



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

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approved and signed.

**DATE:** April 6, 2016

**BALLOT VOTE SHEET:**

**TO:** The Commission  
Todd A. Stevenson, Secretary

**THROUGH:** Stephanie Tsacoumis, General Counsel  
Patricia H. Adkins, Executive Director

**FROM:** Patricia M. Pollitzer, Assistant General Counsel  
Meridith L. Kelsch, Attorney, Office of the General Counsel

**SUBJECT:** Petition for Rulemaking under the Flammable Fabrics Act Requesting  
Modification of the Test Procedure in the Standard for the Flammability of  
Clothing Textiles

BALLOT VOTE DUE April 12, 2016

The Office of the General Counsel is providing for Commission consideration the attached staff briefing package regarding Petition FF 15-1, *Petition to Amend the Standard for the Flammability of Clothing Textiles (16 C.F.R. Part 1610)*. Staff recommends that the Commission deny the petition because amending the mandatory flammability standard for clothing textiles as requested by the petitioner is likely to result in a reduction in the level of safety of textiles and clothing sold in the U.S. market.

Please indicate your vote on the following options:

- I. Grant the petition and direct staff to begin developing a notice of proposed rulemaking.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

II. Defer action on the petition.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

III. Deny the petition.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

IV. Take other action. (Please specify.)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

Attachment: Staff Briefing Package: Petition Requesting Rulemaking to Amend the Standard for the Flammability of Clothing Textiles



## Staff Briefing Package

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# Petition Requesting Rulemaking to Amend the Standard for the Flammability of Clothing Textiles

April 4, 2016

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For Additional Information, contact:

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U.S. Consumer Product Safety Commission  
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## Executive Summary

On February 4, 2015, the U.S. Consumer Product Safety Commission (“CPSC” or “Commission”) received a letter from the International Association of Users of Artificial and Synthetic Filament Yarns and of Natural Silk (“AI.U.F.F.A.S.S.” or “Petitioner”), requesting that the Commission initiate rulemaking to amend 16 C.F.R. part 1610, *Standard for the Flammability of Clothing Textiles* (“Standard”). The Petitioner asks that the Standard be changed to require that all clothing textile samples, including silk, be conditioned prior to testing, at a lower temperature and at a higher level of humidity, and that the time between removing the specimens from conditioning and testing be increased. The Petitioner asserted that the pre-test conditioning requirements for textile samples set forth in the Standard are inappropriate and unrealistic for silk fabrics. The Standard requires that textile specimens be prepared for testing by treating them in an oven at 105°C (221°F) for 30 minutes, then placing them in a desiccator to cool. The Petitioner contends that this process removes all moisture from silk fabric samples, resulting in unrealistic measures of textile flammability. The current conditioning requirement and the specified time between conditioning and testing allow reliable and reproducible comparisons of relative flammability among different textiles. Flammability testing of textiles is especially influenced by the amount of moisture present in the textile product. It is essential that the textile to be tested is at moisture equilibrium for reliable and reproducible test results.

On April 8, 2015, the Commission published a *Federal Register* notice soliciting comments on the petition. CPSC received 12 comments, 11 supporting the changes the Petitioner suggested (including two comments from the Petitioner) and one comment representing five organizations opposing the suggested changes to the Standard.

In this briefing package, staff presents an evaluation of the technical and economic aspects of the petition, as well as incident data and responses to comments received regarding this petition. Staff recommends that the Commission deny the petition to amend 16 C.F.R. part 1610. Amending the mandatory flammability standard for clothing textiles, as requested by the Petitioner, will re-define the classification of dangerously flammable textiles and will result in a test that will not reliably assess relative flammability among textile specimens and samples and is likely to result in a reduction in the level of safety of clothing textiles sold in the U.S. market.

# Briefing Memorandum



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
4330 EAST WEST HIGHWAY  
BETHESDA, MD 20214

This document has been electronically  
approved and signed.

MEMORANDUM

Date: April 4, 2016

TO : The Commission  
Todd A. Stevenson, Secretary

THROUGH: Stephanie Tsacoumis, General Counsel  
Patricia H. Adkins, Executive Director

FROM : George A. Borlase, Assistant Executive Director  
Office of Hazard Identification and Reduction

Linda Fansler, Senior Textile Technologist and Project Manager, Petition  
Requesting Rulemaking to Amend the Standard for the Flammability of  
Clothing Textiles  
Directorate for Laboratory Sciences

SUBJECT : Petition Requesting Rulemaking to Amend the Standard for the Flammability  
of Clothing Textiles, 16 C.F.R. Part 1610

## I. Introduction

The U.S. Consumer Product Safety Commission (“Commission”) received a request from the International Association of Users of Artificial and Synthetic Filament Yarns and of Natural Silk, (“A.I.U.F.F.A.S.S.” or “Petitioner”) to amend the *Standard for the Flammability of Clothing Textiles*, codified at 16 C.F.R. part 1610 (“Standard”). The Commission received the petition on February 4, 2015. The Office of the General Counsel docketed the request as Petition CPSC-2015-0007, and the Commission solicited comments concerning this petition by publishing a notice in the *Federal Register* on April 8, 2015. The comment period closed on June 8, 2015. Twelve comments were received. Eleven of the comments generally supported the petition, and one comment opposed the changes requested by the Petitioner.

The Petitioner, A.I.U.F.F.A.S.S., represents 95 percent of the European silk users (twisters, weavers and finishers), mainly located in Italy and France. The Petitioner requests less severe conditioning requirements for fabric specimens in preparation for testing; specifically, the Petitioner requests: (1) a lower temperature and higher level of humidity, a change that would require an environmental room to maintain those conditioning requirements, and (2) an increase in time before the specimen is removed from the conditioning environment and when testing is initiated. The Petitioner is seeking to amend the Standard by removing the current specimen

conditioning requirements<sup>1</sup> where the specimens are placed horizontally in an oven for 30 minutes at 105°C and then placed in a desiccator until cool, and replacing them with the following: *Specimens are placed in a horizontal position in 21± 1°C (70 ± 2°F) and 65% ± 2% relative humidity for at least 24 hours.* This change in conditioning requirements would apply to all apparel fabrics, not just silk fabric.

This briefing package provides the Commission with staff's analysis regarding the docketed petition requesting amendments to the test procedure in the *Standard for the Flammability of Clothing Textiles*, 16 C.F.R. part 1610. The Petitioner requests changes in the requirements for preparation of clothing textiles for flammability testing.

The briefing package also provides available fire incident data, economic considerations and technical analysis describing the potential impact these changes may have on the safety of clothing textiles. In addition, the comments received and staff's responses to issues raised by the comments are discussed.

## **II. The Petition**

In February 2015, the Commission received a petition requesting amendments to the test procedure in the *Standard for the Flammability of Clothing Textiles*, 16 C.F.R. part 1610. The Petitioner requests that the Standard be changed to require that all clothing textile samples, including silk, be conditioned at a lower temperature and at a higher level of humidity. The Petitioner declares that the conditioning requirements for textile specimens in the Standard are “not developed according to usual international methods and are not adequate for testing the flammability of silk fabrics for apparel.”

The Petitioner states that “silk is a hygroscopic material and its relative humidity is about 11% and never less than 9%.” When silk fabric is conditioned according to the specifications in the Standard, “it loses all its humidity [sic] content,” according to the Petitioner. The Petitioner suggests that using a less severe conditioning procedure will allow all silk fabrics to meet the requirements in the Standard, and therefore, be suitable for sale to U.S. consumers.

The Petitioner proposes conditioning requirements that are found in full room tests used for physical performance testing and are more favorable to silk fabrics. The Petitioner requests that the Commission adopt a portion of the conditioning requirements found in ASTM D1776-04, *Standard Practice for Conditioning and Testing Textiles*, and consistent with ISO (International Standards Organization) 139 *Textiles – Standard Atmospheres for Conditioning and Testing*, and include:

- 21° ± 1°C (70° ± 2°F), and

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<sup>1</sup> The specimens are placed horizontally in an oven for 30 ± 2 minutes at 105° ± 3°C (221° ± 5°F) and then placed over a bed of anhydrous silica gel desiccant in a desiccator until cool, but not less than 15 minutes, 16 C.F.R. § 1610.6(a)(2)(iv) (for plain surface textile fabrics) and 1610.6(a)(3)(v) (for raised surface textiles fabrics). The test begins within 45 seconds of the time the specimen is removed from the desiccator, (16 C.F.R. §1610.6(c)(5)).

- $65 \pm 2\%$  relative humidity for at least 24 hours.

The Petitioner also asks the Commission to revise the Standard to provide for more time between when a specimen is removed from the conditioning environment and when testing is initiated. The Petitioner recommended that after conditioning, the specimens be placed in a “tight container and the test shall be initiated within 4 minutes<sup>2</sup> after opening of the container.” These changes to the conditioning requirements would apply to both plain and raised-fiber surface fabrics.

In addition, the Petitioner asserts that there is no “scientific reason to submit silk (fabrics) to mandatory testing.” The Petitioner contends that there is a lack of evidence to support the exemption<sup>3</sup> for plain surface fabrics, regardless of fiber content, weighing 2.6 ounces per square yard or more and 100 percent silk fabrics should be added to the list of exempted fabrics regardless of fabric weight.

The Petitioner provided some limited test results showing that 100 percent silk fabrics do not always result in an acceptable flammability classification under the existing standard, and therefore, could not be sold in the United States. However, when the same silk fabrics were tested using the proposed conditioning requirements, all of the fabrics had favorable flammability classifications and would be allowed to be introduced into commerce. The data provided by the Petitioner showed that the silk fabrics tested by the Petitioner received a Class 3 classification when conditioned to the current specifications before testing, but received a Class 1 classification when the proposed conditioning requirements were used to condition the specimens before testing.

Additionally, the Petitioner states that the Standard is the only textile standard with such “extreme conditioning for textiles.” Specifically, the Petitioner noted that the National Standards of European Union Countries, European EN Standards and International Organization for Standardization standards for clothing and furniture provide conditioning of test specimens in the standard atmosphere for textile testing ( $20^{\circ}$  or  $23^{\circ}\text{C}$  and 50% or 65% relative humidity).

Although not mentioned in the body of the Petition, the proposed regulatory text provided by the Petitioner recommended changes to § 1610.6(b)(1)(i)(B), including the following:

- 20% polyester where the regulation says 20% cotton;
- AATCC Test Method 124-2001 where the regulation refers to the 2006 version of that test method;
- a washing temperature of  $149 \pm 5^{\circ}\text{F}$  ( $49 \pm 3^{\circ}\text{C}$ ) where the regulation states  $120 \pm 5^{\circ}\text{F}$  ( $49 \pm 3^{\circ}\text{C}$ ); and

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<sup>2</sup> Initially the Petitioner asked for a 1-minute time frame from which the test would be initiated after the specimen is removed from the tight container. In a subsequent submission, (CPSC 2015 0007 0006) the Petitioner asked for a 4-minute time frame.

<sup>3</sup> The Standard allows for specific exemptions for certain fabrics. For further information concerning these allowed exemptions from testing to support guaranties, please see section III. Background.

- adding a subsection (4) to specify the standard atmosphere provisions in ASTM D1776-04.

The Petitioner provided no basis or rationale for those changes.

### **III. Background**

Congress enacted the Flammable Fabrics Act (“FFA”) in 1953. As originally enacted, the FFA prohibits importing, manufacturing for sale, or selling in commerce any article of wearing apparel that is “so highly flammable as to be dangerous when worn by individuals.” The FFA of 1953 specified that a test first published by the U.S. Department of Commerce as a voluntary commercial standard, called Commercial Standard 191-53, “Flammability of Clothing Textiles” (“CS 191-53”), shall be used to determine if fabric or clothing is “so highly flammable as to be dangerous worn by individuals.”

The authority for the enforcement of the FFA was transferred to CPSC in 1973. In 1975, as part of its authority under the FFA, the Commission codified the Standard at 16 C.F.R part 1610, which has conditioning requirements similar to CS 191-53.

The *Standard for the Flammability of Clothing Textiles* is a mandatory federal regulation, adopted under the 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. The Standard provides a method of testing the flammability of clothing textiles and establishes three classes of flammability. Dangerously flammable textiles exhibit rapid and intense burning behavior when tested in accordance with the Standard.

The test protocol found in the Standard has existed since 1953, and was developed by a committee whose membership included representatives of manufacturers, wholesalers, retailers of textiles, and testing laboratories. The Standard was first published by the Department of Commerce in 1953, as a voluntary commercial standard, designated CS 191-53, “Flammability of Clothing Textiles.” The Standard is essentially the same as CS 191-53 regarding the general conditioning requirements, but the two differ in minor ways. The desiccant has been updated in the Standard, along with a temperature tolerance range. CS 191-53 was a direct response to apparel that caused serious burn injuries in the 1940s. The original intent of CS 191-53 was “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.”<sup>4</sup> The Standard identifies the most dangerously flammable items but still allows a range of textile apparel choices for the consumer.

Under the FFA, any fabric or article of wearing apparel is considered highly flammable and deemed dangerous when worn by individuals, if, when tested to the Standard, the wearing

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<sup>4</sup> Commercial Standard 191-53, Flammability of Clothing Textiles, 1954.

apparel exhibits rapid and intense burning. Although the Standard does not necessarily simulate an actual scenario, the Standard identifies textiles and wearing apparel items that burn slowly when subject to a small flame source and are not considered dangerously flammable, in contrast to textile and wearing apparel that burns too rapidly and provides an unreasonable risk of fire leading to death or injury.

The test method in the Standard involves placing a conditioned fabric specimen at a 45° angle and impinging a small flame on the fabric surface for 1 second. If the fabric ignites, the burn rate over a specified distance is recorded. Plain surface fabrics that burn in less than 3.5 seconds, and raised-fiber surface fabrics that burn in less than 4 seconds are rated as Class 3 fabrics which are prohibited.

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. The Standard provides methods of testing to determine the flammability classification and the FFA prohibits Class 3 textiles from being used for wearing apparel.

The Standard provides specific exemptions from testing. Experience gained from years of 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. 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 any of the following fibers: acrylic, modacrylic, nylon, olefin, polyester and wool.

The Standard specifies a conditioning period and conditioning requirements for all specimens before testing. Specimens are dried in an oven for  $30 \pm 2$  minutes at a temperature of  $105^\circ \pm 3^\circ\text{C}$  ( $221^\circ \pm 5^\circ\text{F}$ ) and then placed in a desiccator containing anhydrous silica gel desiccant until cool.

The specimens are removed from the desiccator one at a time for testing. The testing begins within 45 seconds of removal of the specimen from the desiccator. The conditioning procedures are the focus of the petition.

As specified in the Standard, oven drying provides consistency by eliminating moisture regain variability found in some fibers and fabrics and assuring reproducible results. The Standard was written to evaluate all fabrics having the same amount of moisture before testing.

#### **IV. Incident Data**

The Directorate for Epidemiology Division of Hazard Analysis (“EPHA”) staff identified 1898 clothing fires (566 from CPSRMS, 1332 from NEISS) reported to the Commission between January 1, 2010 and November 20, 2015. There were three incidents involving a silk garment. In many cases, the fiber content of the garment involved in a clothing fire is not reported. EPHA staff also searched the NFIRS and CDC<sup>5</sup> but did not find specific incidents involving silk garments.

CPSC staff reviewed recent recalls involving all wearing apparel and clothing. Three consumer-level recalls involved wearing apparel items that failed the Standard. All of the products subject to these recalls were very sheer, lighter-weight silk scarves designed for women. The recalled products were not involved in any reported injuries.

#### **V. Market Information and Economic Considerations**

The Directorate for Economic Analysis provided market information and economic considerations related to this petition. Most silk is produced in China or India. In 2014, China exported approximately 224 tons of silk fabric to the United States, worth approximately \$36 million U.S. dollars. In the same year, India exported approximately 163 tons of silk fabric to the United States, worth approximately \$26 million U.S. dollars.

Silk apparel is available in a wide range of prices, from inexpensive to very expensive, depending on the product and brand. Most apparel sold in the United States is imported because firms headquartered in the United States generally have limited or no manufacturing capabilities within the United States.

Perhaps some additional silk fabrics would enter the U.S. market with a change to the conditioning requirements in the Standard. These additional fabrics would be lighter-weight, very sheer silk fabrics. Therefore, consumers would potentially have more choices in available silk fabrics and wearing apparel. However, as mentioned above, a wide variety of silk fabric is already available in the U.S. market. Thus, the benefits of greater consumer choice would be limited. Additionally, amending the Standard could allow highly flammable fabrics to be introduced into the marketplace.

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<sup>5</sup> NFIRS: The National Fire Incident Reporting System database. CDC: Underlying Cause of Death 1999-2013 on CDC WONDER online Database released 2015. (CDC is the Centers for Disease Control and Prevention, National Center for Health Statistics.

## **VI. Existing Standard and Technical Issues**

### **A. Conditioning Textiles**

According to the Directorate for Laboratory Science Division of Engineering (“LSE”) staff, all fabrics will burn. The burning behavior of fabrics varies, some fabrics will ignite and burn readily, other fabrics ignite, burn away from the flame and self-extinguish, and others sustain a flame and continue burning until consumed. Conditioning before testing is an established test procedure for many products. Textiles are generally conditioned before testing to ensure that the test is fair and to control variables so that the results are reproducible. This is especially important when conducting flammability testing. Fabrics conditioned at different temperatures, and especially at a different relative humidity, can show different flammability performance. Conditioning fabric specimens in a bone-dry environment provides for consistency within the sample being tested and provides consistency across fabric types and among testing facilities. As specified in the Standard, oven drying provides consistency by reducing moisture regain variability found in some fibers and fabrics and assuring reproducible results. The Standard was written to evaluate all fabrics having the same amount of moisture before testing.

### **B. Conditioning Requirements Requested by the Petitioner**

The Petitioner is requesting that the conditioning requirements be changed to  $21^{\circ} \pm 1^{\circ}\text{C}$  ( $70^{\circ} \pm 2^{\circ}\text{F}$ ), and  $65 \pm 2\%$  relative humidity for at least 24 hours.<sup>6</sup> This request differs from the bone-dry conditions currently specified in the Standard. The lower temperature and higher humidity, along with a delay before testing, would allow fabrics that are hydrophilic, meaning they easily absorb moisture from their surroundings, to be tested under different conditions than a fabric that does not easily absorb moisture. In general, fabrics with higher moisture levels will not ignite as easily and will not burn as rapidly as the same fabrics in bone-dry conditions or as other fabrics with lower moisture absorbency rates. This requested change would alter the parameters of the current Standard by changing the flammability classifications of some lighter weight fabrics, such as rayon and silk fabrics, from a Class 3 to a Class 1.

The conditions requested by the Petitioner introduce variability in test conditions and, as a result, in classifications. At 65 percent relative humidity, not all fabrics will have equivalent moisture regain, so each fabric and specimen within a fabric sample will have a different amount of moisture present, affecting the test results. Zero percent humidity is the only time all fibers will be equivalent and all fabrics are evaluated under the same conditions. Using the conditioning requirements requested by the Petitioner, fabrics that easily absorb moisture would have different burning behaviors when tested to the Standard, and therefore, have potentially different flammability classifications. And any flammability classification for a fabric would be suspect

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<sup>6</sup> CPSC staff previously responded to a similar request from A.I.U.F.F.A.S.S. before receiving this Petition. In 2014, the European Union delegation involved in the Transatlantic Trade and Investment Partnership requested a response regarding a document A.I.U.F.F.A.S.S. presented during a meeting of that delegation, recommending the same changes to the conditioning requirements presented in this Petition. On July 7, 2014, CPSC staff responded to the delegation, indicating that the Commission had considered the modified condition requirements during a 2008 rulemaking and concluded that the existing Standard provided “a greater level of safety.”

because different samples of the fabric and different specimens within a fabric sample may reabsorb moisture at different rates, which may result in different classification results for the same fabric. Additionally, it is foreseeable that this change in conditioning requirements could allow some fabrics to be sold that currently are considered dangerously flammable. The current conditioning requirements in the Standard provide a uniform method of measuring burn times by controlling variability in the moisture content among fabrics being tested.

The Petitioner provided test data showing that lightweight silk fabrics that are currently classified as Class 3, defined as dangerously flammable, would receive a classification of Class 1, normal flammability when conditioned at the proposed temperature and humidity specifications and be acceptable for sale. This demonstrates that the classification of dangerously flammable fabrics would change, using the conditioning specifications requested by the Petitioner. Testing fabrics at 65 percent relative humidity introduces significant test variability and consequently unreliable classification for different fabrics and specimens of the same fabric. As a result there may be uncertainty about the accuracy of classifications, which would negatively impact safety.

“Dangerously flammable fabrics,” as defined in the Standard, are fabrics that exhibit rapid and intense burning, namely, plain surface fabrics in which the test specimens burn in less than 3.5 seconds and raised-fiber surface fabrics in which test specimens burn in less than 4 seconds. Not all silk fabrics are considered to be dangerously flammable. Some lighter-weight, sheer silk fabrics have exhibited rapid and intense burning as defined in the Standard. However, there are many silk fabrics that are conditioned and tested according to the test protocol in the Standard and are classified with “Normal Flammability” (Class 1), as defined in the Standard. The Standard (and its predecessor commercial standard), has been in effect for 63 years and has been effective in identifying dangerously flammable fabrics and reducing the injuries from dangerously flammable fabrics used in apparel.

### **C. Voluntary Standards Identified by the Petitioner**

The conditioning specifications requested by the Petitioner are found in two voluntary standards that deal with conditioning textiles, ASTM D1776-04 and ISO 139. These voluntary standards specify a conditioning room or chamber, and do not specifically address conditioning fabrics for flammability testing. They provide conditioning specifications that are appropriate for conditioning fibers and fabrics before testing to determine the physical and mechanical properties of textiles, such as tear strength or density. Many of these tests to determine physical properties require large pieces of equipment, and therefore, testing is conducted in a room or chamber. Some physical properties of textiles are influenced by relative humidity and temperature in a manner that can affect the results of the test. Thus, it is necessary to standardize the humidity and temperature conditions when evaluating physical properties; but unlike flammability testing, bone-dry conditions are not necessary. In contrast to many physical and mechanical property tests, the results of flammability testing are particularly impacted by humidity conditions.

The Petitioner selectively requests the conditioning specifications found in a specific section of ASTM D1776-04, *section 3, Terminology, 3.1.7 standard atmosphere for testing textiles*. The

laboratory conditions for testing fibers, yarns, and fabrics are specified as  $21^{\circ} \pm 1^{\circ}\text{C}$  ( $70^{\circ} \pm 2^{\circ}\text{F}$ ), and  $65 \pm 2\%$  relative humidity. This section cautions that different textile materials require different testing temperatures and relative humidity, depending on the end use of the product.

ASTM D1776-04 “covers the conditioning and testing of textiles in those instances where such conditioning is specified in a test method. Because prior exposure of textiles to high or low humidity may affect the equilibrium moisture pick-up, a procedure also is given for preconditioning the material when specified.” The scope of ISO139 is similar and defines the characteristics and use of a standard atmosphere for conditioning, for determining the physical and mechanical properties of textiles.

These two voluntary standards are not appropriate for establishing flammability performance for textiles and wearing apparel. The current conditioning requirements in the Standard date back to the original Commercial Standard, CS 191-53. These conditioning requirements have been peer reviewed,<sup>7</sup> and found to be reasonable conditioning requirements for testing the flammability of textiles and wearing apparel. Conditioning fabric specimens in a bone-dry environment provides consistency within the sample being tested and provides consistency across fabric types and among testing facilities. As reflected in the Congressional Record,<sup>8</sup> in 1954, an amendment to CS 191-53 was proposed, requesting a change to the conditioning requirements. The proposed changes were similar to those requested by the Petitioner. Congress did not incorporate this change in conditioning requirements to CS 191-53 in 1954.

Similar conditioning requirements are found in the two sleepwear standards: 16 C.F.R. part 1615, *Standard for the Flammability of Children’s Sleepwear: Sizes 0 through 6x* and part 1616, *Standard for the Flammability of Children’s Sleepwear: Sizes 7 through 14*. These two standards are also mandatory federal regulations, and like 16 C.F.R. part 1610, evaluate the flammability of small fabric specimens after being placed in bone-dry conditions. The sleepwear standards were developed by the National Bureau of Standards for CPSC. When considering the appropriate conditioning specifications<sup>9</sup> to include in the test protocol, two factors were considered: (1) test reproducibility, and (2) maximum protection. Conditioning sleepwear specimens at  $105^{\circ}\text{C}$  and cooling in a desiccator (bone dry conditions) were considered a reasonable approach to address test reproducibility concerns while also allowing for maximum protection by selecting the most hazardous conditions and measuring the flammability of fabrics that are exposed to a heat source under these conditions.

The Petitioner’s requested changes to the conditioning requirements would allow fabrics to be tested with higher moisture content. This increased moisture content could cause fabrics to pass the flammability test, and thus, might allow fabrics currently not meeting the Standard and considered dangerously flammable, to be introduced into the U.S. market. Very sheer, lighter-weight silk fabric generally weighing less than  $1.0 \text{ oz/yd}^2$  is one fabric type that typically

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<sup>7</sup> Textile Flammability Testing: Appropriate Levels for Moisture Content of Specimens, Fires and Materials, March 1982, John F. Krasny, Emil Braun, National Bureau of Standards.

<sup>8</sup> 83 Cong. Rec. S0429, at 5713 (daily ed.) April 29, 1954).

<sup>9</sup> Development of the Standards for the Flammability of Children’s Sleepwear, E. Braun, J. Winger and J. Slater, National Bureau of Standards, November 1974.

receives a Class 3 classification in laboratory testing. The test data provided by the Petitioner confirms that some fabrics that are currently Class 3 would become Class 1 when the moisture content of the sample is increased.

Additionally, the requested changes could impact the textile industry by potentially requiring additional tests of all fabrics, regardless of fiber content, to support the issuance of guarantees and to issue a certificate of conformity. Retesting would be needed, due to the potential variance in test results obtained with the different conditioning specifications. Such additional testing and retesting could result in potential costs to the industry that would likely be passed on to the consumer. Changes to the conditioning requirements would also require specialized conditioning rooms with precise controls for temperature and humidity, which would be a potential impact to small businesses and possibly add a significant increase in the cost burden associated with testing.

The claim by the Petitioner that the flammability of textile fibers should be determined by limiting oxygen index values is not supported by the fire community, in general. Limiting oxygen index values are not commonly used to describe textile flammability, especially for fabric performance assessed by regulatory and commercial bodies. Limiting oxygen index values may be influenced by many variables (*e.g.*, fabric construction, weight, weave) and may not accurately describe the burning behavior of an individual fabric type.

#### **D. Initiating Testing**

A longer time to start the test, as requested in the petition, may result in less reliable and useful test results because the absorption of moisture would vary by fiber and fabric type, possibly requiring an increase in the number of specimens tested to reduce the variability within a sample. A longer time to initiate testing could allow those hydrophilic fibers to absorb additional moisture but not impact the hydrophobic fibers, like polyester, which have poor absorbency. Thus, fabrics made from hydrophilic fibers, like silk and cotton, would be tested under different conditions than fabrics made from hydrophobic fibers. Comparing test results and ultimately identifying dangerously flammable fabrics may be difficult as a result. The impact of moisture regain on flammability was discussed above. Specifically, some fibers and fabrics that readily absorb moisture, such as lighter-weight silk fabrics, could absorb more moisture and introduce variability into the test results. This increased moisture content could cause the fabric to pass the flammability test, as shown by the Petitioner's data; and thus, currently considered dangerously flammable fabrics (Class 3) may be misidentified as Class 1 fabrics. Finally, because test results would vary based on the reabsorption of moisture in each sample, it may be difficult to compare test results among fabrics and laboratories and ultimately identify dangerously flammable fabrics.

### **VII. Discussion of Comments**

The majority of the comments responding to the notice favored the Petitioner's requested changes to the conditioning requirements. One comment representing five domestic textile organizations opposes the Petitioner's changes to the conditioning requirements.

The comments favoring the Petitioner's changes offer no compelling argument to support changing the conditioning requirements in the Standard.

The comments regarding the Petition can be found at:

<http://www.regulations.gov/#!documentDetail;D=CPSC-2015-0007-0001>

### **VIII. Staff's Response to Public Comments Received on Petition CPSC 2015-0007**

The Commission published a notice of petition for rulemaking in the *Federal Register* on April 8, 2015. The notice invited written comments on the Petitioner's suggested changes to 16 C.F.R. part 1610. The comment period ended on June 8, 2015. The Commission received 12 comments from businesses, associations and interested parties representing various segments of the textile and apparel industries. In general, 11 comments supported the petitioner's request (including two comments filed by the Petitioner), and one comment representing five different organizations opposed the Petition.

Staff reviewed the written comments and provided their analyses of the Petition. Summaries of the significant issues raised by the commenters follow. More detailed staff input and responses to comments are addressed in Staff's Memorandum at TAB C and TAB D.

**Comment:** Several commenters support changing the conditioning requirements in 16 C.F.R. part 1610. These commenters note that the conditioning requirements that the Petitioner requested are more favorable to silk fabrics and that the current conditioning requirements are not founded in reality, nor based on science. These commenters assert that the current conditioning requirements are inconsistent with other national and international textile standards. These views were presented by 11 commenters, including two comments from the Petitioner (CPSC-2015-0007-0003 through 0012 and 0014).

**Response:** The current conditioning requirements found in the Standard are reasonable. Different fibers and fabrics absorb moisture at different rates. Oven drying the test specimens to a bone-dry state, before testing, negates the effects of moisture content inherent in some fibers. The Petitioner's request is less stringent than the current conditioning requirements and would likely provide a lower level of safety for consumers. In addition, staff at the National Bureau of Standards<sup>6</sup> evaluated the current conditioning requirements for appropriateness and concluded that oven drying is a reasonable conditioning requirement for testing the flammability of apparel, and all fabrics are tested in the same manner.

The conditioning requirements in the Standard date back to the original Commercial Standard, CS 191-53. Although the Petitioner states that the change is necessary to allow some silk apparel to be marketed in the United States, staff notes a wide variety of silk apparel currently is available for sale in the U.S. market. Garments made from silk fabrics have been tested throughout the more than 63 years this Standard and its predecessor commercial standard have been in effect; and many of these garments are not considered to be dangerously flammable.

Some lighter-weight silk fabrics, generally weighing less than 1.0 oz/yd<sup>2</sup>, however, burn rapidly when tested, and these silk fabrics are considered to be dangerously flammable.

The national and international textile conditioning standards referred to by the Petitioner, ASTM D1776 and ISO 139, are more appropriate for use when conditioning textiles before testing the physical properties of textile fibers and fabrics, such as tearing strength and density. Many physical properties are influenced by relative humidity and temperature, which can affect the results of the tests. Thus, standardizing the humidity and temperature conditions when evaluating physical properties is necessary; but unlike flammability testing, bone-dry conditions are not necessary.

The voluntary standards recognize that preconditioning procedures may be necessary for some tests because temperature and relative humidity influence the results of tests. Flammability tests are influenced by the amount of moisture present in textile products, especially the small specimens used in 16 C.F.R. part 1610.

**Comment:** Several commenters favor amending 16 C.F.R. part 1610, by changing the conditioning requirements to the requirements in ASTM D1776. They support the Petitioner's suggestion to require that all clothing textile samples, including silk, be conditioned at a lower temperature and at a higher level of humidity and that a 4-minute delay after removal from the desiccator be allowed before starting the test. Because silk fibers absorb moisture from the environment, the Petitioner suggests that using a less severe conditioning procedure will allow all silk fabrics to be sold to U.S. consumers. This comment was supported by 11 commenters (two comments received from the Petitioner) (CPSC-2015-0007-0003 through 0012 and 0014).

**Response:** The data provided by the Petitioner shows that changing the conditioning requirements for lighter-weight silk fabrics (0.29 to 0.64 oz/yd<sup>2</sup>) changes the results from a Class 3 to a Class 1.<sup>10</sup> The bone-dry conditions currently required in the Standard provide a uniform method of testing and reduce any potential variability that would occur under the proposed conditioning requirements. The Petitioner only provided test data for silk fabrics and did not provide any information regarding fabric classifications for other fibers conditioned at the requested lower temperature and higher level of humidity. Without test data for other fibers, staff cannot be certain how the change in conditioning would affect other fibers used in textile construction when conditioned at the requested lower temperature and higher levels of humidity. Nevertheless, given the impact of moisture content on flammability test results, and the varied moisture absorption of different fibers, it is likely that the Petitioner's requested conditioning method would also impact the classifications of other fibers.

Four minutes is a significant delay start time once a specimen is removed from a desiccator for testing. Such an increase in time before starting the test would add another variable to the testing of an already variable textile product. Namely, fabrics that are hydrophilic, meaning they easily absorb moisture from their surroundings, would be tested under different conditions than a fabric

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<sup>10</sup> Class 3 fabrics are fabrics that burn too rapidly. Plain-surface fabrics that burn in less than 3.5 seconds and raised-surface fabrics that burn in less than 4 seconds do not meet the requirements of 16 C.F.R. part 1610, *The Standard for the Flammability of Clothing Textiles*.

that does not easily absorb moisture, and the additional time delay would provide even more time for moisture absorption, exacerbating the difference in moisture content of different fibers and specimens. In general, fabrics with higher moisture levels will not ignite as easily and will not burn as rapidly as the same fabrics in a bone-dry condition or other fabrics with lower moisture absorbency rates.

Making the changes to the conditioning requirements, as requested by the Petitioner, may introduce fabrics currently identified as dangerously flammable into the U.S. market because the changes would alter the current classification of dangerously flammable textiles.

**Comment:** One commenter and the Petitioner state that the Petitioner's changes will not alter the effectiveness of 16 C.F.R. part 1610, and therefore, the changes would not impact safety. In addition to submitting the petition, the Petitioner submitted a comment. Petitioner's comment supported the commenter's conclusion that the proposed Standard changes would not impact safety.

**Response:** Staff disagrees. The Petitioner's changes may alter the effectiveness of 16 C.F.R. part 1610. Without data, staff cannot be certain how the change in the conditioning requirements will affect fabrics currently classified as dangerously flammable and any resulting ignition of those fabrics and possible consumer injuries, however, it is likely that many fabrics that are currently Class 3 would qualify as Class 1. With the conditioning requirements in the current Standard, several apparel recalls were initiated in 2015. A review of the data indicated at least three incidents involving silk clothing and others involving other cellulosic fibers. Staff believes that the Petitioner's proposed conditioning would bring about unreliable test results and possibly no longer identify and classify fabrics that ignite too readily and burn too rapidly. This change in conditioning would alter how dangerously flammable textiles are identified and could impact the overall safety of wearing apparel.

**Comment:** The Petitioner comments that the suggested change will offer relief to the European silk industry; the Standard has negatively affected the European exporters of silk products. The Petitioner states that the economic impact of certification procedures is "relevant" to the European silk industry.

**Response:** Significant sales of silk already occur in the U.S. market. Most of the silk fiber production occurs outside the United States. China and India produce more than 90 percent of the world's silk. In 2014, China exported approximately 224 tons of silk fabric to the United States, worth approximately \$36 million U.S. dollars. In 2014, India exported approximately 163 tons of silk fabric to the United States worth approximately \$26 million U.S. dollars.

**Comment:** One comment, submitted collectively by five organizations, asserts that the Petitioner's changes to the conditioning requirements will impact the current high level of compliance for organizations relying on their products to meet 16 C.F.R. part 1610. The loss of existing exemptions<sup>3</sup> could require additional equipment and staff to retest fabrics to ensure compliance with the revised Standard.

**Response:** Changing the conditioning requirements, as suggested by the Petitioner, would impact the textile industry by potentially voiding the current exemptions and requiring all fabrics, regardless of fiber content, to be tested to support general certificates of conformity for all apparel textiles of those fabrics. Textiles that have a demonstrated history of passing the current Standard are exempt from testing to support guaranties and to issue a certificate of conformity. Staff does not have any information regarding the increase in cost of the additional testing that would need to be conducted if the conditioning requirements in the Standard were changed and all fabrics required testing.

**Comment:** One comment, submitted collectively by five organizations, asserts that amending flammability testing will have a negative effect on small businesses. The comment states that many firms that supply textiles and apparel are small and operate on narrow margins. In addition, if the testing provisions in 16 C.F.R. part 1610 were amended, small firms would not be able to afford to purchase the new equipment required to test samples.

**Response:** Publicly-available information is insufficient to identify the size and dollar sales of U.S. silk manufacturers. Staff does not have sufficient information to identify the number of small entities that supply silk because these firms may produce other products. According to Census data, most firms that supply apparel to retailers are small. If the petition is granted and the Commission proposes a change in the Standard, estimating the cost to manufacturers would depend on the actual requirements included in a proposed rule, which could differ from those in the Petition. As noted in the Memorandum from the Directorate for Laboratory Sciences, more expensive testing requirements could result from Petitioner's requested changes because manufacturers would be required to use a conditioning room with precise controls for temperature and humidity, instead of the currently required drying ovens and desiccators.

**Comment:** One comment, submitted collectively by five organizations, points out the importance of keeping the conditioning requirements as currently specified in 16 C.F.R. part 1610 for the impact on fire safety. The proposed conditioning requirements outlined by the Petitioner would reduce flammability safety for ordinary apparel fabrics.

**Response:** The current conditioning requirements, part of the original Commercial Standard 191-53, and now 16 C.F.R. part 1610, have been in place since the 1950s and reduce the variability of test results for textiles and help identify fabrics that are dangerously flammable. Both Congress (1954) and CPSC (2008) reviewed the current conditioning requirements and declined to make a change to conditioning requirements that would impact the level of safety provided by the current Standard.

**Comment:** One commenter notes that currently, the Standard references AATCC test method 124-2006 for the laundering requirements as part of the refurbishing process. The commenter states that the Standard should refer to the latest version of AATCC 124. The commenter notes that obtaining equipment to meet the referenced AATCC standard is becoming harder.

**Response:** Staff considers this comment to be outside the scope of the Petition.

## **IX. Discussion and Conclusions**

The Petition requests changes to the conditioning requirements for 16 C.F.R. part 1610, *Standard for the Flammability of Clothing Textiles*. Specifically, the Petitioner requests less severe conditioning requirements: a lower temperature and higher level of humidity. The Petitioner has also requested a change in the time between when the specimen is removed from the desiccator and testing begins. Although Petitioner's justification for the requested changes relates primarily to silk fabrics and apparel, the requested changes would apply to all types of clothing textiles.

The conditioning requirements have been reviewed at least twice; the first time in 1954 when Congress reviewed CS 191-53, and the second time by the Commission during a 2008 rulemaking. In both instances a decision was made to keep the existing Standard and maintain the level of safety provided by the Standard, which ensures repeatable and reproducible results across samples, fabrics and test facilities.

The conditioning requirements specified in the Standard have been in use for more than 63 years. The Standard provides a test method to show relative flammability by classifying flammability characteristics and identifying dangerously flammable fabrics. The purpose of the Standard is to identify those textiles and wearing apparel items that burn slowly when subject to a small flame source and are not considered dangerously flammable and those that burn too rapidly and provide an unreasonable risk of fire leading to death or injury and protect consumers from the injuries associated with clothing fires.

As discussed, the Petitioner's proposed change is not limited to silk fibers and fabrics and would allow for increased moisture levels in all tested textiles and fabrics; this change in the conditioning requirements redefines the definition of dangerously flammable fabrics." All fabrics would have to be reconsidered, resulting in testing to determine flammability classification. Some fabrics, including lighter weight silk fabrics, would change flammability classification. Data provided by the Petitioner show changes to the flammability classification could potentially artificially decrease flammability of the tested sample, causing hydrophilic fibers (those that absorb the extra moisture), such as silk and other cellulosic fibers, not to be classified any more as dangerously flammable. Thus, these fabrics would be able to be introduced into commerce. It is unknown how many other fibers that are currently Class 3 would become Class 1. The impact of the change to the conditioning requirements requested by the Petitioner on fibers/fabrics other than silk fibers and fabrics thus is not clear.

The Standard would no longer identify and classify in a reliable or repeatable way those fabrics that ignite too readily and burn too rapidly. As a result, the overall safety of clothing textiles sold to U.S. consumers may be reduced.

## **X. Options**

The following options are available for Commission consideration:

1. Grant Petition CPSC-2015-0007 and begin rulemaking to amend the Standard and change the conditioning requirements.
2. Deny Petition CPSC -2015-0007.
3. Defer Petition CPSC-2015-0007.

## **XI. Recommendation**

Staff recommends that the Commission deny the petition and not change the conditioning specifications in 16 C.F.R. part 1610, *Standard for the Flammability of Clothing Textiles*.

The *Standard for the Flammability of Clothing Textiles* is a mandatory federal regulation that specifies that all clothing textiles and fabrics used or intended for use as clothing textiles meet certain requirements before entering commerce. The Standard provides a method of testing the flammability of clothing and classifies clothing textiles into three categories. Any textile that is rated as a Class 3 textile is considered dangerously flammable because it exhibits rapid and intense burning and cannot be manufactured into clothing. The purpose of the regulation is to identify dangerously flammable clothing textiles and garments and protect consumers from unreasonable risks. The distribution of any dangerously flammable textiles is prohibited under the FFA.

The test method requires conditioning of specimens prior to conducting the test. The conditioning requirement of oven drying the specimens minimizes variability and ensures repeatability and reproducibility of the test data across test specimens and testing facilities. The amount of moisture present influences test results, especially for hydrophilic fibers like silk and other cellulosic fibers.

The Petition requests changes to the conditioning requirements in the Standard. Specifically, the Petition seeks less severe conditioning requirements. Testing fabrics at 65 percent relative humidity introduces significant test variability, and consequently, unreliable classifications for different fabrics and specimens of the same fabric. As a result, there may be uncertainty about the accuracy of classifications, which impacts safety. This change would allow textiles and fabrics currently prohibited from being used for wearing apparel and currently classified as dangerously flammable to be introduced into commerce. The Petitioner provided data showing that changing the conditioning requirements for light-weight silk fabrics changes the test results and resulting classifications from dangerously flammable to normal flammability. CPSC staff has issued recalls for silk apparel items with Class 3 test results. These recalls have included sheer silk items. Changing the conditioning requirements, as requested by the Petitioner, redefines how dangerously flammable textiles are identified. The Standard would no longer reliably and repeatedly identify fabrics that ignite too readily and burn too rapidly; and as a result, the overall safety of clothing textiles sold to U.S. consumers may be reduced.

## **XII. Attachments**

**TAB A – Petition CPSC-2015-0007**

**TAB B – Federal Register Notice: Request for Comments**

**TAB C – Memorandum from S.Li, “Market Information and Economic Considerations Related to Silk Petition, February 11, 2016**

**TAB D – Memorandum from L.Fansler, “Technical Issues-Petition Requesting Rulemaking to Amend the Standard for the Flammability of Clothing Textiles,” February 1, 2016**

**TAB E – Public Comments**

# **TAB A: Petition CPSC-2015-0007**



## A.I.U.F.F.A.S.S.

Association Internationale des Utilisateurs de Fils de Filaments Artificiels et Synthétiques et de Soie Naturelle

International Association of Users of Artificial and Synthetic Filament Yarns and of Natural Silk

TO THE OFFICE OF THE SECRETARY  
U.S. NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

Attn: Rulemakings and Adjudications Staff

A.I.U.F.F.A.S.S. is the Association of European silk and man made filament weavers and represents 95% of European silk users (twisters, weavers and finishers) mainly located in Italy and France.

You will find herewith enclosed a petitioning for rulemaking that A.I.U.F.F.A.S.S. is submitting with the aim of amending the Standard for the flammability of clothing textiles 16 CFR 1610 that was published in the Federal Register (vol. 73, No. 58) in March 25, 2008.

Here is our contact reference: [g.tettamanti@unindustria.com.it](mailto:g.tettamanti@unindustria.com.it)

We thank you for taking our petition into proper consideration.

Yours sincerely,

Franco Ghiringhelli  
A.I.U.F.F.A.S.S. President

January, 27, 2015

Encl.

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**A.I.U.F.F.A.S.S. PETITIONING  
FOR AMENDING THE STANDARD  
FOR THE FLAMMABILITY OF CLOTHING TEXTILES (16 CFR 1610)  
REGARDING SILK PRODUCTS**

**PETITIONER**

A.I.U.F.F.A.S.S. is the "INTERNATIONAL ASSOCIATION OF USERS OF ARTIFICIAL AND SYNTHETIC FILAMENT YARNS AND OF NATURAL SILK".

It comprises Silk Weavers from Italy, France and Switzerland, representing 95% of European silk weaving industry. They are usual suppliers of luxury brands in Italy, France and all over the world.

It is supported by Ufficio Italiano Seta (Como, Italy), Intersoie (Lyon, France) and Swiss Silk Group, (Zurich, Switzerland), the most important groups of silk entrepreneurs in Europe.

A.I.U.F.F.A.S.S. Head Office is: Villa Creatis -2 rue des Muriers-69009 Lyon France-  
Telephone + 33(0)472537205

E.mail: [ipanaye@unitex.fr](mailto:ipanaye@unitex.fr) or [g.tettamanti@unindustriacomo.it](mailto:g.tettamanti@unindustriacomo.it)

**STATUTE UNDER CONSIDERATION:**

**STANDARD FOR THE FLAMMABILITY OF CLOTHING TEXTILES (16 CFR 1610)**

The latest amendment to the Standard for the flammability of clothing textiles 16 CFR 1610 was published in the Federal Register (Vol 73, No. 58) on March 25, 2008.

All clothing textiles (fabrics and garments) for adults and children (except children's night clothes, which are subject to Standards 16 CFR 1615-1616) fall within the scope of Standard 16 CFR 1610.

**CRITICAL ASPECTS OF 16 CFR 1610**  
**concerning silk products**

**1. Technical approach**

According to the procedures foreseen by Standard 16 CFR 1610, the sample of fabric is first tested in its original state (ready for use as a clothing article), then, if found acceptable (class 1), subjected to further testing after having been refurbished as required.

Before running the test, the specimens need to be dried in an oven at 105°C for 30 minutes, then placed in a desiccator and left to cool for at least 15 minutes.

The fabric, as a result of such treatment, loses all its humidity content. This is an extreme condition not found in reality. **Silk** in its natural state and under normal conditions of use, as silk garment, **is a hygroscopic material and its relative humidity is about 11% and never less than 9%.**

There are exceptions to the provisions foreseen by Standard 16 CFR 1610. The Standard does not apply to specific kinds of hats, gloves, interlinings, etc. and a few special cases where products can be exempted from testing. The first case for exemptions is for "Plain surface fabrics weighing 88.8 g/m<sup>2</sup> (2.6 oz/ya<sup>2</sup>) or greater, regardless of fiber content".

There is no scientific evidence to support the upper limit of 88.8 g/s.m (2.6 oz/ s.ya), it is a simple matter of experience and tradition.

A.I.U.F.F.A.S.S. has conducted almost 130 tests on silk fabrics of different structures with a weight between 20 and 88 g/m<sup>2</sup>, each one of these single fabrics has been tested according to the Standard 16 CFR 1610 and it has been classified Class 1.

Several reports are assembled in Annexe 1.

Lightest silk fabrics sometimes may be only a little bit below the limit set for conformity, but A.J.U.F.F.A.S.S. has also done laboratory tests which demonstrate that the conditioning atmosphere is the real critical point of the Standard 16 CFR 1610.

15 samples of different silk fabrics with a mass per unit less than 30 g/m<sup>2</sup> were tested in accordance with the conditioning conditions described in the Standard 16 CFR 1610 (30 min at 105°C) versus the standardized conditions of test (according to ASTM 1776-04\* and/or ISO 139\*\*): 20°C-65%HR

\*ASTM 1776-04: Standard Practice for Conditioning and Testing Textile

\*\*ISO 139: Standard atmospheres for conditioning and testing

The results are summarized in the following table:

	16 CFR 1610 Conditioning of samples:30 min at 105°C Humidity of samples: 0 %HR		ISO 139 "testing conditions for apparel/textile" Conditioning of samples": Temperature : 20*.±: 2"C Humidity: 65.±: 4% HR	
weight g/m <sup>2</sup>	Average burning time	Class	Average burning time	Class
21	2,9	3	3,6	<b>1</b>
21	3,1	3	3,5	<b>1</b>
22	3,1	3	3,8	<b>1</b>
10	2,8	3	3,9	<b>1</b>
17	3,3	3	3,6	<b>1</b>
17	3,6	<b>1</b>		
19	4,7	<b>1</b>		
19	IBE	<b>1</b>		
19	3,1	3	5,3	<b>1</b>
24	4,4	<b>1</b>		
24	4,2	<b>1</b>		
26	5,9	<b>1</b>		
27	5,1	<b>1</b>		
30	IBE	<b>1</b>		
30	IBE	<b>1</b>		

IBE = IGNITION BUT EXTINGUISHED

The reports are assembled in Annexe.2

The overwhelming majority of silk fabrics can reach a performance Class 1 when they are conditioned in the standard humidity rather than subjected to the conditioning oven and desiccator at 0 percent humidity.

Standard 16 CFR 1610 foresees very severe conditioning requirements that are not developed according to usual international methods and that are not adequate for testing the flammability of silk fabrics for apparel.

## **2.Scientific approach**

The second case for exemptions is for "Plain or raised surface fabrics, regardless of fabric weight, made, entirely or in a combined form, from the following fiber types: acrylic, modacrylic, nylon, olefin, polyester, wool."

Scientific community at international level has no discussion at all about the fact that silk is considered among the less flammable fibers, as well as wool. Silk is a protein fiber. It burns slowly, it tends to self-extinguish, in contact with a flame it is difficult to ignite.

The flammability behaviour of fibers is scientifically represented by L.O.I. (limiting oxygen index) value, which is the most authoritative measure of flammability characteristics of textile.

L.O.I. provides a measure of flame retardancy through the amount of oxygen needed to support combustion.

In the following table, you'll find L.O.I.% value for some textile fibers available in literature

Cotton	Rayon	PET	silk	Nylon	wool
16-17	17-19	20-22	22-23	22-24	24-25

L.O.I. for silk (22-23) is very similar to nylon (22-24, exempted from testing) and it is much less flammable than polyester (20-22, exempted from testing) and acrylic (18-20, exempted from testing).

**There is no scientific reason to submit silk to mandatory testing.**

### **3.Consumer Safety approach**

European silk weavers are well aware of the utmost importance of consumer safety. They are striving for improving these aspects in the sake of final consumers. They supply international markets and their European silk fabrics do not face any problem at all with flammability standards all over the world but in the U. S.

As far as we know, silk fabrics do not exhibit "rapid and intense burning". Italy and France have a very long tradition in silk industry. In these two European countries silk fabrics and clothes have been produced since the 15<sup>th</sup> Century. Manufacturers have neither produced nor sold items "so highly flammable as to be dangerous when worn by individuals". The precautionary principle applies to internal market and external trade. As you know, this principle has been even enshrined in the French Constitution. For all we know in Europe no injuries from silk goods consumption have ever been recorded.

European manufacturers of silk fabrics and items are fully conversant with whatever may jeopardize consumers' health and safety. They are unwilling to imperil their own customers. They obviously have the same respect for public security and the same ethical behavior towards American customers.

**There is no relevant safety reason for impeding the free commercial movement of silk goods**

### **4.Economic approach**

U.S. market is fundamental for European Silk Industry and Standard 16 CFR 1610, with its complex certification procedure, has affected severely European exporters of silk products.

European silk sales always consist of several lots of small quantities and they regard fashion articles which always vary deeply, according to various colours and various patterns developed on various kinds of fabrics.

For this reason the economic impact of certification procedures on E.U. industry has been very relevant also because customers are used to reverse it entirely on their suppliers.

### **CONCLUSION AND REQUEST FOR AMENDMENTS**

**For all the reasons stated above, A.I.U.F.F.A.S.S has been asking for long to include silk in the exemption list. As there has been no agreement on this from the CPSC, A.I.U.F.F.A.S.S is now asking for the following amendments to be included in 16 CFR Part 1610.**

The comments are mainly linked to the conditioning procedure of the specimen tests foreseen by 16 CFR 1610 in order to align them with international practice ISO standard 139 and/or ASTM 1776-04

In the past even the National Cotton Council of America suggested that cotton fabrics should have been tested in standard humidity conditions. In its answer, Consumer Product Safety Commission stated that more severe conditions in the Standard could provide a greater level of safety, but it also acknowledged N.C.C argument was right.

As far as we know, Standard 16 CFR 1610 is one of the only case of standard in which it is required such an extreme conditioning for textile. The national standards of E.U. countries (UNI, BS, DIN, etc.), European EN standards, and I.S.O standards for clothing (including protective type) and furniture provide conditioning of test specimens in the standard atmospheres for textile testing (20 or 23° and 50 or -65% R.H.) Even ASTM 1776-04 foresees that all fabrics should be tested in standardized humidity. It should be noted, also, that the tests relating to protective clothing are carried out after conditioning in a standard atmospheres according to ISO 139

For all reasons stated above, AIUFFASS submits the following amendments describing the procedure for testing with normal humidity instead of 0% humidity:

## § 1610.6 Test procedure

(a) *Step 1-Testing in the original state.*

(2) *Plain surface textile fabrics: ...*

(iv) *Condition specimens.*

### **Remove:**

~~(All specimens mounted in the holder shall then be placed in a horizontal position on an open metal shelf in the oven to permit free circulation of air around them. The specimens shall be dried in the oven for  $30 \pm 2$  minutes at  $105 \pm 3^\circ \text{C}$  ( $221 \pm 5^\circ \text{F}$ ), removed from the oven and placed over a bed of anhydrous silica gel desiccant in a desiccator until cool, but not less than 15 minutes.)~~

### **Replace with:**

All specimens mounted in the holders shall then be placed in a horizontal position in the standard atmosphere for testing textiles, which is  $21 \pm 1^\circ \text{C}$  ( $70 \pm 2^\circ \text{F}$ ) and  $65 \pm 2\%$  relative humidity for at least 24 h. according to the atmosphere defined in ASTM 1776-04

The specimens before to be removed from the standard atmosphere shall be placed in a tight container and the test shall be initiated within 1 min after the opening of the container.

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Idem for (3) *Raised surface textile fabrics-(v) Condition specimens.*

## § 1610.6 Test procedure.

### **Modification of:**

(b) *Step 2-Refurbishing and testing after refurbishing. .*

(1) *The refurbishing procedures are the same for both plain surface textile fabrics and raised fiber surface textile fabrics. Those samples that result in a Class 3, Rapid and Intense Burning after Step 1 testing in the "as received" or original state shall not be refurbished and do not undergo*

*Step2.*

(i) *Dry cleaning procedure. (A) All samples shall be dry cleaned before they undergo the laundering procedure. Samples shall be dry cleaned in a commercial dry cleaning machine, using*

*the following prescribed conditions:*

*Solvent: Perchloroethylene, commercial grade*

*Detergent class: Cationic Cleaning*

*time: 10-15 minutes Extraction*

*time: 3 minutes*

*Drying Temperature:  $60 \text{ } \forall \text{ } 66^\circ \text{C}$  ( $140 \text{ } \forall \text{ } 150^\circ \text{F}$ )*

*Drying Time: 18-20 minutes*

*Cool Down/Deodorization time: 5 minutes*

*(B) Samples shall be dry cleaned in a load that is 80% of the machine's capacity. If necessary, ballast consisting of clean textile pieces or garments, white or light in color and consisting of approximately 80% wool and 20% polyester, shall be used.*

*(ii) Laundering procedure. The sample, after being subjected to the dry cleaning procedure, shall be washed and dried one time in accordance with sections 8.2.2, 8.2.3 and 8.3.1(A) of AATCC Test Method 124-2001 "Appearance of Fabrics after Repeated Home Laundering." Washing shall be performed in accordance with sections 8.2.2 and 8.2.3 of AATCC Test Method 124-2001 using wash water temperature (V) ( $149^{\circ} \pm 5^{\circ}\text{F}$ ;  $60^{\circ} \pm 3^{\circ}\text{C}$ ) specified in Table II of that method, and the water level, agitator speed, washing time, spin speed and final spin cycle specified for "Normal/Cotton Sturdy" in Table III. A maximum wash load shall be 8 pounds (3.63 kg) and may consist of any combination of test samples and dummy pieces. Drying shall be performed in accordance with section 8.3.1(A) of that test method, Tumble Dry, using the exhaust temperature ( $150^{\circ} \pm 10^{\circ}\text{F}$ ;  $66^{\circ} \pm 5^{\circ}\text{C}$ ) and cool down time of 10 minutes specified in the "Durable Press" conditions of Table IV.*

*(2) Testing plain surface textile fabrics after refurbishing. The test procedure is the same as for Step 1-Testing in the "as received" or original state described in paragraph (a)(1) of this section; also follow the test sequence § 1610.7(b)(2).*

*(3) Testing raised fiber surface textile fabrics after refurbishing. The test procedure is the same as for Step 1-Testing in the "as received" or original state as described in paragraph (a)(3) of this section; also follow the test sequence in § 1610.7(b)(4).*

**Add here the following sentence:**

*(4) Before performing the test, according to test procedure described as for Step 1 the specimen pre-treated will have to be conditioned according to the atmosphere defined in ASTM 1776-04 which is:  $21 \pm 10\text{C}$  ( $70 \pm 2^{\circ}\text{F}$ ) and  $65 \pm 2\%$  relative humidity"*

**TAB B: Federal Register Notice: Request for  
Comments - Petition CPSC-2015-0007**

(vii) solar-assisted fossil fuel storage water heaters.

\* \* \* \* \*

[FR Doc. 2015-07956 Filed 4-7-15; 8:45 am]

BILLING CODE 6450-01-P

## CONSUMER PRODUCT SAFETY COMMISSION

### 16 CFR Part 1610

[Docket No. CPSC-2015-0007]

#### Petition Requesting Rulemaking To Amend the Standard for the Flammability of Clothing Textiles

**AGENCY:** Consumer Product Safety Commission.

**ACTION:** Notice of Petition for Rulemaking.

**SUMMARY:** The Consumer Product Safety Commission (CPSC or Commission) has received a petition requesting amendments to the test procedure in the *Standard for the Flammability of Clothing Textiles*, 16 CFR part 1610. Petitioner requests changes in the requirements for preparation of clothing textiles for flammability testing. The Commission invites comments concerning the petition.

**DATES:** The Office of the Secretary must receive comments on the petition by June 8, 2015.

**ADDRESSES:** You may submit comments, identified by Docket No. CPSC-2015-0007, by any of the following methods:

**Electronic Submission:** Submit electronic comments to the Federal eRulemaking Portal at: <http://www.regulations.gov>. Follow the instructions for submitting comments. The Commission does not accept comments submitted by electronic mail (email), except through [www.regulations.gov](http://www.regulations.gov). The Commission encourages you to submit electronic comments by using the Federal eRulemaking Portal, as described above.

**Written Submissions:** Submit written submissions by mail/hand delivery/courier to: Office of the Secretary, Consumer Product Safety Commission, Room 820, 4330 East West Highway, Bethesda, MD 20814; telephone (301) 504-7923.

**Instructions:** All submissions received must include the agency name and docket number for this notice. All comments received may be posted without change, including any personal identifiers, contact information, or other personal information provided, to: <http://www.regulations.gov>. Do not submit confidential business information, trade secret information, or

other sensitive or protected information that you do not want to be available to the public. If furnished at all, such information should be submitted in writing.

**Docket:** For access to the docket to read background documents or comments received, go to: <http://www.regulations.gov>, insert the docket number, [ ], into the "Search" box, and follow the prompts.

**FOR FURTHER INFORMATION CONTACT:** Rocky Hammond, Office of the Secretary, Consumer Product Safety Commission, 4330 East West Highway, Bethesda, MD, 20814; telephone (301) 504-6833, email: [rhammond@cpsc.gov](mailto:rhammond@cpsc.gov).

**SUPPLEMENTARY INFORMATION:** On February 4, 2015, CPSC's Office of the Secretary received a petition to the Commission to initiate rulemaking to amend the test procedure in 16 CFR part 1610, *Standard for the Flammability of Clothing Textiles* (the Standard). Petitioner, the International Association of Users of Artificial and Synthetic Filament Yarns and of Natural Silk, asserts that the pre-test conditioning requirements for textile samples set forth in 16 CFR 1610.6(a)(2)(iv) (for plain surface textile fabrics) and 1610.6(a)(3)(v) (for raised surface textile fabrics) are inappropriate and unrealistic for silk fabrics. The Standard requires that textile specimens be prepared for testing by treating them in an oven at 105° C (221 °F) for 30 minutes, then placing them in a desiccator to cool. See 16 CFR 1610.6(a)(2)(iv); 1610.6(a)(3)(v). Petitioner contends this process removes all moisture from silk fabric samples, resulting in unrealistic measures of textile flammability. Petitioner asks that the Standard be changed to require that all clothing textile samples, including silk, be conditioned at a lower temperature and at a higher level of humidity.

**Proposed Changes in Testing.** Petitioner asks the Commission to adopt changes that would require all clothing textiles to be conditioned before flammability testing under the temperature and humidity conditions set forth in ASTM D1776-04, *Standard Practice for Conditioning and Testing Textiles*. This standard specifies that general textiles should be conditioned at a temperature of 21° ± 1° C (70° ± 2° F) and at a relative humidity of 65 ± 2% for at least 24 hours prior to testing. Petitioner contends flammability testing of silk fabrics would be more realistic and more meaningful if testing were conducted using these conditioning requirements. The proposed changes in

pre-test conditioning would apply to all clothing textiles.

**Reasons for Proposed Testing Changes.** Petitioner asserts that the Standard's conditioning requirements subject silk fabric samples to "extreme conditions not found in reality" and are not based on any scientific reason. Petitioner claims its test results show that flammability testing outcomes for silk fabrics vary dramatically, depending on the conditioning standard used. Petitioner also asserts that the Standard's conditioning requirements are inconsistent with all national and international textile testing standards of which Petitioner is aware, including textile testing standards promulgated by the International Organization for Standardization (ISO) and ASTM International (ASTM). The two alternative standards specifically cited by Petitioner, ASTM D1776-04 and ISO 139, *Textiles—Standard atmospheres for conditioning and testing*, require conditioning of fabrics at lower temperatures and at higher levels of humidity than the Standard.

**Proposed Commission Action.** Petitioner requests the Commission implement the pre-test conditioning standards of ASTM D1776 by amending 16 CFR 1610.6(a)(2)(iv) (conditioning of plain surface textile fabrics) and 1610.6(a)(3)(v) (conditioning of raised surface textile fabrics) to include the conditioning standards of ASTM D1776-04 for all clothing textiles, including silk. These revisions also would include a requirement that conditioned samples be sealed in a tight container and that testing be initiated within one minute of opening of the container. Petitioner also requests that the Commission amend 16 CFR 1610.6(b) (refurbishing and testing after refurbishing) by adding a new subsection 1610.6(b)(4) to apply ASTM D1776-04 conditioning standards to flammability testing of refurbished (*i.e.*, laundered or dry cleaned) textiles.

By this notice, the Commission seeks comments concerning this petition. Interested parties may obtain a copy of the petition by writing or calling the Office of the Secretary, Consumer Product Safety Commission, 4330 East West Highway, Bethesda, MD 20814; telephone (301) 504-6833. The petition is also available at <http://www.regulations.gov> under Docket No. CPSC-2015-0007, Supporting and Related Materials.

**Alberta E. Mills,**  
Acting Secretary, Consumer Product Safety Commission.

[FR Doc. 2015-07907 Filed 4-7-15; 8:45 am]

BILLING CODE 6355-01-P

**TAB C: Memorandum from S.Li, ‘Market  
Information and Economic Considerations Related to  
Silk Petition, February 11, 2016**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
4330 EAST WEST HIGHWAY  
BETHESDA, MD 20214

MEMORANDUM

Date: February 11, 2016

TO : Linda Fansler, Project Manager  
Petition Requesting Rulemaking to Amend the Standard for the Flammability  
of Clothing Textiles  
Directorate for Laboratory Sciences

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

Robert Franklin, Senior Staff Coordinator  
Directorate for Economic Analysis

FROM : Samantha Li, Economist  
Directorate for Economic Analysis

SUBJECT : Market Information and Economic Considerations Related to Silk Petition

**Background**

The Commission received and the Office of the General Counsel docketed a petition (FF15-1) requesting that the Commission initiate rulemaking to revise the conditioning requirements in the *Standard for Flammability of Clothing Textiles* (16 C.F.R. part 1610). The Petitioner asserts that amending the conditioning requirements in the flammability test protocol, to allow a lower temperature, higher humidity, and longer time before testing, would provide a more realistic way to test silk fabrics. The Petitioner further asserts that amending 16 C.F.R. part 1610, as requested in the Petition, would allow the use of lighter weight types of silk fabric, without increasing the hazard to consumers.

Although 16 C.F.R. part 1610 applies to all fabrics, this memorandum provides information on the market and economic considerations for silk apparel because the impact on silk apparel was the focus of the Petition. The discussion is based on information that was readily available, including information provided by the Petitioner and public commenters.

**The Product**

Silk fibers are protein fibers produced from insect larva, especially silk worms. Silk fibers are obtained from the cocoons of silk worms. The cocoon is placed in boiling water or blasted with hot air or steam, and the filaments are unwound. This process prepares protein fibers for commercial use. Silk can be categorized into two broad categories: cultivated silk fibers and wild

silk fibers. Cultivated silk is the predominant type used commercially. Silk fabrics are produced from threads and yarns manufactured from these fibers.<sup>1</sup>

Silk can be used for a range of fabric types and is used primarily for apparel and home furnishing items. The quality of silk fabrics can vary greatly, depending on the processing of the silk worm cocoon and the finishing of the fabric. Silk fabrics can be dyed before or after weaving or knitting. Silk fabric can be woven via automated looms, which is less labor-intensive than hand-painted silk apparel or silk printing. Silk is used in many types of fabric, including sheer, woven, jacquard, velvet, and chiffon.

## **Market for Silk**

Most silk is produced outside the United States. According to United Nations 2014 data, China and India produce more than 90 percent of world's silk. Other countries that manufacture silk include Brazil, Thailand, and Vietnam. According to United Nations data, about 90 percent of silk is produced in Asia.

According to the International Trade Centre trade statistics, in 2014, China exported approximately 224 tons of silk fabric to the United States, worth approximately \$36 million U.S. dollars; and India exported approximately 163 tons of silk fabric to the United States, worth approximately \$26 million U.S. dollars.

Publically available information is insufficient to identify the size and dollar sales of U.S. silk manufacturers. The North American Industry Classification System ("NAICS") lists product codes for U.S. firms. Firms that supply silk thread may list their business under the NAICS product code for fiber or fabric mills (*313110 Fiber, Yarn, and Thread Mills or 313210 Broadwoven Fabric Mills*). However, in addition to silk, these codes encompass other textile materials, such as yarn and wool.

Based on 2012 U.S. Census data, there are approximately 2,000 firms in the U.S. market associated with textile mills manufacturing (code *313 Textile Mills*), including 558 associated with fiber and fabric mills (codes *313110 Fiber, Yarn, and Thread Mills* and *313210 Broadwoven Fabric Mills*). More than 90 percent are small. These two categories include all fabrics. The number of firms that supply only silk fiber is unknown.

## **Market for Apparel**

Silk is widely used in apparel. Many garments consist of 100 percent silk; other garments contain silk blends. Silk fabric or silk blends are used in ties, skirts, shirts, and dresses. Retail prices for silk apparel range from \$10 to more than \$1,000, depending on the product. For example, based on a search of several online retailers, women's silk and silk blend dresses range from \$100 to

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<sup>1</sup> "Silk-An Introduction." International Sericulture Commission. 2013. Accessed on February 10, 2016. [http://inserco.org/en/?q=silk\\_an\\_introduction](http://inserco.org/en/?q=silk_an_introduction).

\$400. Men's silk ties range from \$10 to \$200; and women's silk blouses range from \$50 to \$300. Silk garments sold at high-end retailers are more expensive and can be priced at more than \$1,000. In general, prices depend on several factors, including the actual fabric content and type, the brand, and the retailer.

According to Census data, most apparel sold in the United States is imported. Although many apparel firms are headquartered in the United States, these firms generally have limited or no manufacturing capabilities within the United States. (Platzer, 2014) Some firms design and market apparel in the United States and contract out manufacturing. Firms produce apparel through a combination of owning foreign factories and using third party suppliers (*e.g.*, contract agreements with foreign manufacturers). Most third party suppliers are based in Asia. Retailers may also use apparel sourcing firms to contract out production to independent manufacturers.

Some custom or high-end designers use silk fabric in apparel. These firms may list their business under apparel manufacturing (*315240 Women's, Girls, and Infants' Cut and Sew Apparel Manufacturing* or *315220 Men's and Boys' Cut and Sew Apparel Manufacturing*). Manufacturers generally use multiple types of fabrics.

Domestic importers are retailers and wholesalers of apparel. Firms that supply apparel may list their businesses under the NAICS product code for retail stores (*448110 Men's Clothing Stores, 448120 Women's Clothing Stores, 448140 Family Clothing Stores, and 4482 Shoe Stores*) or wholesale stores (*424320 Men's and Boys' Clothing and Furnishings Merchant Wholesalers and 424330 Women's, Children's, and Infants' Clothing and Accessories Merchant Wholesalers*). Firms may list their businesses under more than one product code. Firms supplying apparel may include silk garments.

According to Census data, annual sales of all retail clothing stores in the United States in 2013 were approximately \$178 billion. Annual sales include all types of fabric materials. Annual sales for specifically silk clothing were not available. In 2012, the number of firms associated with retail and wholesale stores was approximately 30,000.

## **Flammability Standard**

Clothing and fabrics used for clothing are covered under the Flammable Fabrics Act ("FFA"). The testing procedures in 16 C.F.R. part 1610 specify testing conditions for textile and fabric flammability. The Petition requests that the Commission amend the testing procedures of 16 C.F.R. part 1610 to allow additional lighter or more sheer silk fabrics to meet the standard and enter the U.S. market. Consequently, consumers could potentially have some increased choices in available fabric materials. However, according to Laboratory Sciences staff, amending 16 C.F.R. part 1610 would also allow into the U.S. marketplace, additional silk fabrics that are now considered highly flammable.<sup>2</sup>

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<sup>2</sup> Memorandum from Linda Fansler, dated February 1, 2016, Subject: Technical Issues-Petition Requesting Rulemaking to Amend the Standard for the Flammability of Clothing Textiles.

## **Economic Implications Arising from the Petition**

If the Commission grants the petition and eventually proposes a rule that would implement all or some of the revisions to 16 C.F.R. part 1610 that are suggested by the Petitioner, the Commission would need to consider the expected benefits and costs of the proposed rule. The benefits of implementing such a rule (which would increase the likelihood that additional lighter or sheer silk fabrics would conform to the rule) would be the increased choice in silk garments for consumers. However, as previously mentioned, a wide variety of silk garments and other products, including scarves, ties, blouses, dresses, curtains and draperies, are already available. Therefore, the benefits of greater consumer choice would likely be limited.

There are two potential costs to consider. First is the cost of the increased risk to consumers from exposure to more highly flammable fabrics. To estimate this cost, EC staff would need information on the increased propensity of the fabrics conforming to the revised rule to ignite and cause injury to consumers. Currently, staff does not have this information. Staff in the Directorate for Epidemiology Division of Hazard Analysis (“EPHA”) identified 1,898 clothing fires between January 1, 2010 and November 20, 2015, including three incidents involving a silk garment. However, the reported incidents do not constitute a national probability estimate; and, in many cases, EPHA staff could not identify the fiber content of the garment involved. Moreover, there was no information reported on whether the garments, including the silk garments, met the requirements of 16 C.F.R. part 1610, or the requirements suggested by the petition. Consequently, it will be very difficult to evaluate the increased risk that might result from relaxing the requirements for silk garments.

The second cost resulting from the Petitioner’s testing requirements changes would be the cost to manufacturers of modifying the testing procedures. Directorate for Laboratory Sciences staff assert that replacing the current requirements in 16 C.F.R. part 1610 with the petitioner’s suggestions would possibly “void” the current exemptions in 16 C.F.R. part 1610. In addition, the changes could impose more expensive testing requirements on manufacturers because manufacturers would be required to use a conditioning room with precise controls for temperature and humidity, instead of the currently required drying ovens and desiccators. A public comment from five textile and fiber trade associations also expressed this concern. This cost would depend upon the actual requirements that would be included in a proposed rule, which could differ from those in the petition, and are not known at this time.

## **Summary**

A wide variety of silk fiber and materials are available in the U.S. market. Amending 16 C.F.R. part 1610, as requested by the Petitioner, would potentially increase consumer choice in available silk garments, by increasing the likelihood that some lighter or more sheer silk fabrics would pass the requirements of the standard. However, as discussed above, a wide variety of silk garments and other products are already available. Therefore, this benefit of more available silk garments would be limited. Amending 16 C.F.R. part 1610 would also allow fabrics that are now considered highly flammable to be entered into commerce, increasing the risk of injury to

consumers. Additionally, if amending 16 C.F.R. part 1610 changed the testing requirements, there could also be additional costs to manufacturers and suppliers of all garments.

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**TAB D: Memorandum from L.Fansler, “Technical Issues-Petition Requesting Rulemaking to Amend the Standard for the Flammability of Clothing Textiles,”  
February 1, 2016**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
BETHESDA, MD 20214

**Memorandum**

Date: February 1, 2016

TO : Linda Fansler, Project Manager, Petition Requesting Rulemaking to Amend the Standard for the Flammability of Clothing Textiles  
Division of Engineering

THROUGH: Andrew G. Stadnik, P.E.  
Associate Executive Director, Directorate for Laboratory Sciences

Allyson Tenney  
Director, Division of Engineering

FROM : Linda Fansler, Project Manager, Senior Textile Technologist, Division of Engineering

SUBJECT : Technical Issues – Petition Requesting Rulemaking to Amend the Standard For The Flammability of Clothing Textiles

**I. Introduction**

The U.S. Consumer Product Safety Commission<sup>(1)</sup>, (“Commission”) received a petition<sup>(1)</sup> from the International Association of Users of Artificial and Synthetic Filament Yarns and of Natural Silk (“A.I.U.F.F.A.S.S.”) requesting changes to the conditioning requirements in the *Standard for the Flammability of Clothing Textiles*, 16 C.F.R. part 1610 (the “Standard”).<sup>(2)</sup> The Commission’s Office of the Secretary received the petition on February 4, 2015. The petition was docketed and designated as Petition CPSC-2015-0007. The Commission solicited comments concerning this petition in the *Federal Register* on April 8, 2015, and the comment period closed on June 8, 2015. The Commission received 12 comments, including two from the Petitioner.

The Petitioner, A.I.U.F.F.A.S.S represents 95 percent of European silk users (twisters, weavers and finishers) mainly located in Italy and France. The Petitioner requests less severe conditioning requirements from those required in the Standard; specifically, the Petitioner requests a lower temperature and higher level of humidity. This change would apply to all apparel fabrics and products subject to the Standard, not just silk fabric.

Specifically, A.I.U.F.F.A.S.S. requests that the Commission remove the current conditioning requirements in the Standard<sup>1</sup> and replace them with the following:

- Specimens are placed in a horizontal position in  $21 \pm 1^{\circ}\text{C}$  ( $70 \pm 2^{\circ}\text{F}$ ) and  $65\% \pm 2\%$  relative humidity for at least 24 hours;
- The specimens are then placed in a tight container and the test is initiated within 4 minutes<sup>2</sup> after opening the container.

These conditioning requirements are found in ASTM D1776-04, *Standard Practice for Conditioning and Testing Textiles*; and similar requirements are also in ISO (International Organization for Standardization) 139, *Textiles – Standard Atmospheres for Conditioning and Testing*.

This memorandum discusses the intent and origins of the *Standard for the Flammability of Clothing Textiles*, 16 C.F.R. part 1610, the basis for the textile exemptions found in the Standard, textile flammability, the importance of conditioning textiles before flammability testing, and the appropriate temperature and humidity levels used when evaluating apparel fabrics for flammability. The points raised by the Petitioner and by other commenters are also discussed.

## II. 16 C.F.R. part 1610 - The Standard for the Flammability of Clothing Textiles

Under the Flammable Fabrics Act (“FFA”) the *Standard for the Flammability of Clothing Textiles* is a mandatory federal regulation with requirements that all clothing textiles and fabrics used or intended for use as clothing textiles must meet before entering commerce. The FFA prohibits the distribution of dangerously flammable clothing textiles and garments. The Standard provides a method of testing the flammability of clothing textiles and establishes three classes of flammability. Dangerously flammable textiles exhibit rapid and intense burning behavior when tested in accordance with the Standard.

### A. Requirements

The test method in the Standard involves placing a conditioned<sup>1</sup> fabric specimen at a  $45^{\circ}$  angle and impinging a small flame on the fabric surface for 1 second. If the fabric ignites, the burn rate over a specified distance is determined. Plain surface fabrics that burn in less than 3.5 seconds, and raised-fiber surface fabrics that burn in less than 4 seconds fail this test. Plain surface fabrics are fabrics that do not have an intentionally raised fiber or yarn surface, such as a pile or nap. Raised-fiber surface fabrics have an intentionally raised fiber or yarn surface; some examples of a raised-fiber surface fabric are corduroy, velvet and flannel.

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<sup>1</sup> The specimens are placed horizontally in an oven for  $30 \pm 2$  minutes at  $105^{\circ} \pm 3^{\circ}\text{C}$  ( $221^{\circ} \pm 5^{\circ}\text{F}$ ) and then placed over a bed of anhydrous silica gel desiccant in a desiccator until cool, but not less than 15 minutes; 16 C.F.R. § 1610.6(a)(2)(iv) (for plain surface textile fabrics) and 1610.6(a)(3)(v) (for raised surface textile fabrics). The test begins within 45 seconds of the time the specimen is removed from the desiccator, 16 C.F.R. § (1610.6(c)(5).

<sup>2</sup> Originally the Petitioner requested a test initiation within 1 minute.

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-surface fabrics), and (3) Class 3- Rapid and Intense Burning. The Standard provides methods of testing to identify Class 3 textiles that cannot be used for wearing apparel. Some fabrics that have certain specifications do not require testing. Firms issuing guaranties for the following types of fabrics, or of products made entirely from one of more of these fabrics, are exempt from any requirement for testing to classify and show that these fabrics meet the Standard. These exemptions are based on experience from years of testing<sup>3</sup> in accordance with the Standard; the exempted fabrics do not exhibit rapid and intense burning characteristics.

- Plain surface fabrics, regardless of fiber content, weighting 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 combination of the following fibers: acrylic, modacrylic, nylon, olefin, polyester, wool.

## **B. Background**

The test protocol found in the Standard has been in existence since 1953, and was developed by a committee whose membership included representatives of manufacturers, wholesalers, retailers of textiles, and testing laboratories. The Standard was first published by the U.S. Department of Commerce in 1953, as a voluntary commercial standard, designated Commercial Standard 191-53, "Flammability of Clothing Textiles," ("CS 191-53"). The Standard is essentially the same as CS 191-53 for the general conditioning requirements, but they differ in minor ways. The desiccant has been updated in the Standard, along with a temperature tolerance range. CS 191-53 was a direct response to apparel that caused serious burn injuries in the 1940s. The original intent of CS 191-53 was "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."<sup>(3)</sup>

All fabrics will burn and some fabrics will ignite and burn readily; other fabrics ignite, burn away from the flame and self-extinguish; and others sustain a flame and continue to burn until consumed. The Standard identifies the most dangerously flammable items but still allows a range of textile apparel choices for the consumer. An unreasonably dangerous apparel fabric is one that burns too rapidly and does not allow for a reaction time to remove or extinguish a burning garment. The Standard identifies fabrics that ignite readily and burn rapidly.

Specifically, the Standard specifies a 45-second time to start the test once a specimen is removed from the desiccator. The specimens are placed in the desiccator to retain the bone-dry state achieved during oven drying. This provision was in the original voluntary commercial standard,

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<sup>3</sup> These exemptions are based on laboratory test results from the Federal Trade Commission, the Commission's Laboratory, industry and independent laboratories, and data found in numerous published reports.

CS 191-53. Although the original text of CS 191-53 does not explain why 45 seconds was chosen as a start time, years of experience by textile technologists at many different laboratories has proven that this is an easy target to meet. As part of CS 191-53, this time limit was selected by industry members.

Additionally, the conditioning requirements found in the Standard, requiring specimens to be oven-dried at  $105^{\circ} \pm 3^{\circ}\text{C}$  ( $221^{\circ} \pm 5^{\circ}\text{F}$ ) for  $30 \pm 2$  minutes and cooled in a desiccator not less than 15 minutes at 0 percent relative humidity, were studied regarding appropriateness for textile flammability testing. Krasny and Braun<sup>(4)</sup> looked at the appropriate moisture level for textile flammability test specimens. They concluded that oven drying is a reasonable conditioning requirement for testing the flammability of apparel and home furnishing fabrics. The study looked at the effect of the level of humidity in dwellings, the moisture content of garments worn at various distances from the body, and the effect of relatively short exposures to heat on the moisture content of fabrics. Fabric specimens exposed at a short distance from an electric space heater had moisture contents similar to specimens that were oven dried and cooled in a desiccator.

The Commission's Directorate for Laboratory Sciences ("LS") staff has extensive expertise in evaluating fabric flammability. Some silk fabrics generally weighing  $1.0 \text{ oz/yd}^2$  or less have been found to not meet the requirements of the Standard and have been identified by LS staff as dangerously flammable. In recent years, three consumer-level recalls involved wearing apparel items were found to fail the Standard. The recalled products were very sheer, lighter-weight silk scarves designed for women.

### **III. Textile Flammability**

Several key physical properties of textiles affect their flammability. Some of these key physical properties are fiber content, weave and weight of a fabric, and absorbency or moisture regain of the fabric.

Fiber content (chemical nature) is a very important factor affecting the flammability of a fabric. Some examples of common fibers used in clothing textiles and their flammability characteristics are discussed below. Cellulosic fibers usually ignite readily when in contact with an ignition source, burn steadily and produce relatively great amounts of heat. Cellulosic fibers, like cotton and rayon do not self-extinguish, and their flames are often difficult to extinguish. Thermoplastic fibers are not as easily ignited and have a tendency to shrink away from the heat source. During ignition, the fibers may melt and shrink. Polyester and nylon are two examples of thermoplastic fibers. Protein fibers do not melt and tend to move away from the flame. Wool and silk are protein fibers.

The weave and weight of a fabric will also affect how readily the fabric will ignite and burn. Heavy, tightly woven fabrics will burn slower than fabrics more loosely woven, lighter-weight fabrics of the same material. The texture of the fabric also affects flammability. Fabrics with loose, long, fluffy pile or a brushed nap will ignite easier than fabrics with a tight, hard surface, and in some instances, will result in flames flashing across the fabric surface.

Another factor that can influence the flammability behavior of a fabric is its ability to absorb and retain moisture. All fibers absorb some water from an atmosphere having a relative humidity above zero percent. Absorbency is measured by the amount of moisture a bone dry fiber will absorb from the air under standard atmospheric conditions, (21° C/70°F and 65% relative humidity<sup>4</sup>). Storage conditions play an important role in the amount of moisture a fiber will absorb. Lowering the relative humidity of the environment will result in the fiber losing moisture until equilibrium moisture content is reached. Similarly, increasing the relative humidity of the environment will result in the fiber gaining moisture until new equilibrium moisture content is reached.

Hydrophilic fibers are fibers with the ability to easily absorb moisture from their surroundings; silk is a hydrophilic fiber. The Petitioner states: "Silk in its natural state and under normal conditions of use, as [a] silk garment, is a hygroscopic material and its relative humidity is about 11% and never less than 9%." For comparison,<sup>(5)</sup> cotton has a moisture regain of 7 to 11 percent, and polyester has a moisture regain of 0.4 percent at standard atmospheric conditions.

#### **IV. Basis for Conditioning**

Conditioning before testing is an established laboratory test procedure for many products. Textiles are generally conditioned before testing to ensure that the test is fair and that the results are reproducible. This is especially important when conducting flammability tests.

Fabrics conditioned at different temperatures and especially at a different relative humidity can show different flammability performance. With a 65 percent relative humidity condition, hydrophilic fibers, such as cotton and silk, will absorb moisture in greater amounts than polyester fibers will. Fabrics containing higher levels of water will not ignite as easily and will not burn as rapidly as the same fabrics in a bone-dry condition or as other fabrics with lower moisture absorbency rates will ignite.

Studies have looked at the effect of fabric moisture content on burning behavior. The general finding has been that the presence of moisture in the fabric slows down the burning rate.<sup>(6,7)</sup> The amount of moisture regain depends on the fiber content and the humidity levels.

Oven drying provides consistency by reducing moisture regain variability found in some fibers and fabrics and ensuring reproducible results. The Standard was written to evaluate all fabrics having the same amount of moisture before testing. Many fabrics have been shown to ignite in shorter exposures to ignition sources, and burn with higher flame spread rate when oven dried, than when tested with a higher moisture content.<sup>(8)</sup> This is true for lighter-weight silk fabrics, as shown in Table 1 below.

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<sup>4</sup> ASTM D1776-04, Standard Practice for Conditioning and Testing Textiles.

**V. Data Provided by the Petitioner**

Table 1 contains test results provided by the Petitioner. Plain surface fabrics with burn times equal to or greater than 3.5 seconds are classified as Class 1 textiles and exhibit normal flammability and are acceptable for use in clothing. Fabrics classified as Class 3 textiles exhibit rapid and intense burning, are dangerously flammable and cannot be used for clothing. For plain surface Class 3 textiles, the time of flame spread is less than 3.5 seconds.

**Table 1. Test Results Provided by the Petitioner**

	16 CFR 1610 Conditioning of samples:30 min at 105°C Humidity of samples:0 %HR		ISO 139 "testing conditions for apparel/textile" Conditioning of samples": Temperature :20°.± 2°C Humidity: 65.±: 4% HR	
weight g/m2	Average burning time	Class	Average burning time	Class
21	2,9	3	3,6	<b>1</b>
21	3,1	3	3,5	<b>1</b>
22	3,1	3	3,8	<b>1</b>
10	2,8	3	3,9	<b>1</b>
17	3,3	3	3,6	<b>1</b>
17	3,6	<b>1</b>		
19	4,7	<b>1</b>		
19	IBE	<b>1</b>		
19	3,1	3	5,3	<b>1</b>
24	4,4	<b>1</b>		
24	4,2	<b>1</b>		
26	5,9	<b>1</b>		
27	5,1	<b>1</b>		
30	IBE	<b>1</b>		
30	IBE	<b>1</b>		

IBE = IGNITION BUT EXTINGUISHED

This table of test results provided by the Petitioner points out what happens to the same silk fabrics when conditioned at a relative humidity of 65 percent versus the bone dry requirements in the Standard. The results go from a Class 3 classification prohibited from being used for wearing apparel to a “Normal Flammability” Class 1 classification.

Although the Petitioner requests that the change in conditioning requirements apply to all fibers, the Petitioner did not provide data regarding fabric classifications for other fiber contents conditioned at the requested lower temperature and higher level of humidity. Whether other fabrics that currently fail with a Class 3 classification and are considered dangerously flammable would change to a Class 1 classification and be allowed to be used for clothing is unclear.

## **A. Test Start Time**

The Petitioner also requests a revision to the length of time before testing is initiated. The Petitioner requests that conditioned fabric specimens be placed in a tight container and that testing be initiated within 4 minutes of opening the container. Currently, the Standard specifies that the test begin within 45 seconds of the time the specimen is removed from the desiccator. Forty-five seconds is ample time to perform steps necessary from removing the specimen to beginning the testing.

A longer time to initiate testing could allow hydrophilic fibers to absorb additional moisture but not impact hydrophobic fibers, like polyester, which have poor absorbency. Thus, fabrics made from hydrophilic fibers, like silk and cotton, would be tested under different conditions than fabrics made from hydrophobic fibers. Comparing test results and ultimately identifying dangerously flammable fabrics would be difficult. The impact of moisture regain on flammability was discussed above.

## **B. Comparison and Appropriateness of ASTM D1776 and ISO 139 Conditioning Requirements**

The conditioning requirements requested by the Petitioner include the following:

ASTM D1776, *Standard Practice for Conditioning and Testing Textiles* and ISO 139 *Textiles – Standard Atmospheres for Conditioning and Testing*, are voluntary consensus standards developed or adopted by standards-setting bodies, both domestic and international. During the standards development process, a party identifies a need and a committee representing interested parties convenes to draft a voluntary standard. These voluntary consensus standards are established, technical requirements for products, practices, methods or operations. These two voluntary standards establish room or chamber conditioning specifications and do not include a test procedure to identify the flammability of textiles and wearing apparel.

ASTM D1776 “covers the conditioning and testing of textiles in those instances where such conditioning is specified in a test method. Because prior exposure of textiles to high or low humidity may affect the equilibrium moisture pick-up, a procedure also is given for preconditioning the material when specified.”

ISO 139 “defines the characteristics and use of a standard atmosphere for conditioning, for determining the physical and mechanical properties of textiles and a standard alternative atmosphere that may be used if agreed between parties.”

Conditioning textiles before testing is a standard practice and it is fundamental to obtaining reproducible results on textiles and textile products. To make reliable comparisons among different textiles and among different laboratories, it is necessary to standardize the temperature and humidity conditions.

However, just because there are voluntary standards for conditioning textiles does not necessarily mean that the conditions included in those voluntary standards are applicable or appropriate in all instances. Conditioning specifications are selected based on type of product, purpose of method, and whether the specifications are supported by test data. The Petitioner states that ASTM D1776 and ISO 139 are used to condition protective clothing and furniture. Protective clothing is designed, fabricated, or treated to protect personnel against hazards caused by extreme changes in physical environment, dangerous working conditions, or enemy action. Furniture can be large composite structures composed of various layers and materials. Those two product categories are quite different than apparel fabrics because they are usually made up of multiple layers and multiple components. The conditions referenced in these two voluntary standards are often associated with textile testing of the physical properties of fibers and fabrics, such as tearing strength and density. So for those types of properties, a temperature of  $21 \pm 1^\circ\text{C}$  ( $70 \pm 2^\circ\text{F}$ ) and  $65\% \pm 2\%$  relative humidity for at least 24 hours is logical and appropriate.

These two voluntary standards are not appropriate for establishing flammability performance for textiles and wearing apparel. The current conditioning requirements in the Standard date back to the original Commercial Standard, CS 191-53. These conditioning requirements have been peer reviewed<sup>(9)</sup>, and found to be reasonable conditioning requirements for testing the flammability of textiles and wearing apparel. Conditioning fabric specimens in a bone dry environment provides consistency within the sample being tested and provides consistency across fabric types. As reflected in the Congressional Record<sup>(10)</sup>, in 1954 an amendment to CS 191-53 was proposed requesting a change to the conditioning requirements. The proposed changes were similar to those requested by the Petitioner. Congress did not incorporate this change in conditioning requirements to CS 191-53 in 1954.

Similar conditioning requirements are found in the two sleepwear standards; 16 C.F.R. part 1615, *Standard for the Flammability of Children's Sleepwear: Sizes 0 through 6x* and part 1616, *Standard for the Flammability of Children's Sleepwear: Sizes 7 through 14*. These two standards are also mandatory federal regulations and like 16 C.F.R. part 1610 evaluate the flammability of small fabric specimens after being placed in bone dry conditions. The sleepwear standards were developed by the National Bureau of Standards for CPSC. When considering the appropriate conditioning specifications<sup>(11)</sup> to include in the test protocol, two factors were considered; test reproducibility and maximum protection. Conditioning sleepwear specimens at  $105^\circ\text{C}$  and cooling in a desiccator, (bone dry conditions) were considered a reasonable approach to address test reproducibility concerns while also allowing for maximum protection by selecting the most hazardous conditions and measuring the flammability of fabrics that are exposed to a heat source under these conditions.

## **VI. 16 C.F.R. part 1610 – Impact of Changes**

The Standard was established using expertise and existing test and incident data available at the time. The Standard performs as intended by preventing the most dangerously flammable fabrics to reach the marketplace but still allowing consumers a choice. A range of silk garments meeting the requirements in the Standard is currently available in the marketplace. The proposed change to conditioning would allow hydrophilic fibers, like silk, to absorb more moisture prior to

testing. This increased moisture content could cause the fabric to pass the flammability test, as shown by the Petitioner's data; and thus, by changing the conditioning requirements, some fabrics currently classified as dangerously flammable, would be allowed to enter commerce and be sold. The Standard would no longer identify and classify those fabrics that ignite too readily and burn too rapidly. This change could impact the overall safety of wearing apparel because Class 3 textiles exhibit rapid and intense burning behavior.

Some of the types of fabrics that may not meet the requirements in the Standard are very sheer silk and rayon fabrics, usually 1.0 oz/yd<sup>2</sup> or less, and very fuzzy raised-fiber surface fabrics, made from rayon or a blend of fibers usually containing cotton or rayon. However, there are no certainties with these fiber contents and fabric types, so testing must always be conducted.

Historically, data to support the current fabric exemptions date back to the 1950s. If the conditioning requirements are changed, all fabrics would need to be re-tested to determine their compliance with a new version of the Standard. Changing the conditioning requirements would impact the textile industry, by potentially voiding the current exemptions, and requiring all fabrics, regardless of fiber content, to be retested to support new guaranties of those fabrics.

Testing laboratories currently have the required conditioning equipment specified in the Standard. Test laboratories are equipped with drying ovens and desiccators to condition test specimens. Changes to the conditioning requirement would require a conditioning room with precise controls for temperature and humidity. This may be a burden for some testing laboratories.

## **VII. Summary**

The Petition requests changes to the conditioning requirements for 16 C.F.R. part 1610, the *Standard for the Flammability of Clothing Textiles*. Specifically, the Petitioner requests less severe conditioning requirements: a lower temperature and higher level of humidity. The Petitioner's changes may alter the effectiveness of 16 C.F.R. part 1610. How the change in the conditioning requirements will affect those fabrics currently classified as dangerously flammable, with any resulting ignition of those fabrics and possible consumer injuries, is unknown. With the conditioning requirements in the current Standard several apparel recalls were initiated in 2015. A review of the data indicated at least 3 incidents involving silk clothing.

Changing the conditioning requirements in the Standard would result in a change to the definition of "dangerously flammable fabrics." Staff believes that the Standard would possibly no longer identify and classify fabrics that ignite too readily and burn too rapidly. This could result in textiles and fabrics currently prohibited from being used for wearing apparel and currently classified as dangerously flammable to be introduced into commerce. The overall safety of clothing textiles sold to U.S. consumers may be reduced. Dangerously flammable clothing textiles, and garments made from those textiles, pose a flammability hazard to consumers. The current Standard, codified in 16 C.F.R. part 1610, identifies dangerously flammable textiles that exhibit rapid and intense burning behavior.

## References

- (1). Petition CPSC-2015-0007, Petitioner, the International Association of Users of Artificial and Synthetic Filament Yarns and of Natural Silk.
- (2). 16 C.F.R. part 1610 Standard for the Flammability of Clothing Textiles.
- (3). Commercial Standard 191-53, Flammability of Clothing Textiles, 1954.
- (4). Textile Flammability Testing: Appropriate Levels for Moisture Content of Specimens, Fire and Materials, March 1982, John F. Krasny, Emil Braun, NBS.
- (5). ASTM D1909 Standard Table of Commercial Moisture Regains For Textile Fibers.
- (6). Measurement of Burning Rates of Unrestrained Fabrics, Textile Chemist & Colorist, April 1975, Bernard Miller, Ronald J. Martin, Charles H. Meiser, Jr.
- (7). The Effects of Moisture on the Flammability Characteristics of Textile Materials, Textile Research Institute, August 1974, Bernard Miller, J. Ronald Martin, Bhuvnesh C. Goswami, and Charles H. Meiser, Jr.
- (8). ASTM D1230 Standard Test Method for Flammability of Apparel Textiles.
- (9). Textile Flammability Testing: Appropriate Levels for Moisture Content of Specimens, Fires and Materials, March 1982, John F. Krasny, Emil Braun, National Bureau of Standards.
- (10). 83 Cong. Rec. S0429, at 5713 (daily ed. April 29, 1954).
- (11). Development of the Standards for the Flammability of Children's Sleepwear, E. Braun, J. Winger and J Slater, National Bureau of Standards, November 1974.

# **TAB E: Public Comments – Petition CPSC-2015-0007**

Public Submissions  
Petitions for Rulemaking: Amending the  
Standard for the Flammability of  
Clothing Textiles  
CPSC-2015-0007  
Comments Due: June 8, 2015

<http://www.regulations.gov/#!documentDetail;D=CPSC-2015-0007-0001>

