropriate than professional wet cleaning, given the purpose of the provision.

The comment also suggested following the method of ISO 3175-3 for hydrocarbon solvents. Dry cleaning with hydrocarbon solvents is one of the more cost-efficient alternatives to perchloroethylene. The estimated cost per pound of clothes dry cleaned with hydrocarbon solvents is $0.88, compared to $1.02 for clothes cleaned with perchloroethylene. Most other alternatives, such as carbon dioxide, wet cleaning, and siloxane, have an estimated cost-per-pound-cleaned greater than $1.02, the cost for perchloroethylene.[6, 7] Although dry cleaning with hydrocarbon solvents is more cost-efficient than perchloroethylene, hydrocarbons are flammable, while perchloroethylene is not. If residual hydrocarbon solvent were not effectively removed during the drying process, it has the potential to affect the flammability of the sample negatively, when testing to 16 CFR part 1610, compared to the perchlorinated treatment. Another concern is that finishes will have different solubility in hydrocarbon solvents versus perchloroethylene. A molecule that is soluble in a chlorinated solvent, such as perchloroethylene, may not be soluble in a hydrocarbon solvent. So, finishes currently removed by perchloroethylene might not be removed by hydrocarbons. Conversely, hydrocarbon solvents may also remove finishes not currently removed by perchloroethylene. A comparison study would be needed to evaluate how these factors may affect flammability test results for 16 CFR part 1610. Even though hydrocarbon may replace perchloroethylene as the most common commercial dry cleaning solvent, the purpose of the dry cleaning step is not to simulate how garments would be cared for by the consumer, but to provide a repeatable process to remove finishes.

Dry Cleaning Options

Staff identified several options to consider for updating the dry cleaning procedure in the standard, which are listed below:

1) Do not change dry cleaning procedure;
2) Change solvent to another commercial dry cleaning solvent (comparison study needed);
3) Use extraction process with one or more solvents in the lab (method development and comparison testing needed); or
4) Eliminate dry cleaning requirement (comparison study needed).

Discussion of Dry Cleaning Options

Each option involves pros and cons, outlined below.

Option 1, no change in dry cleaning procedure, would give reproducible and consistent flammability test results. However, stakeholders and staff are concerned over future availability. Although surveys done as recently as 2012, still show the majority of drycleaners use perchloroethylene, surveys also suggest that drycleaners believe perchloroethylene will not be a viable option for much longer as the EPA imposes increased regulations of the industry.[8] Drycleaners in California must stop using perchloroethylene by 2023, limiting the ability of labs

in California to meet the refurbishing requirements in 16 CFR part 1610. If no change is made to the dry cleaning procedure, labs in California could send dry cleaning out of state to comply with the dry cleaning requirements of the standard. CPSC currently sends some samples out of state for dry cleaning.

Option 2, changing to another commercial dry cleaning solvent, would require staff to conduct comparison testing of each option. It should be noted that this option entails not simply switching one solvent for another in existing process machinery, but also changing the whole process, which requires different dry cleaning machines. As such, parameters like wash times, extraction times, drying times and temperatures, and even detergent type, may need to be changed to ensure compatibility with new solvent process equipment. Individual solvent alternatives may have additional concerns. For example, there is concern that cleaning with a flammable solvent, such as hydrocarbons, could impact flammability test results.

Option 3, laboratory extraction process, could be used if a suitable commercial dry cleaning alternative is not found. Solvents could be selected that would dissolve similar finishes as perchloroethylene. A small-scale laboratory process would not be ideal for testing labs working with large numbers of samples. This option has similar concerns as in Option 2 regarding selection of solvent and additional parameter and process changes resulting from the choice of solvent.

Option 4, eliminating the dry cleaning requirement, would offer the greatest burden reduction, but poses the most risk of potentially reducing safety. A potential risk assessment would need to be done to see whether there are samples that currently do not meet the standard that would pass if the dry cleaning requirement were removed.

Dry Cleaning Recommendations

Due to increased regulations and bans of perchloroethylene in recent years, there is concern over the future availability of commercial drycleaners to meet the current standard. Therefore, staff recommends initiating this work in FY21, taking steps to evaluate future alternatives to ensure that they provide reproducible flammability test results, produce data consistent with the current method, and do not significantly reduce the level of safety provided by the standard. To accomplish this, staff recommends conducting comparison testing studies to evaluate Options 2, 3, and/or 4. Based on these tests, it may then be appropriate to seek additional comments from industry to determine the current need to change the dry cleaning procedure in the standard, because, at present, the solvent currently used in the standard, perchloroethylene, is still widely used. This can be done as part of an NPR.

Laundering Background and Discussion of RFI Comments

Home washing machines have changed substantially over the past decade, to reduce water use and make machines more energy efficient. Due in part to these changes, washing machines that meet the current laundering procedure for the Standard are no longer commercially available. The current laundering procedure in section 1610.6(b)(ii) references the outdated 2006 version of AATCC TM-124, which refers to the washing procedure in AATCC Monograph 6 (M6), now superseded by Laboratory Procedure 1 – Home Laundering: Machine Washing (LP1). The

current method in 16 CFR part 1610 uses the parameters specified in Table 1 under Option 1 below.

CPSC received no comments from the RFI addressing clothes dryers. Unlike washing machines, there has been little change in the designs of clothes dryers in recent years, and dryers that meet the current requirements are still widely available. The current dryer exhaust temperature specifications of 66 ± 5 °C in section 1610.6(b)(ii) are similar to the specification of 68 ± 6 °C in AATCC Laboratory Procedure 1. Since there is little change, staff does not recommend exploring changes to the drying requirement.

We received only one comment from the RFI addressing laundering. The commenter suggested replacing the current reference to AATCC TM 124-2006 in section 1610.6(b)(ii), with an updated reference to the Standard Washing Procedure, described in Table I of Laboratory Procedure 1 (LP1). The commenter stated that LP1 and machines meeting its requirements are not expected to change in the near future. AATCC's LP1 differs from the current standard in a number of parameters, including agitation speed, water level, wash time, spin speed, spin time, and load size (Table 1 Option 3). Washing machines that meet the parameters of LP1 are currently available, including machines specifically designed to meet AATCC's methods (M6 and LP1), which several testing labs currently use.

CPSC recently purchased a new washing machine designed for testing labs. This machine offers preprogramed wash cycles meeting AATCC's LP1, and additionally, it allows the user to program their own cycle parameters, subject to the machine's physical specification limits. This programming feature allows for greater control and customization. All machine programmable cycle parameters, except the agitation speed, can meet the current laundering requirements specified in 16 CFR part 1610. The current standard requires an agitation speed of 179 strokes per minute (spm), while the maximum programmable agitation speed for the newly purchased programmable washer is 120 spm (Table 1). However, LP1 does not currently consider the differences in stroke length. Stroke length is a measurement of the degrees of rotation of the agitator. Older machines typically had shorter stroke lengths of up to 90 degrees and higher agitation speeds. Newer machines have stroke lengths of up to 220 degrees that can achieve the same wash results with lower agitation speed.[9] Thus, the agitation speed alone cannot be used as a measure of how rough the wash cycle is on the textiles, making it hard to compare parameters intended for newer machines with longer stroke lengths to those for older machines.

Table 1: Laundering Procedure Parameters

	Option 1: Current Standard 16 CFR part 1610[10]	Option 2: Agitation Reduction	Option 3: AATCC LP1 Table I, (1) Normal, (IV) Hot[11]
Agitation Speed, strokes/min	179 ± 2	120 ± 2	86 ± 2
Water Level, L (gal)	68 ± 4 (18 ± 1)	68 ± 4 (18 ± 1)	72 ± 4 (19 ± 1)
Washing Time, min	12	12	16 ± 1
Spin Speed, rpm	645 ± 15	645 ± 15	660 ± 15
Final Spin Time, min	6	6	5 ± 1
Wash Temperature, °C (°F)	49 ± 3 (120 ± 5)	49 ± 3 (120 ± 5)	49 ± 3 (120 ± 5)
Load size, kg (lbs)	≤ 3.63 (≤ 8)	≤ 3.63 (≤ 8)	1.8 ± 0.1 (4 ± 0.2)
AATCC 1993 Standard Reference Detergent, g (oz)	66 ± 0.1 (2.3 ± 0.004)	66 ± 0.1 (2.3 ± 0.004)	66 ± 1 (2.3 ± 0.004)

Laundering Options

Staff identified several options to consider for updating the laundering procedure in the standard, which are listed below:

1) Make no change (not recommended because washing machines not currently available);
2) Reduce required agitation speed from 179 spm to 120, keeping other parameters the same (comparison testing study needed);
3) Adopt AATCC Laboratory Procedure 1 Table 1 suggested by AATCC, which further reduces agitation speed to 86 spm, along with changes to other parameters noted in Table 1 (comparison testing study needed); or
4) Eliminate washing requirement (comparison testing study needed).

Discussion of Laundering Options

The pros and cons of each option are outlined below:

Option 1, no change, would give reproducible and consistent flammability test results, but new machines currently are not available, and because existing machines eventually fail, CPSC and testing labs will lose the capability of testing to the standard.

Option 2 has the fewest changes from the current standard, with only the agitation speed changed. However, the stroke length would also be longer than older machines used to meet the

current standard. Therefore, this method could result in a rougher wash cycle than the current standard. Washing machines are available that would meet the specifications for Option 2. This option would establish a new method not currently used.

Option 3 is already a method used in industry, and testing labs are already able to meet the specifications in AATCC LP1 Table 1. This method specifies a load size that is half that of the current laundering procedure for the Standard. This reduced load would increase the number of loads needed to wash the same amount of testing samples, thus, increasing the time burden. However, an LP1 Table 1 option for a larger load size was proposed at the AATCC Spring Committee Meetings in May 2020, so this may change in the future.[9] Similar to Option 2, the change in parameters, such as agitation speed, water level, wash time, load size, spin speed, and spin time for Option 3 could result in a change in the roughness of the wash cycle when compared to the current standard. This could change how effectively finishes, which affect the flammability, are removed.

Option 4 would offer the greatest burden reduction, but poses the greatest potential risk of reducing safety. A potential risk assessment would need to be done to see whether there are samples that currently fail the test that would pass if the laundering requirement were removed.

For Options 2, 3, and 4, comparison testing studies would need to be developed where flammability testing is done on the same samples after the current procedure and potential new procedures to help determine the best option that would give reproducible and consistent data, with no reduction in safety.

Laundering Recommendations

Because machines meeting the current laundering requirements are not available, staff does not recommend Option 1, no change to standard. Therefore, staff recommends developing a comparison testing plan for other options, to evaluate the alternative laundering method's reproducibility of flammability test results, assess any potential changes in safety provided by the standard, and compare effect on garment flammability with the current method.

Next Steps

Staff's recommended next steps in updating the refurbishing procedures are selecting which methods to compare and developing a comparison testing plan for both dry cleaning and laundering methods in FY21. To proceed with updating these requirements, staff would develop a round-robin test design involving multiple testing laboratories performing the same methods on the same set of samples. This round-robin test design would allow staff to determine the reproducibility of new methods, as well as evaluate whether the new methods are comparable to the current method specified in the standard. Once round robin testing is complete, staff could reevaluate the method options.

Conclusion

CPSC staff recommends revising the washing and dry cleaning requirements in the Standard because washing machines meeting the requirements of the Standard are unavailable, and the future availability of the specified dry cleaning solvent, perchloroethylene, is uncertain. Given that perchloroethylene is being phased-out in some states, staff recommends evaluating alternative options and subsequently issuing an NPR to update the requirement and seek comment on potential options. Washing machines that meet the current requirements specified in section 1610.6(b)(ii) are no longer commercially available because washing machine designs have changed substantially over the past decade, to reduce water consumption and make machines more energy efficient. Staff recommends evaluating alternative options to identify a potential replacement and subsequently issuing an NPR to update the requirement and seek comments on potential options. Staff is not aware of any issues with the availability or use of clothes dryers. Therefore, staff does not recommend exploring changes to the drying requirements at this time. CPSC staff recommends further evaluating options for both washing and dry cleaning through comparison testing in anticipation of preparing an NPR.

References

1) Request for Information About Possible Exemptions from Testing and Other Changes to the Standard for the Flammability of Clothing Textiles, 84 Fed. Reg. 16797 (April 23, 2019)

2) IARC Working Group on the Evaluation of Carcinogenic Risk to Humans. Dry Cleaning, Some Chlorinated Solvents and Other Industrial Chemicals. International Agency for Research on Cancer; 1995. (IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, No. 63.) 1, Exposure Data. Available from: https://www.ncbi.nlm.nih.gov/books/NBK464368/

3) California Dry Cleaning Industry Technical Assessment Report, California Air Resources Board, Stationary Source Division Emissions Assessment Branch, February 2006. Available from: https://ww3.arb.ca.gov/toxics/dryclean/finaldrycleantechreport.pdf

4) Reducing Air Pollution from Dry Cleaning Operations. Environmental Protection Agency, Available form: https://www.epa.gov/sites/production/files/2017-06/documents/drycleaners_oo_sheet.pdf

5) Phase Out of Perchloroethylene from the Dry Cleaning Process. California Air Resources Board. Available from:https://ww2.arb.ca.gov/our-work/programs/phase-out-perchloroethlyene-dry-cleaning-process/about

6) Morris, M. and Wolf, K., Evaluation of New and Emerging Technologies for Textile Cleaning, Institutes for Research and Technical Assistance, August 2005. Available from: https://dtsc.ca.gov/wp-content/uploads/sites/31/2016/01/P2_REP_Emerging_Technology_Textile_Cleaning.pdf

7) Assessment of Alternatives to Perchloroethylene for the Dry Cleaning Industry. Toxic Use Reduction Institute. 2012. Available from:

https://www.turi.org/TURI_Publications/TURI_Methods_Policy_Reports/Assessment_of_Alternatives_to_Perchloroethylene_for_the_Dry_Cleaning_Industry._2012

8) Beggs, B. Survey: Given Updated EPA Assessment, Most Cleaners Believe Perc's Days are Numbered. American Drycleaner. March 13, 2012. https://americandrycleaner.com/articles/survey-given-updated-epa-assessment-most-cleaners-believe-percs-days-are-numbered

9) AATCC Spring Committee Meetings. RA88 – Home Laundering Technology. May 19, 2020.

10) AATCC TM 124-2006 Appearance of Fabrics after Repeated Home Laundering

11) AATCC LP1-2018, Home Laundering: Machine Washing

Tab D: Directorate for Epidemiology Memo on Clothing Fire Incidents

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

Memorandum

Date: August 28, 2020

TO : Paige Witzen, Textile Technologist
Directorate of Laboratory Science

THROUGH : Stephen Hanway
Associate Executive Director
Directorate for Epidemiology

Risana Chowdhury
Director, Division of Hazard Analysis

FROM : David Miller, Mathematical Statistician
Directorate of Hazard Analysis

SUBJECT : Incident Data Statement for 1610 Briefing Package

NEISS Incidents

CPSC staff produced National Electronic Injury Surveillance System (NEISS) estimates of Emergency Department-treated injuries from clothing fires for the years 2005 – 2010[18]. These estimates are as follows:

Year	Estimated Clothing Fire Injuries
2005	3,800
2006	3,400
2007	3,700
2008	4,200
2009	4,100
2010	4,900

[18] The incidents looked at in this report surround the previous update to 16 CFR part 1610 in 2008. Additional analysis will be conducted in the follow up work in FY21 and beyond.

CPSRMS Incidents

Additionally, CPSC staff reviewed its Consumer Product Safety Risk Management System (CPSRMS) Database for clothing fire incidents between 2005 and 2010. This review found a total of 2,714 in-scope clothing burn incidents. Some of these incidents are fatal incidents, some are nonfatal injury incidents, and some do not involve injuries. Some of the incidents involve multiple victims.

Spandex Incidents

CPSC staff reviewed NEISS and CPSRMS clothing fire data from 2000 – 2019 in search of clothing fire incidents that involve spandex clothing. This search found two CPSRMS incidents involving spandex clothing; one involving pajamas in 2011 and another involving a jacket in 2017. In the 2011 incident, the pajama pants worn by a 49-year old woman were ignited by a spark from an extension cord, causing an injury to the woman. In the 2017 incident, a 46-year old woman was warming her hands near a space heater when her jacket ignited. There was no injury. Staff did not find any NEISS clothing fire case involving spandex. It should be noted that in many of the incidents, in both NEISS and CPSRMS, the type of fabric is unknown or not mentioned.

Tab E: Directorate for Economics Memo on Market Information and Economic Considerations

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

Memorandum

Date: August 11, 2020

TO : Paige Witzen, Textile Technologist
Allyson Tenney, Director
Division of Engineering

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 : Market Information for Textiles and Textile Products

Market Information and Economic Considerations

Many types of fabric are manufactured in "Textile mills" which are classified under the North American Industry Classification System (NAICS) code 313.[19] Manufacturers of apparel products are classified as "Apparel manufacturing" under NAICS code 315; this code includes manufacturers of apparel products containing spandex, among others. According to data available from the Census Bureau, the estimated value of shipments from U.S. manufacturers in these two industries combined totaled approximately $38 billion in 2018. Textile mills, accounted for roughly $28.2 billion of this total, approximately three times the value of shipments from domestic apparel manufacturing. Census data show that more than 170,000 people are employed in these industries in the United States.[20] These totals refer to all U.S. textile and apparel manufacturing, not just the manufacture of spandex and spandex apparel. Another industry sector, "Artificial and synthetic fibers and filaments manufacturing" (NAICS

[19] The NAICS refers to the North American Industrial Classification System and is a system for classifying all industries.
[20] U.S. Census Bureau, Annual Survey of Manufacturers, 2018. Accessed August 7, 2020: https://data.census.gov/cedsci/table?q=am1831&hidePreview=true&tid=ASMAREA2017.AM1831BASIC01&vintage=2018&n=N0000.00.

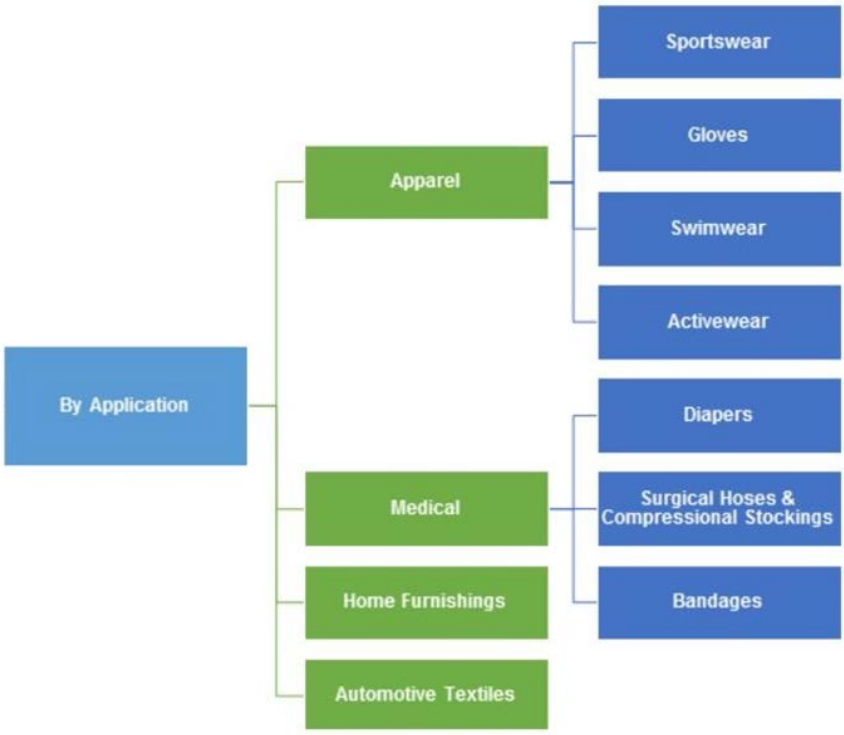
32522), includes the manufacture of spandex fiber, filament, and yarn as well as nylon, acrylic and rayon.

According to the U.S. Department of Commerce, Office of Textiles and Apparel, the United States imported roughly $111.2 billion in total textile and apparel goods in 2019 and exported $22.9 billion[21], resulting in trade deficit of $88.3 billion. The Office of Textiles and Apparel, also known as OTEXA, does not provide separate estimates for spandex fabric, but does track categories for various blends of man-made fibers. Spandex is an elastic fiber produced from polyether-polyurea copolymer[22] and is most often used in combination with other man-made fibers in fabrics, such as nylon and/or polyester, or natural fibers, such as cotton, to create a fiber blend fabric.

Consumer products that use spandex and spandex blend fabrics are found in end-use products in the automotive, home furnishing, medical and apparel sectors. See Figure 1 for a diagram of the various applications for spandex. The highly elastic properties of spandex are often desirable in garments to prevent sagging and for providing both comfort and fit. Spandex is used extensively in various sportswear, like swimsuits or yoga pants, as it allows for movement without chaffing. An increased demand for sportswear (e.g. athleisure) will likely increase the demand for spandex blend fabrics. Similarly, increasing demand for compression stockings and surgical hose in the medical sector will also likely increase the demand for spandex fiber and spandex blend fabrics. The demand for spandex fiber in the future will depend on the demand for end-use consumer products like sportswear, gloves, swimwear, as well as various medical, home furnishing and automotive textile products.

[21] U.S. Department of Commerce, Office of Textiles and Apparel: https://otexa.trade.gov/msrpoint.htm. Accessed August 7, 2020.
[22] Kunal, A. and Rawat, A., Global Market Insights "*Americas Spandex Market Size by Application*", Report ID GMI4518, February 2020. https://www.gminsights.com/industry-analysis/americas-spandex-Market. Accessed 29 May 2020

Figure 1. Spandex use by product application



Source: Global Market Insights