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

This document has been electronically approved and signed.

BALLOT VOTE SHEET

DATE: August 6, 2014

TO: The Commission
Todd A. Stevenson, Secretary

THROUGH: Stephanie Tsacoumis, General Counsel
DeWane Ray, Acting Executive Director

FROM: Patricia M. Pollitzer, Assistant General Counsel
Hyun S. Kim, Attorney, OGC

SUBJECT: Petition CP 04-1 and HP 04-1; Request for Fire Safety Standards for Candles and Candle Accessories

BALLOT VOTE Due: August 12, 2014

The National Association of State Fire Marshals (NAFSM) requested mandatory fire safety standards for candles and candle accessories (candle products). On March 10, 2004, the request was docketed under the Consumer Product Safety Act (CPSA), petition number CP 04-1, and the Federal Hazardous Substances Act (FHSA), petition number HP 04-1. On July 19, 2006, the Commission voted to defer a decision on the petition. The Commission directed staff to continue working with ASTM in developing standards for candle products and provide the Commission periodic status updates on standards development. Staff provided the Commission with status reports on candle standards development activities in 2007 and 2011. In the attached briefing package, staff now recommends denial of the petition.

Please indicate your vote below:

I. Grant the petition.

_____ _____
(Signature) (Date)

II. Defer the petition.

_____ _____
(Signature) (Date)

III. Deny the petition.

_____ _____
(Signature) (Date)

IV. Take other action (please specify).

_____

_____

_____

_____ _____
(Signature) (Date)

Attachment: Staff Briefing Package: Staff Recommendations to the Commission on Petition CP 04-1/HP 04-1, Requesting Mandatory Safety Standards for Candles and Candle Accessories

United States
Consumer Product Safety Commission

Staff Briefing Package

Staff Recommendations to the Commission on Petition CP 04-1/HP 04-1, Requesting Mandatory Safety Standards for Candles and Candle Accessories

August 6, 2014

For further information contact:

Scott Ayers, Project Manager
Directorate for Engineering Sciences
U.S. Consumer Product Safety Commission
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EXECUTIVE SUMMARY

Pending before the U.S. Consumer Product Safety Commission (Commission or CPSC) is a petition from the National Association of State Fire Marshals (NASFM). NASFM, the petitioner, requests that the CPSC mandate the voluntary fire safety standards for candle and candle accessories (candle products). These standards were developed by ASTM International (ASTM), Subcommittee F15.45, to address the risk of fire hazards associated with candle products.

In 1997, CPSC staff, aware of the increasing fire hazards and societal costs associated with candle accessories, requested ASTM Subcommittee, F15.45 – *Candle Products,* to develop voluntary performance standards for candles to reduce fire hazards associated with candle products. Several task groups were formed within ASTM Subcommittee F15.45 to develop new voluntary standards for candle products. The task groups addressed terminology, labeling, data evaluation, glass containers, smoking, wicks, and fire safety. To date, there are six published ASTM standards for candles and candle accessories. Future work of ASTM Subcommittee F15.45 includes discussing possible revisions to these standards and conducting the required five-year review of each standard. ASTM subcommittee members include representatives from candle manufacturers, importers, third party testing laboratories, safety organizations, mass merchandisers (retailers), and CPSC staff.

On March 10, 2004, the CPSC docketed the petition from NASFM as CP 04-01/HP 04-01. NASFM asserted that mandatory standards are necessary because residential fires and associated fire losses caused by candles increased from 1989 to 1999. NASFM also stated that candles can be designed and produced to reduce fire losses, and that making standards mandatory will ensure compliance. The petitioner requested that the Commission mandate fire safety standards for candle products based on, at a minimum, the requirements contained within ASTM International's *Provisional Specifications for Fire Safety for Candles* (PS59-02), published by ASTM in 2002. The petitioner also requested that the mandatory standards include several additional requirements not included in this "provisional" standard. On April 6, 2004, the Commission published a *Federal Register* notice soliciting public comments on the petition.

On July 19, 2006, the Commission voted to defer a decision on the petition and directed staff to continue working with ASTM to develop standards for candle products and to provide periodic status updates on the developments of the standards to the Commission. Staff provided the Commission with status reports on candle standards development activities in 2007 and 2011. CPSC staff maintains direct involvement in the ASTM subcommittees and actively and consistently participates in many of the task groups, by providing incident data and technical support. The voluntary standards have been revised multiple times since the petition was submitted, and the revisions include all of the petitioner's requests. The National Candle Association (NCA), a major candle industry trade association representing about 90 percent of the candles made in the United States , reports that all of its member companies conform to the ASTM standards.

ASTM published the first provisional candle standard, PS59-02, in 2002, and finalized the standard in 2004, as F2417, *Standard Specification for Fire Safety for Candles*. Subsequently,

ASTM revised F2417 three times. ASTM published the current standard, F2417-11, *Standard Specification for Fire Safety for Candles*, in 2011. This current standard addresses the petition requests for candle performance requirements for stability, flame height, secondary ignition, end-of-life behavior, and gel candles. Additionally, ASTM initially published F2601, *Fire Safety for Candle Accessories* (F2601), in 2007 with the current revision published in 2013; this standard provides minimum safety requirements and test methods for certain candle accessories, which addresses the petitioner's request for stability requirements for candle holders. Complementary ASTM standards establish uniform terminology, labeling requirements, glass container requirements, and emission collection requirements.

In the briefing package, staff has identified the risk of injury presented by candle products. Staff has also evaluated the current voluntary standards, hazard data, market analysis, and compliance data, which indicate that compliance with the current ASTM voluntary standards would adequately reduce the risk of fire hazards associated with candles and candle accessories. In addition, staff's review showed that substantial compliance with the voluntary standards is likely based on: (i) industry estimates that 90 percent of U.S. candle consumption already conforms to the latest ASTM voluntary standards; (ii) confirmation from several mass merchandisers that compliance with the ASTM voluntary standards is required; (iii) staff's review of candle product PSAs from 2009 to 2013, which found that 80 percent of the candle products reported to have a fire safety issue, were compliant with the ASTM voluntary standards; and (iv) a steady decline in the three-year average of candle product fires, deaths, and injuries from 2002 through 2011, after the introduction of the ASTM voluntary standards. Staff also notes that domestic consumption of candles has declined since 2004 (approximately 35 percent). However, staff believes that the reductions in candle-related deaths and incidents cannot be attributed to any single factor but is likely the result of a combination of factors, including reduced consumption and substantial compliance with the voluntary standards. Based on these considerations, staff recommends that the Commission deny the petition.

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ACKNOWLEDGEMENTS

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
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Memorandum

Date: August 6, 2014

TO : The Commission
Todd A. Stevenson, Secretary

THROUGH : Stephanie Tsacoumis, General Counsel
DeWane Ray, Acting Executive Director

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

Scott Ayers, Project Manager
Directorate of Engineering Sciences

SUBJECT : Staff Recommendation to the Commission on Petition CP 04-1/HP 04-1, Requesting Mandatory Safety Standards for Candles

I. Introduction

The U. S. Consumer Product Safety Commission (CPSC, Commission) is considering a petition[1] from the National Association of State Fire Marshals (NASFM or petitioner), requesting that the Commission mandate ASTM International (ASTM) voluntary fire safety standards for candles and candle accessories (candle products).(Tab A). NASFM asserted that mandatory standards are necessary because residential fires and associated fire losses caused by candles increased from 1989 to 1999. NASFM also stated that candles can be designed and produced to reduce fire losses and that making standards mandatory will ensure compliance. This briefing package provides information about the candle hazard identified in the petition and the options the Commission may consider regarding the petition. Staff's evaluation of the current ASTM voluntary candle standards, hazard data, market analysis, and compliance data demonstrate that compliance with the current ASTM voluntary candle standards would adequately reduce the risk of fire hazards associated with candles and candle accessories. In addition, staff believes that there is substantial compliance with these standards.

II. Background

In 1997, fire loss estimates from CPSC staff indicated an increase in the fire hazards and societal costs associated with candle products. To address these hazards, staff requested ASTM Subcommittee F15.45 – *Candle Products* to develop voluntary performance standards for

[1] CP 04-1/HP 04-1, Petition for improved candle fire safety, National Association of State Fire Marshals, February 10, 2004.

candles, to reduce fire hazards associated with candle products. As a result, ASTM Subcommittee F15.45 formed several task groups to develop new voluntary standards for candle products. The task groups specifically addressed terminology, labeling, data evaluation, glass containers, smoking, wicks, and fire safety. In 2002, ASTM published *Provisional Specifications for Fire Safety for Candles* (PS59-02). (This provisional standard was superseded by ASTM 2417-04, which has developed into the current ASTM F2417-11, *Standard Specification for Fire Safety of Candles*.)

In 2004, NASFM petitioned the CPSC to mandate fire safety standards for candle products. NASFM requested that the mandatory standards be based upon the requirements contained within the ASTM voluntary standards for candle products. NASFM specifically requested mandatory fire safety standards for candle products, based, at a minimum, on the requirements contained within ASTM's *Provisional Specifications for Fire Safety for Candles* (PS59-02).

On March 10, 2004, the Commission docketed the request as a petition, under the Consumer Product Safety Act (CPSA) and the Federal Hazardous Substances Act (FHSA). The CPSC designated the petition, CP 04-1/HP 04-1. On April 6, 2004, the Commission published a request for comments on the petition in the *Federal Register*. The comment period ended on June 7, 2004.

In response to the petition, CPSC staff presented an options briefing package[2] to the Commission on July 10, 2006, which included staff's response to the three comments received on the petition. The options briefing package also included a discussion of incident data, market information, a review of existing voluntary standards, conformance to voluntary standards, and CPSC's participation in the development of voluntary candle standards. Staff recommended that the Commission defer a decision on the petition to provide staff with additional time to continue working with ASTM in developing voluntary consensus standards for candle products and to assess the impact of the ASTM standards.

On July 19, 2006, the Commission voted to defer a decision on the petition, consistent with staff's recommendations. The Commission directed staff to continue working with ASTM in developing standards for candle products and to provide the Commission periodic status updates on standards development.

On June 6, 2007[3] and June 1, 2011,[4] staff provided the Commission with status reports on candle standards development activities (Tab B). CPSC staff maintains direct involvement with the ASTM subcommittee and has participated actively and consistently in many of the task groups, by providing incident data and technical support. Members of the ASTM Subcommittee F15.45

[2] Staff Briefing Package. *Options to Address Petition from National Association of State Fire Marshals (NASFM) Requesting Mandatory Candle Standards*, submitted to the Commission on July 10, 2006 (available from the CPSC Office of the Secretary or at: http://www.cpsc.gov/PageFiles/88038/candleballot.pdf).
[3] Staff Memorandum, *Status Report on Candle Standards Development Activities*, submitted to the Commission on June 6, 2007. http://www.cpsc.gov/PageFiles/87636/candle.pdf.
[4] Staff Memorandum, *Status Report on Candle Standards Development Activities*, submitted to the Commission on June 1, 2011. http://www.cpsc.gov/PageFiles/117536/candles2010.pdf.

also include domestic candle manufacturers, suppliers, importers, mass merchandisers, and consumer groups.

Currently, there are six published ASTM standards for candle products. Future task group work includes discussing possible revisions to these standards and conducting the required review of each standard every five years. The ASTM candle standards need to be evaluated as a whole because all of the standards contribute to reducing the hazard of candle fires. These standards go beyond the scope of the petitioner's request, with many requirements included in the standards by ASTM, which were not mentioned by the Petitioner.

III. Petition (Tab A)

NASFM requested that the CPSC adopt and enforce a standard addressing candle products fire safety. This mandatory fire safety standard for candle products should be based, at a minimum, on the requirements contained within ASTM's *Provisional Specifications for Fire Safety for Candles* (PS59-02). NASFM noted in its petition that PS59-02 addressed some of the more common reasons that candles contribute to fires. Specifically, the petitioner highlighted the provisional standard's requirements for excess flame height; prohibitions on the ignition of items other than the wick; end-of-life requirements for filled candles; and stability of the candle. However, NASFM requested that additional requirements be added to a mandatory standard including:

1. flammability performance requirements for candle accessories, including candleholders;
2. end-of-useful life requirements for freestanding, tealight, taper, and votive candles;
3. stability requirements for votive candles and taper candles mounted in appropriate candle holders; and
4. miscibility and flash point requirements for gel candles.

NASFM suggested that the CPSC should consider the efforts of ASTM Subcommittee F15.45 in developing these additional provisions. NASFM noted the Subcommittee's pursuit of additional requirements, including requirements similar to the four above, to upgrade the provisional standard to a final consumer product safety standard. NASFM also pointed out that because experts from the candle industry had provided leadership and participated in the development of this standard, the standard should be commercially feasible.

According to NASFM, ASTM's voluntary provisional standard, PS59-02, with the additional provisions NASFM specified, adequately addresses the hazards and should be effective in reducing accidental fire losses. However, NASFM stated that there are no mechanisms to ensure adherence by industry, and NASFM further asserted that there would not be substantial compliance with a voluntary standard. Therefore, NASFM requested a mandatory national candle product standard.

The CPSA requires that "the Commission shall rely upon voluntary consumer product safety standards rather than promulgate a consumer product safety standard prescribing requirements . . . whenever compliance with such voluntary standards would eliminate or adequately reduce the

risk of injury addressed and it is likely that there will be substantial compliance with such voluntary standards."[5] Therefore, to evaluate the petitioner's request, staff reviewed whether:

- compliance with the ASTM Subcommittee F15.45 standards would eliminate or adequately reduce the risk, and whether
- it is likely that there will be substantial compliance with the ASTM Subcommittee F15.45 standards.

In 2006, the Commission deferred a decision on the petition to allow more time to evaluate the request. In 2007 and 2011, staff provided the Commission with updates on staff's progress evaluating the petition. At this time, staff believes that enough data exist to evaluate the petition properly. Staff's review shows that the current voluntary standards would eliminate or adequately reduce the risk of injury addressed, and there is substantial compliance with the voluntary standards.

IV. ASTM Standards

To date, ASTM has published six candle-related standards. ASTM's candle standards go beyond the scope of the petitioner's request because they include many requirements and test methods that the petitioner did not request to address candle fire hazards.

Table 1 provides a summary of each standard and each standard's status. The petitioner requested that the Commission base a mandatory standard on ASTM PS95-02. ASTM PS59-02 provides safety requirements and test methods for flame height, secondary ignition, safety requirements for end-of-useful life (for all filled container candles), and safety requirements for stability (for freestanding candles). The petitioner also requested additional requirements on end-of-useful life for freestanding, tealight, taper, and votive candles and stability requirements for votive candles and taper candles mounted in appropriate candleholders.

The current voluntary standard, ASTM F2417-11, *Standard Specification for Fire Safety for Candles* (F2417-11), incorporates the requirements from the provisional standard, ASTM PS59-02 and the petitioner's request for end-of-useful life requirements for freestanding, tealight, taper, and votive candles and stability requirements for votive candles and taper candles mounted in appropriate candleholders.

The petitioner also requested that the Commission address miscibility and flash point requirements for gel candles. In ASTM F2417-11, the candle burning performance test provides an increase in the burn cycle interval for gel and gel-containing candles from the four hour time required for other candle types to eight hours. Appendix XI of ASTM F2417-11 provides additional recommendations for the development of gel and gel-containing candles, including safety recommendations for raw materials and finished products and extensive testing to prevent potential problems.

[5] 15 U.S.C. § 2056(b)(1).

The petitioner also requested flammability performance requirements for candle accessories, including candleholders. ASTM F2601-13, *Fire Safety for Candle Accessories* (F2601), provides minimum safety requirements and test methods for certain candle accessories holders to help ensure a reasonable degree of safety for normal use with candles. Included in ASTM F2601, are safety requirements and test methods for candle rings, candle holders, burners, and potpourri burners, and safety requirements for stability for all accessories intended to be used in direct contact with burning candles.

Table 1: ASTM Candle-Related Standards

ASTM Designation	Title	Description	Status
F1972-05	Standard Guide for Terminology Relating to Candles and Associated Accessory Items	Defines standard terms used to describe candles and candle products	Originally published in 1999, revised in 2005. Ballot out currently to approve a new version.
F2058-07	Standard Specification for Candle Fire Safety Labeling	Specifies cautionary labeling information for candles and candle products	Originally published in 2000, revised in 2007. Currently attempting to harmonize with European CEN standard; therefore a revision has been delayed.
F2179-14	Standard Specification for Annealed Soda-Lime-Silicate Glass Containers that are Produced for Use as Candle Containers	Specifies performance requirements to prevent glass candle containers from shattering	Originally published in 2002, revised in 2014.
F2326-09	Standard Test Method for Collection and Analysis of Visible Emissions from Candles as they Burn	Provides test method to evaluate visible emissions from indoor candle use	Originally published in 2004, reapproved in 2009. Task group has recently started the review of this standard.
F2417-11	Standard Specification for Fire Safety for Candles	Prescribes candle performance requirements (stability, flame height, secondary ignition, and end-of-useful-life behavior)	Originally published in 2004, revised in 2011.
F2601-13	Standard Specification for Fire Safety for Candle Accessories	Prescribes requirements for certain candle accessories (stability and flammability of candle burners and trim rings)	Originally published in 2007, revised in 2013.

In addition, other ASTM candle standards specify additional requirements to address fire hazards associated with candles and candle accessories. ASTM F1972-05, *Standard Guide for Terminology Relating to Candles and Associated Accessory Items* (F1972), defines standard terms used to describe candles and associated accessory products. ASTM F2058-07, *Standard Specification for Candle Fire Safety Labeling* (F2058), provides requirements for safety labels

that are to be placed on candles for sale. ASTM F2179-07, *Standard Specification for Annealed Soda-Lime-Silicate Glass Containers that are Produced for Use as Candle Containers* (F2179), provides minimum requirements for annealed soda-lime silicate glass containers that are used as candle containers. ASTM F2326-09, *Standard Test Method for Collection and Analysis of Visible Emissions from Candles as they Burn* (F2326), provides the requirements for the collection and analysis of visible emissions from candles as they burn. The current ASTM standards continue to be updated and reevaluated as candle technologies evolve; and the standards are reviewed every five years. The CPSC participates actively in the development and revision of the ASTM standards for candle products.

The ASTM standards account for some expected consumer behavior, including foreseeable misuse. However, safety requirements cannot be designed for all potential consumer action. Candles are open flames and can ignite soft furnishings, such as drapes and upholstery, or even clothing. Therefore, only a portion of the total candle fire incidents can be mitigated by safety standards; staff believes that the current ASTM candle standards would adequately reduce the risk of this portion of total candle fire incidents.

V. Incident Data (Tab C)

National fire loss data indicate that the three-year average estimate (2009−2011) of total fire department-attended candle fires was 6,700 fires. These fires resulted in an estimated 70 deaths, 680 injuries, and $308 million in property losses annually for the period. The estimated total number of candle fires attended by the fire service increased steadily from 5,400 fires in 1990, to 15,900 fires in 2001. More recently, the number has decreased steadily, with 6,600 fires in 2011 (the most recent year for which data are available). The proportion of fires that were candle fires (the total number of candle fires divided by the total number of all fires) followed similar trends.

The decade of the 2000s has seen a decrease in the candle fire and fire loss estimates after an increase in the estimates in the 1990s.

- The following are three-year average candle fire estimates: 15,200 for 2000 – 2002; 13,000 for 2003 – 2005; 9,700 for 2006 – 2008; and 6,700 for 2009 – 2011. These estimates have decreased steadily.

- The following are three-year average candle fire injury estimates: 1,490 for 2000 – 2002; 1,200 for 2003 – 2005; 910 for 2006 – 2008; and 680 for 2009 – 2011. As with the fire estimates, these have decreased steadily.

- The following are three-year average candle fire death estimates: 150 for 2000 – 2002; 170 for 2003 – 2005; 130 for 2006 – 2008; and 70 for 2009 – 2011. These candle fire death estimates show a decline late in the 2000s.

Staff evaluates the trends using three year averages. Year-to-year variability in the data, particularly with the death and injury estimates, can be large. Three year averages are used to smooth out the year-to-year fluctuations and evaluate longer term trends.

VI. Market Information (Tab D)

There are three major types of candles: container, votive, and freestanding. Candles that are fabricated and burned in vessels made of nonflammable materials, such as glass or ceramic, are referred to as "container" (or "filled") candles. Tealights and devotional candles are examples of container candles. Candles that are intended to melt, to lose shape, and to take the form of a larger container or holder are "votives." Candles that are rigid and generally placed on a candleholder for burning are called "freestanding" candles. Freestanding candles include tapers, pillars, and novelties (candles formed into shapes, such as figurines). ASTM defines a "candle accessory" as "an object designed, intended or marketed for use with a candle." This definition includes accessories, such as: candle sticks, small glass votive holders, candle burners, lanterns, luminaries, candelabra, candle shades, and wall sconces.

The National Candle Association (NCA) is a major trade association representing manufacturers and suppliers of candles, candle accessories, and candle manufacturing materials. According to NCA, NCA members produce about 90 percent of the candles made in the United States. NCA represents about 40 U.S. candle manufacturers and distributors. The International Guild of Candle Artisans (IGCA) is another U.S.-based organization. It is comprised of crafts persons and has 800 members from around the world. Other trade associations include the Latin American Candle Association (ALAFAVE) and the Consumer Specialty Products Association (CSPA). Additionally, the Holiday and Decorative Association (HDA), formerly the American Floral Industry Association (AFIA), represents firms in the "permanent botanical, holiday and decorative accessories" industry.

According to the NCA, there are about 400 domestic manufacturers of candles and hundreds of small craft producers.[6] Most manufacturers and importers have fewer than 100 employees. In fact, a majority of candle manufacturers have fewer than five employees. (Reference USA, 2013). Most candle production is labor intensive and not highly automated. Because start-up expenses are generally small, producers of candles may enter and exit the market easily and frequently. Many candle manufacturers market candle accessories along with candles.

Candles and their accessories are marketed to consumers and to commercial and institutional establishments, such as restaurants and religious organizations. They are sold through grocery, discount, and department stores, mass merchandise retailers, specialty and gift shops, craft stores, catalogs, the Internet, and through direct sales at in-home shows.

The United States' apparent consumption of candles is defined as domestic production, plus imports, minus exports (Deardoff, 2006). Based on this definition, the apparent U.S. consumption of candles amounted to about $1.39 billion in 2009 (the most recent year for which U.S. production is available). This represents a decline in real value of 35 percent from 2004.

[6] http://www.candles.org/about_facts.html.

VII. Recall History (Tab E)

From January 1, 2009 to July 8, 2013, CPSC staff collected samples of 213 different candle and candle accessory products. Staff initiated consumer-level recalls of 21 candle products that staff determined to be potentially hazardous. The 21 recalls involved 2,393,454 products that could have potentially led to fires or burns to consumers. There were no reported deaths from any of the products recalled between January 1, 2009 and July 2013.

VIII. Conformance to Voluntary Standards (Tab D)

In its comments to the petition, the NCA stated that its members produce candles and candle products "in accordance with recognized industry standards and practices." The NCA also states on its website that its member companies account for approximately 90 percent of all candles made in the United States. According to NCA, members in good standing of the NCA pledge to manufacture candles and candle products in accordance with recognized industry standards and practices. In comments to the petition, NCA states: "[s]ince NCA members account for approximately 90 percent of the candles manufactured in the U.S., this alone constitutes more than substantial compliance by the industry with the ASTM standards." In addition, NCA states: "[o]ur retail members, as well as major non-member retailers and mass purchasers, specify the ASTM standards in their procurement and supply contracts." Likewise, the Consumer Specialty Products Association (CSPA), commented that its members, who include "most of the major candle manufacturers and marketers in the United States [are] in compliance with the current ASTM standards."

According to an NCA representative (Miller, 2013), several of the largest mass merchandisers are involved in voluntary standards activities and conduct independent third party testing on candles and accessories. Staff contacts with three mass merchandisers (Adair, 2013) that participate in voluntary standards activities confirm that these mass merchandisers require their suppliers to conform to the voluntary standards for candles and candle accessories. Additionally, two of these retailers indicate that their competitors purchase from the same candle suppliers and that they witnessed candle testing of competitors' products when visiting testing labs. This information supports the NCA statement that there is a high rate of conformance to the voluntary standards.

Moreover, mass merchandisers account for a large proportion of candle imports. Due to these large retailers' conformance requirements, a large proportion of imports are likely to conform to the voluntary standards as well. If the conformance of imports is similar to domestic production (due in part to the requirements of the mass merchandisers), then about 90 percent of total U.S. candle consumption would conform to the latest voluntary standards.

In addition, staff reviewed all candle product Product Safety Assessments (PSAs) from Fiscal Year (FY) 2009 to FY 2013. Staff found a total of 40 PSAs in which staff assessed a candle or candle accessory available in the U.S. marketplace to at least one requirement in the ASTM candle fire safety voluntary standards (see Table 1). Many of the PSAs only evaluated the products to the portions of the ASTM standards that were pertinent to the reported issues; therefore not every requirement was evaluated on every product. It should be noted that these

products were not a random sample, but rather were products that had a reported fire safety issue. Staff expects that a random sample of candles and candle accessories would perform better because products with no history of safety issues would be included. Staff found that 32 of 40 products (80.0 percent) analyzed met the ASTM requirements evaluated. Staff found that 27 of 34 products (79.4 percent) evaluated for labeling requirements met the ASTM requirements. Excluding the labeling requirements, staff found that 35 of 38 products (92.1 percent) met the ASTM requirements evaluated. Staff found that 18 of 18 products (100 percent) met the ASTM requirements for stability; 30 of 30 products (100 percent) met the ASTM requirements for flame height; 26 of 28 products (93.3 percent) met the ASTM requirements for secondary ignition; 15 of 16 products (94.1 percent) met the ASTM requirements for end of life; 5 of 5 products (100 percent) met the ASTM requirements for plastic tealight containers; and 4 of 4 products (100 percent) met the ASTM requirements for candle accessories.

These 40 tested candle and candle accessories represent just a small portion of all the candle products available to U.S. consumers; however these products were tested because they were reported to have safety issues. Staff still found 80 percent of these candle products complied with the evaluated ASTM requirements.

IX. Response to Public Comments

On April 6, 2004, the CPSC's request for public comment on the petition appeared in the *Federal Register*.[7] The Commission received comments from the National Candle Association (NCA), National Fire Protection Association (NFPA), and the Consumer Specialty Products Association (CSPA). Two of the commenters objected to mandatory standards for candles and asked the CPSC to deny the petition. One commenter supported the petition for mandatory standards for candles.

This section responds to the issues commenters raised on Petition CP 04-1/HF 04-1. Staff previously addressed these comments in the briefing package submitted to the Commission on July 10, 2006. However, staff is updating the responses to comments to reflect the current injury data more accurately.

1. **Two commenters objected to mandatory standards because the commenters believe that the ASTM F15.45 voluntary consensus standards addressing candle fire safety are effective and will continue to reduce the fire risks; it is too early to determine the effectiveness of voluntary standards; the industry is already complying with voluntary standards and industry members have pledged to continue prompt compliance with future standards; and mandatory standards will have a negative impact on safety because changing mandatory standards is complex and they impede advances in technology and design (NCA; CSPA).**

The ASTM Subcommittee F15.45 Fire Safety Task Group was formed in April 2001, to develop standards to address candle fire safety specifically. In 2002, ASTM published *Provisional Specifications for Fire Safety for Candles* (PS59-02). (This provisional standard was superseded

[7] 69 *Federal Register* 18059; April 6, 2004.

in 2004 by ASTM 2417-04, which has developed into the current ASTM F2417-11, *Standard Specification for Fire Safety of Candles* published in November 2011; the standard includes candle performance requirements for characteristics identified with reported hazard patterns (stability, flame height, end-of-life behavior, and secondary ignition). Based on industry comments submitted by the NCA and CSPA, a substantial portion of U.S. candle producers conform to the current ASTM standards. Additionally, according to the NCA, mass merchandisers are involved in voluntary standards activities and conduct their own independent third party testing on candles and accessories. Because mass merchandisers also account for a large proportion of candle imports (See Tab D for additional details), a large proportion of imports conform to the voluntary standards.

Staff notes that enough time has elapsed since the introduction of PS59-02, and subsequent publication of ASTM 2417 to assess the standard's effectiveness in reducing fire hazards involving candles.

The ASTM standards are reviewed every five years. The opportunity to revise the ASTM standards as the products evolve has allowed ASTM F2601, *Standard Specification for the Fire Safety of Candle Accessories,* to be updated frequently as new classes of candle accessories with unique safety requirements are introduced. The current revision of ASTM F2601 was published in 2013.

2. **Two commenters objected to the petition because the petitioner disregards the additional standards development work by the ASTM Fire Safety Task Group; the ASTM standards include many of the provisions proposed by the petitioner or are under consideration by the ASTM Fire Safety Task Group (NCA, CSPA).**

Staff agrees that ASTM Subcommittee F15.45 has been responsive in addressing the risk. The petitioner requested mandatory standards based on ASTM PS59-02, *Provisional Specifications for Fire Safety for Candles,* with additional specified provisions. The petitioner acknowledges the efforts of the ASTM Fire Safety Task Group and asks CPSC to consider the progress of the Task Group in developing any candle requirements. CPSC staff has participated in the development of the candle standards and is aware of the progress made by the Fire Safety Task Group. Since receipt of the petition, ASTM PS59-02 has been superseded by a final standard, ASTM F2417, which includes additional provisions and requirements, some of which directly incorporate the requests of the petitioner. Staff recognizes that the Subcommittee is considering additional requirements. In 2013, ASTM published an additional standard, ASTM F2601-13, which establishes requirements for certain candle accessories.

3. **One commenter expressed the belief that it is consumer misuse and inattention to basic fire safety precautions that leads to candle fires; consumers leaving lit candles unattended, placing candles too close to combustibles, or placing them within the reach of children and pets is misuse; and that only the education of consumers as to the proper burning of candles and observance of candle fire safety rules can have an impact in reducing these candle fires (NCA).**

Staff agrees that consumer misuse and inattention to basic fire safety precautions may lead to candle fires. However, staff notes that this is foreseeable behavior. A more complete discussion is available in Tab F.

Filled candle jars are thick and heavy and give the impression that the candle is safe because the flame appears contained. Tealights placed in larger containers to burn may give the impression that the candle is safe because the flame appears contained. Many candles from the very small tealights to the large pillar-type candles have long burning times. Thus, it is foreseeable that if users believe that their candle is sturdy and safe and has a long burning time, they may leave their candle unattended. Additionally, if a candle appears to be burning properly, this may reinforce the notion that it is safe to leave a lit candle unattended. Finally candles are a familiar product; the more familiar users are with a product, the less likely they perceive a hazard associated with it.[8] Therefore, familiarity with candles may also explain why some users feel comfortable leaving their candles unattended.

The effectiveness of an information and education (I & E) campaign depends on a number of variables, including the user's perception of the hazard, familiarity, and experience with the product.[9] Due to the low perceived hazard associated with these products, consumers' familiarity and past positive experiences with the product, an I&E campaign may have limited effectiveness. Therefore, CPSC staff believes that educating consumers on candle safety is not enough to have an impact on reducing candle fires.

4. One commenter who supports the petition stated that although consumer behavior is a factor in most candle fires . . . product problems have also played a role (NFPA).

Staff agrees with this comment and continues to review cases where the candle or container/holder malfunctions.

X. Options

A. Grant petition CP 04-1/HP 04-1 and direct staff to initiate rulemaking for mandatory standards for candles and candle products.

B. Deny petition CP 04-1/HP 04-1.

C. Defer petition CP 04-1/HP 04-1.

XI. Recommendation and Rationale

Staff believes now there is enough information for the Commission to determine whether:

[8] Wogalter, M. and Leonard, S. (1999). *Warnings and Risk Communication.* London: Taylor & Francis.
[9] Ayers, T.; Gross, M.; Wood, C.; Horst, D.; Beyer, R.; and Robinson, J. (1984). *What is a Warning and When Will It Work? Proceedings of the Human Factors Society's 33rd Annual Meeting.*

- compliance with the ASTM Subcommittee F15.45 standards would eliminate or adequately reduce the risk of injury, and
- there is likely to be substantial compliance with the ASTM voluntary candle standards,

In the petition, NASFM stated that a standard incorporating PS59-02 with the additional four requirements "should be effective in reducing accidental fire losses, thus meeting the first criterion." ASTM F2417-11 and ASTM F2601-13 collectively incorporate the requirements from PS59-02, along with the four additional requirements presented in the petition. There are additional ASTM standards that would include additional requirements for candles and candle products. The ASTM standards continue to be updated and reevaluated as candle technologies evolve; and the standards are reviewed every five years. The ASTM Subcommittee F15.45 is made up of groups from various segments of the candle industry, including manufacturers, suppliers, retailers, experts, and the CPSC. These standards mostly originated in the early 2000s, and as a result, contributed to a decline in candle fires. Therefore, staff feels that compliance with the ASTM Subcommittee F15.45 standards adequately reduces the risk of injury associated with candles and candle products.

The voluntary standards bodies can adopt new fire safety standards and revise existing standards when new candle products enter the marketplace; the ASTM Subcommittee F15.45 has shown continued interest in evolving the standards. Staff believes that the CPSC should continue to participate on ASTM Subcommittee F15.45, as resources and priorities permit, to encourage continued refinement of these voluntary standards.

Staff has evaluated the current voluntary standards, hazard data, market analysis, and compliance data, which indicate that compliance with the current ASTM voluntary standards would adequately reduce the risk of fire hazards associated with candles and candle accessories. In addition, staff's review showed that substantial compliance with the voluntary standards is likely based on: (i) industry estimates that 90 percent of U.S. candle consumption already conforms to the latest ASTM voluntary standards; (ii) confirmation from several mass merchandisers that compliance with the ASTM voluntary standards is required; (iii) staff's review of candle product PSAs from 2009 to 2013, which found that 80 percent of the candle products reported to have a fire safety issue, were compliant with the ASTM voluntary standards; and (iv) a steady decline in candle product fires, deaths, and injuries from 2002 through 2011, following the introduction of the ASTM voluntary standards. Staff also notes that domestic consumption of candles has declined since 2004 (approximately 35 percent). However, staff believes that the reduction in candle-related deaths and incidents cannot be attributed to any single factor, but is likely the result of a combination of factors, including reduced consumption and substantial compliance with the voluntary standards. Based on these considerations, staff recommends that the Commission deny Petition CP 04-1/HP 04-1.

Tab A

Embedded digital copy of Petition CP 04-1/HP 04-1 from the National Association of State Fire Marshals

TAB A

CP 04-1/HP04-1

NATIONAL ASSOCIATION OF STATE FIRE MARSHALS

Government Relations

3/17/04

February 10, 2004

Office of the Secretary
United States Consumer Product Safety Commission
Washington, DC 20207

RE: Petition for improved candle products fire safety

The National Association of State Fire Marshals (NASFM) is a membership organization whose members include the senior fire safety officials in the United States. NASFM is committed to the protection of life, property and the environment from fire and other hazards.

For the reasons stated below, NASFM petitions[1] the United States Consumer Product Safety Commission (CPSC) to adopt and enforce a standard addressing candle products fire safety. This standard should be substantially based, as a minimum, upon the requirements contained within ASTM International (ASTM) Provisional Specifications for Fire Safety for Candles (Designation PS39-02) for all candles sold for consumer use in the United States. Details of this ASTM standard are included in Appendix 1 of this correspondence. The CPSC mandatory standard should also incorporate, at a minimum, the following additional provisions:

1. Flammability performance requirements for candle accessories, including candleholders;
2. End of useful life requirements for freestanding, tealight, taper, and votive candles;
3. Stability requirements for votive candles and taper candles mounted in appropriate candleholders; and
4. Miscibility and flash point requirements for gel candles.

The CPSC should consider the recent efforts of the ASTM Candle Products Subcommittee, F15.45, in developing these additional provisions. This Subcommittee is pursuing similar additional requirements to upgrade the provisional standard during the process to convert the provisional standard into a final consumer product safety standard. CPSC has been represented on the task group working in these areas.

[1] This petition on candle fire safety is filed in accordance with the Consumer Product Safety Act (15 U.S.C. 2051 *et seq.*), and in conformity with the requirements set forth under 16 CFR 1051.2-6.

1319 F Street, NW, Suite 301 | Washington, DC 20004 | Tel: (202) 737-1226 | Fax: (202) 393-1296 | www.firemarshals.org

Tab B

Embedded digital copies of the status reports on candle standards development activities from 2007 and 2011

Tab B

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date JUN – 6 2007

TO : The Commission
Todd A. Stevenson, Secretary

THROUGH : Page C. Faulk, General Counsel
Patricia M. Semple, Executive Director

FROM : Jacqueline Elder, Assistant Executive Director
Office of Hazard Identification and Reduction
Allyson Tenney, Project Manager
Directorate for Engineering Sciences

SUBJECT : Status Report on Candle Standards Development Activities

Introduction

A request to the U.S. Consumer Product Safety Commission (CPSC) from the National Association of State Fire Marshals (NASFM) to issue mandatory standards for candles and candle accessories was docketed as a petition, CP 04-1/HP 04-1, on March 10, 2004. In response to the petition, CPSC staff prepared an options briefing package[1] for the Commission which was submitted on July 10, 2006. CPSC staff recommended that the Commission defer a decision on the petition from NASFM to provide the staff with additional time to continue working with ASTM International (ASTM) in developing voluntary consensus standards for candle products and to assess the impact of the ASTM standards.

On July 19, 2006, the Commission voted to defer a decision on the petition in accordance with staff recommendations. Statements were submitted by the Honorable Nancy A. Nord, Acting Chairman, and by the Honorable Thomas H. Moore, Commissioner, directing staff to continue working with ASTM in developing standards for candle products and to provide periodic status updates on the development of the standards to the Commission. This document is the first status report on candle standards development activities.

[1] Staff Briefing Package – *Options to Address Petition from National Association of State Fire Marshals (NASFM), Requesting Mandatory Candle Standards*, submitted to the Commission on July 10, 2006 (available from Office of the Secretary, www.cpsc.gov)

NOTE: This Document has not been reviewed or accepted by the Commission. Initial _____ Date 6/6/07

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

Memorandum

June 1, 2011

TO: The Commission
Todd A. Stevenson, Secretary

THROUGH: Cheryl A. Falvey, General Counsel
Kenneth R. Hinson, Executive Director

FROM: Robert J. Howell, Assistant Executive Director
Office of Hazard Identification and Reduction
Allyson Tenney, Project Manager
Directorate for Engineering Sciences

SUBJECT: Status Report on Candle Standards Development Activities

Introduction

On March 10, 2004, a request to the U.S. Consumer Product Safety Commission (CPSC) from the National Association of State Fire Marshals (NASFM) to issue mandatory standards for candles and candle accessories was docketed as a petition, CP 04-1/HP 04-1. CPSC staff sent an options briefing package[1] to the Commission on July 10, 2006, recommending that the Commission defer a decision on the petition from NASFM. Staff noted that deferring a decision on the petition would provide staff with additional time to continue working with ASTM International (ASTM) in developing voluntary consensus standards for candle products and to assess the impact of the ASTM standards.

The Commission voted on July 19, 2006, to defer the petition as recommended by staff. Staff was directed by the Commission to continue working with ASTM in developing standards for candle products and to provide periodic status updates on the development of the standards to the Commission. The first status report was provided to the Commission on June 6, 2007.[2] This is the second status report on candle standards development activities. It provides a discussion of the most recent available incident data and also provides a summary of current industry activities and compliance actions.

---

[1] Staff Briefing Package–*Options to Address Petition from National Association of State Fire Marshals (NASFM) Requesting Mandatory Candle Standards*, submitted to the Commission on July 10, 2006 (available from Office of the Secretary or www.cpsc.gov, specifically at http://www.cpsc.gov/library/foia/foia06/brief/candleballot.pdf).
[2] Status Report, June 6, 2007, available from Office of the Secretary or www.cpsc.gov, specifically at http://www.cpsc.gov/library/foia/foia07/brief/candle.pdf).

Tab C

Memorandum from David Miller, Division of Hazard Analysis

Tab C

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

Memorandum

July 7, 2014

TO: Scott Ayers
Directorate for Engineering Sciences

THROUGH: Kathleen Stralka
Associate Executive Director
Directorate for Epidemiology

Stephen Hanway
Division Director
Division of Hazard Analysis

FROM: David Miller
Division of Hazard Analysis

SUBJECT: Candle Fire Loss Estimates and In-Depth Investigation Review[10]

Introduction

In March 2004 the National Association of State Fire Marshals (NASFM) submitted a petition to the CPSC requesting that the voluntary fire safety standards for candles be made mandatory. Additionally, the petition requested that the mandatory standard incorporate provisions regarding candle accessories and gel candles. In July 2006 the Commission voted to defer a decision on that petition citing the need to allow time to assess the effectiveness of the voluntary standard. In 2002, ASTM published *Provisional Specifications for Fire Safety for Candles* (PS59-02). (This provisional standard was superseded by ASTM 2417-04 and published in 2004. The current version of the standard is ASTM F2417-11, *Standard Specification for Fire Safety of Candles*.) ASTM 2417-11addresses issues of flame height, stability, end-of-life behavior (that the candle burns itself out), and secondary ignition,. There was also a cautionary labeling standard that went into effect in 2000, a glass container standard that went into effect in 2002, and a candle accessories standard in 2007.

This memorandum provides the most recent three year average estimates available - 2009, 2010, and 2011, which estimate the number of fire department attended residential structure fires and fire losses where a candle provided the *heat source*[11]. Year-to-year variability in the data, particularly with the death and injury estimates, can be large. Three year averages are used to smooth out the year-to-year fluctuations and evaluate longer term trends. The memorandum also provides the estimates of

[10] This analysis was prepared by the CPSC staff, and it has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.
[11] Heat source is an NFIRS variable for which there is a code ('66 – Candle') for candle.

addressable[12] fires and associated losses where a candle provided the *heat source* as well as candle fire loss estimates back to 1990, to provide a broader perspective on the candle fire problem. This timespan (1990 to 2011) shows an increase in estimates of candle fires and losses in the 1990s and then a decrease in the 2000s. The years from 2002 to 2011 (after the introduction of the voluntary fire standard PS59-02)) show a downward progression in the estimates of candle fires and losses. Based on data from the National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA) Annual Survey of Fire Losses, CPSC staff produces estimates of fires and fire losses associated with specific consumer products. These estimates are for fire department-attended fires only. Additionally, the estimates exclude fires and losses from intentionally set fires and include only civilian casualties.

This memorandum also provides details of CPSC staff's work on In-Depth Investigations (IDIs) of candle fire incidents. IDIs are investigations and reports performed by CPSC field staff. IDIs are assigned for candle incidents by CPSC staff when there was an apparent candle malfunction that was witnessed by a consumer. Incidents involving unattended candles are not assigned for IDIs because they tend not to yield much useful information about what happened in the incident. A summary of candle fire IDIs from 2007 to 2013 is presented.

Executive Summary

This report presents estimates of fires and fire losses from fire department attended, residential structure fires where a candle provided the heat source for the fire. In March 2004, NASFM presented a petition to CPSC requesting that the voluntary safety standards for candles be made mandatory. In July 2006, the Commission voted to defer the petition citing the need to assess the effectiveness of the voluntary standards on candle safety. The decade of the 2000s has seen a decrease in the candle fire and fire loss estimates following an increase in the estimates in the 1990s.

- The following are three-year average candle fire estimates: 15,200 for 2000 – 2002; 13,000 for 2003 – 2005; 9,700 for 2006 – 2008; and 6,700 for 2009 – 2011. These estimates have decreased steadily.

- The following are three-year average candle fire injury estimates: 1,490 for 2000 – 2002; 1,200 for 2003 – 2005; 910 for 2006 – 2008; and 680 for 2009 – 2011. As with the fire estimates, these have decreased steadily.

- The following are three-year average candle fire death estimates: 150 for 2000 – 2002; 170 for 2003 – 2005; 130 for 2006 – 2008; and 70 for 2009 – 2011. These candle fire death estimates show a decline late in the 2000s.

This report also presents tallies of candle types and malfunction types from a review of candle IDIs involving incidents that occurred from 2007 to 2013. The IDIs are not assigned based on a statistical sample so there is no statistical inference to be made based on them. The IDIs only present examples of some of the types of candle malfunction incidents that are occurring.

- There were 114 in-scope candle fire incidents between 2007 and 2013, for which CPSC field staff completed IDIs. Fifty-two of these 114 incidents involved filled candles and 33 involved tealight candles. There were nine incidents involving gel candles.

[12] Addressable is defined as a fire of a type that could be addressed by the candle fire safety standard.

- Sixty-three of the incidents involved the rupturing or ignition of the container or holder. Of these 63 container/holder incidents, 38 involved filled candles, and 14 involved tealight candles. Fifty of the incidents involved flare-ups. Of these 50 flare-up incidents, 18 involved filled candles, 17 involved tealight candles, and 8 involved gel candles.

Estimated Numbers of Fires and Fire Losses

Table 1 provides 2009 to 2011 annual and three-year average estimates for fire department attended residential structure unintentional candle fires and losses. Appendix A details the methodology for these estimates. These fires and losses include both potentially addressable and non-addressable candle fires.

Table 1. Fires and Losses from Fires where a Candle Provided the *Heat Source*[13]

Year	Fires	Deaths	Injuries	Property Loss (in $Millions)
2009	6,900	50	670	431
2010	6,700	80	620	257
2011	6,600	90	740	236
2009 – 2011 Average	6,700	70	680	308

Note: Fires are rounded to the nearest hundred, deaths and injuries to the nearest ten, and property loss to the nearest $million.

Fire Losses Addressable by the Voluntary Standard:

Table 2. Estimated Potentially Addressable Residential Fires and Fire Losses Involving Candles, Attended by the Fire Service, 2009 – 2011 Annual Average

Item First Ignited	Fires	Deaths	Deaths per million population	Injuries	Injuries per million population	Property Loss in Millions($)
Potentially Addressable Candle Fires	**5,900**	**60**	**0.19**	**560**	**1.80**	**270**
Floor or Wall Covering	500	10	0.02	30	0.11	20
Upholstered Furniture	400	10	0.05	40	0.14	33
Mattress, Bedding	800	10	0.03	110	0.35	47
Wearing Apparel, not worn	300	*	*	40	0.12	12
Curtains, blinds, drapery, tapestry	500	*	*	60	0.20	19
Magazines, newspaper, writing paper	200	*	*	20	0.08	14
Other Addressable Item First Ignited[14]	3,200	30	0.09	250	0.80	124

Note: Fires are rounded to the nearest hundred, deaths and injuries to the nearest ten, property loss to the nearest million dollars, and death and injury rates to the nearest hundred. Asterisks denote fire deaths estimates of fewer than five. Subtotals do not necessarily add to heading totals due to rounding.

[13] These estimates can be found in Tables 2a-2d in "2009 – 2011 Residential Fire Loss Estimates", p.10-13, D. Miller, CPSC, July 2013.

[14] Some of the common 'Item First Ignited' codes for candle fires that fall into this 'Other' category are ' 00 - Other item ignited', '20 – Furniture, utensils, other', '33 – Linen; other than bedding', '42 – Decoration', and '99 – Multiple items first ignited'. Note: Fires are rounded to the nearest hundred, deaths and injuries to the nearest ten, property loss to the nearest million

Table 2 shows three-year averages (2009 – 2011) for estimates of potentially addressable candle fires and associated losses. The data are broken down by different *Items First Ignited*. Appendix A and Appendix B describe the methodology used for producing these NFIRS fire loss estimates.

Table 3. Estimated Residential Fires and Fire Losses Involving Candles, 1990 – 2011

Year	Fires	Deaths	Deaths per million population[15]	Injuries	Injuries per million population	Property Loss in Millions($)
1990[16]	5,400	90	0.36	560	2.24	61
1991	5,900	60	0.24	690	2.74	77
1992	6,000	110	0.43	630	2.47	57
1993	6,400	90	0.35	670	2.60	83
1994	7,100	80	0.31	850	3.27	91
1995	8,400	80	0.30	1,010	3.84	115
1996	10,100	130	0.49	1,200	4.52	169
1997	12,000	160	0.60	1,290	4.82	176
1998	12,800	170	0.63	1,200	4.44	175
1999[17]	15,100	80	0.29	1,480	5.43	272
2000	15,300	130	0.46	1,760	6.24	313
2001	15,900	200	0.70	1,410	4.95	280
2002	14,800	130	0.45	1,300	4.51	363
2003	13,700	200	0.69	1,280	4.42	353
2004	13,400	150	0.52	1,240	4.22	390
2005	12,100	170	0.56	1,070	3.61	428
2006	10,800	120	0.40	1,040	3.50	360
2007	9,700	160	0.53	900	2.97	367
2008	8,800	100	0.33	790	2.61	353
2009	6,900	50	0.15	670	2.20	431
2010	6,700	80	0.25	620	2.02	257
2011	6,600	90	0.30	740	2.39	236

Note: Deaths and injuries are rounded to the nearest ten, property losses to the nearest million dollars, and death and injury rates to the nearest hundred. Asterisks denote fire deaths estimates of fewer than five. Subtotals do not necessarily add to heading totals due to rounding.

There was an estimated annual average of 5,900 potentially addressable fire department-attended candle fires in this period causing an estimated 60 deaths, 560 injuries, and $270 million in property loss. Using

[15] Used U.S. Census Bureau Population Estimates for each year.

[16] Data from 1980 – 1998 obtained from "Revised Residential Fire Loss Estimates 1980 – 1998", L.Smith, J. Mah, CPSC, July 2002.

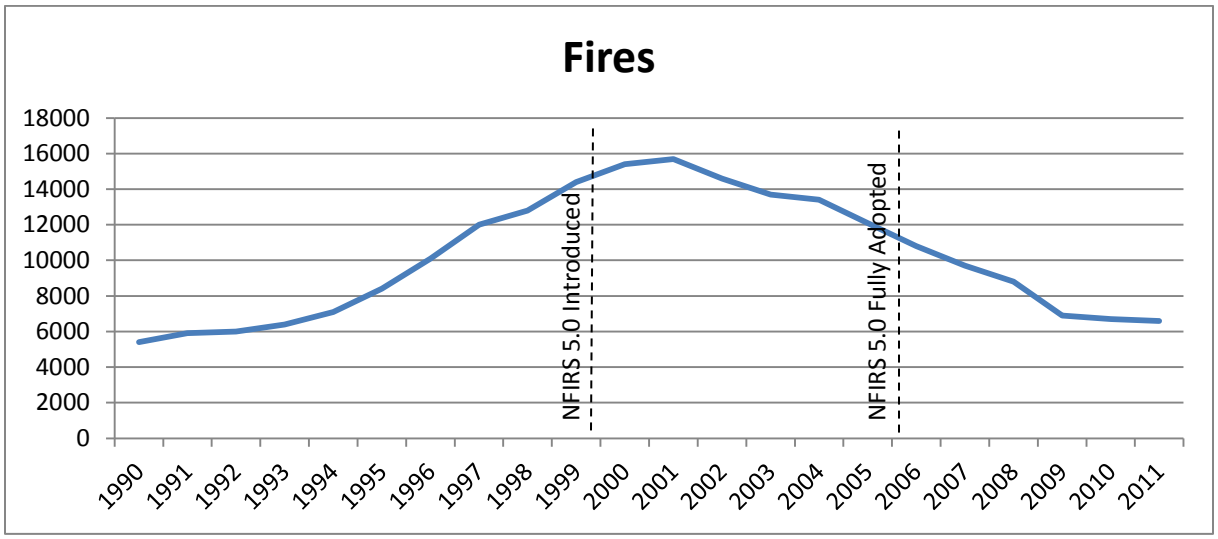
[17] Note: 1999 is the first year of the new NFIRS data collection system. Data from Years 1999 – 2004 are a mix of data coded in version 5.0 and data converted from version 4.1. Data for years prior to 1999 are not directly comparable due to the change in coding systems. Data from 2005 and after are exclusively 5.0 data. A discussion of the different coding systems occurs in Appendix A.

309,409,294[18] as the average estimated U.S. population for this period, there were an estimated 0.19 potentially addressable deaths and 1.80 potentially addressable injuries per million people.

Estimates of candle fires and losses since 1990, which include not just potentially addressable but also fires deemed not addressable can be seen in Table 3. This table is similar to Table 1, but goes back to 1990, and includes per capita estimates.

A new NFIRS coding system became available in 1999. Before 1999, all data were coded in the old system (NFIRS 4.1). From 1999 until 2004, some data were originally coded in the old system (version 4.1) and converted to the new system (NFIRS 5.0); and some data were originally coded in 5.0. Since 2005, all data have been originally coded in version 5.0. In 1999, 5 percent of the data were originally coded in NFIRS 5.0, 20 percent in 2000, 50 percent in 2001, 70 percent in 2002, 80 percent in 2003, and 89 percent in 2004. It is unknown what effect the introduction of NFIRS 5.0 might have had on the candle fire estimates. If there is an effect it would likely be small.

Figure 1[*]
Estimated Residential Candle Fires, Attended by the Fire Service, 1990 – 2011



[18] This is the average of the U.S. Census Bureau population estimates for July 1st of 2009, 2010, and 2011.

[*] Note: 1999 is the first year of the new NFIRS data collection system. Data from Years 1999 – 2004 are a mix of data coded in version 5.0 and data converted from version 4.1. Data for years before 1999 are not directly comparable due to the change in coding systems. Data from 2005 through 2010 are exclusively 5.0 data. A discussion of the different coding systems occurs in Appendix A. Data from 1980 to 1998 obtained from "Revised Residential Fire Loss Estimates 1980 - 1998", L.Smith, J. Mah, CPSC, July 2002. Data from 1999 to 2003 obtained from "1999 - 2003 Residential Fire Loss Estimates", R. Chowdhury, M. Greene, D. Miller, CPSC, October 2006. Data from 2004 to 2006 obtained from "2004 - 2006 Residential Fire Loss Estimates", D. Miller, R. Chowdhury, M. Greene, CPSC, October 2009. Data from 2007 and 2008 obtained from "2006 - 2008 Residential Fire Loss Estimates", D. Miller, R. Chowdhury, CPSC, July 2011. Data from 2009 - 2011 obtained from "2009 - 2011 Residential Fire Loss Estimates", D. Miller, CPSC, July 2013.

Figure 2*
Estimated Residential Candle Fire Deaths, Attended by the Fire Service, 1990 – 2011

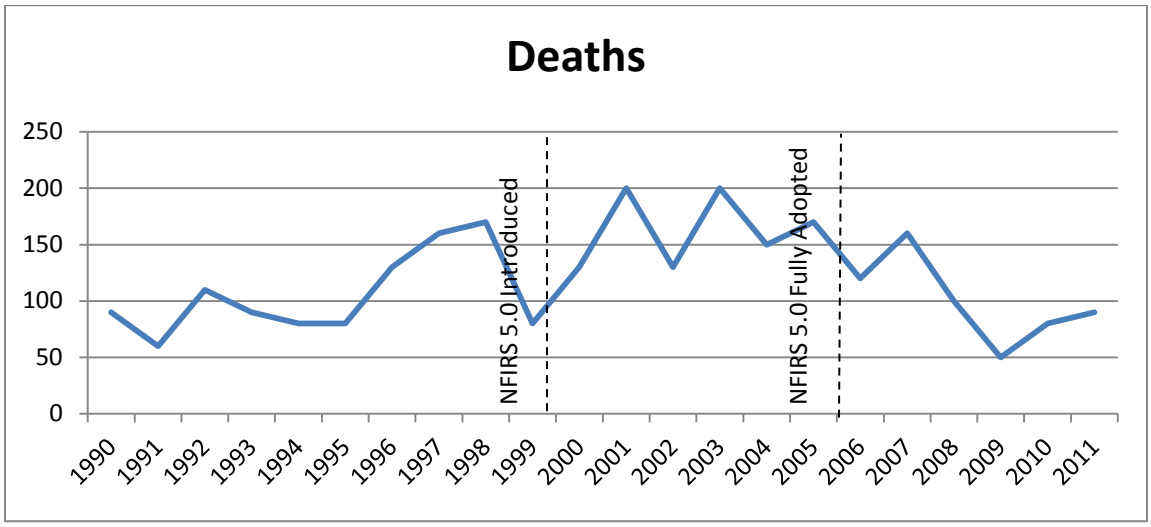
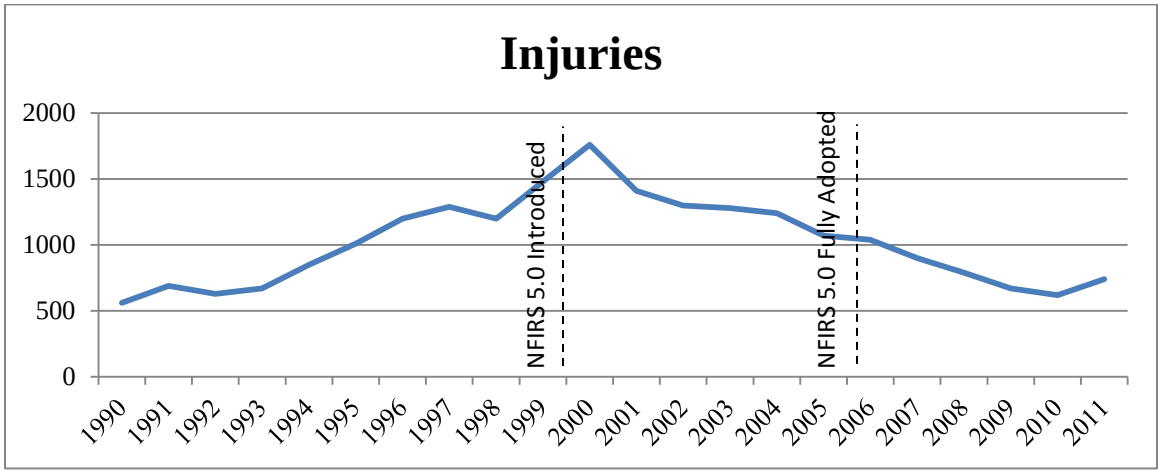


Figure 3
Estimated Residential Candle Fire Injuries, Attended by the Fire Service, 1990 – 2011



In-Depth Investigations

CPSC staff assigned candle incidents to field investigators to conduct In-Depth Investigations (IDIs). CPSC staff reviewed completed IDIs and characterized the hazard scenarios. Cases were assigned for IDIs if CPSC staff believed that the candle may have malfunctioned in a way that is addressable and the malfunction was witnessed. The main source of these incidents is IPIIs (Injury and Potential Injury Incidents), which are a collection of newspaper accounts, CPSC Hotline reports, Internet complaints, reports from medical examiners, and letters to CPSC. The addressable malfunctions comprise the following categories: flare-ups, candle exploded, wax was low, container/holder shattered or ignited, candle reignited, and candle tipped over (not caused by a pet).

The IDIs for in-scope candle incidents occurring between 2007 and 2013 are characterized below. These cases are not a random sample of all candle fire cases and should not be seen as representative of all candle fire incidents. IPII itself is not a random sample of fire cases and the selected set of cases assigned from IPII is not a random sample. The assignments are biased towards incidents where there was somebody present to see what happened with the candle. While not statistically representative of all candle fire incidents, the IDIs give insight into some scenarios of a selected set of candle fire incidents where the candle behaved unusually or unexpectedly.

Table 4. 2007 - 2013 Candle Fire Incident IDIs by Candle Type and Incident Type

Candle Type	Total Incidents	Container/ Holder Broke or Ignited	Flare-Up	Exploded	Embedded Object Ignited	Tipover	Wax Low	Other
Filled	52	38	18	12	3	0	5	0
Tealight	33	14	17	1	0	0	1	2
Votive	8	4	2	0	0	0	0	2
Gel	9	2	8	0	2	0	0	0
Taper	2	0	1	0	0	1	0	0
Pillar	6	3	3	0	1	0	0	1
Novelty	2	2	0	0	0	0	0	0
Unknown	2	1	1	1	0	0	0	0
Total	114	64	50	14	6	1	6	5

Note: Some incidents have multiple incident types so detail will not add to total.

As can be seen in Table 4, of the 114 IDIs reviewed, 85 involved either a filled (52) or a tealight (33) candle. In 38 of the incidents a filled candle had its container (or holder) either break or ignite. In 33 of those 38 incidents a glass container broke or ignited. There were 18 incidents where a filled candle reportedly flared up and 12 reportedly exploded. The 33 tealight incidents involved 14 holder/container incidents and 17 flare-ups. There were nine gel candle incidents which included eight flare-ups. Some incidents involved multiple incident types. For example, a candle could flare-up, and the container could shatter.

In 46 of the 114 incidents, it is unknown where the candle (or container or holder, if that is what malfunctioned) was made. Of the 68 incidents where it is known where the candle (or container or holder) was made, 23 were made in the United States, and 45 were made in another country.

Table 5 through Table 11 show the breakdown of candle and incident types by individual year.

Table 5. 2007 Candle Fire Incident IDIs by Candle Type and Incident Type

Candle Type	Total Incidents	Container/ Holder Broke or Ignited	Flare-Up	Exploded	Embedded Object Ignited	Tipover	Wax Low	Other
Filled	10	8	6	2	2	0	0	0
Tealight	7	4	2	1	0	0	0	0
Votive	1	1	0	0	0	0	0	0
Gel	3	1	2	0	1	0	0	0
Taper	1	0	0	0	0	1	0	0
Pillar	0	0	0	0	0	0	0	0
Novelty	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	22	14	10	3	3	1	0	0

Table 6. 2008 Candle Fire Incident IDIs by Candle Type and Incident Type

Candle Type	Total Incidents	Container/ Holder Broke or Ignited	Flare-Up	Exploded	Embedded Object Ignited	Tipover	Wax Low	Other
Filled	12	9	3	7	1	0	0	0
Tealight	7	3	5	0	0	0	0	0
Votive	0	0	0	0	0	0	0	0
Gel	3	1	3	0	0	0	0	0
Taper	0	0	0	0	0	0	0	0
Pillar	2	2	0	0	0	0	0	0
Novelty	0	0	0	0	0	0	0	0
Unknown	1	1	0	1	0	0	0	0
Total	25	16	11	8	1	0	0	0

Table 7. 2009 Candle Fire Incident IDIs by Candle Type and Incident Type

Candle Type	Total Incidents	Container/ Holder Broke or Ignited	Flare-Up	Exploded	Embedded Object Ignited	Tipover	Wax Low	Other
Filled	5	5	1	0	0	0	1	0
Tealight	4	3	2	0	0	0	0	0
Votive	1	0	1	0	0	0	0	0
Gel	0	0	0	0	0	0	0	0
Taper	0	0	0	0	0	0	0	0
Pillar	0	0	0	0	0	0	0	0
Novelty	0	0	0	0	0	0	0	0
Unknown	1	0	1	0	0	0	0	0
Total	11	8	5	0	0	0	1	0

Table 8. 2010 Candle Fire Incident IDIs by Candle Type and Incident Type

Candle Type	Total Incidents	Container/ Holder Broke or Ignited	Flare-Up	Exploded	Embedded Object Ignited	Tipover	Wax Low	Other
Filled	7	3	3	0	0	0	1	0
Tealight	8	2	5	0	0	0	1	1
Votive	1	1	0	0	0	0	0	0
Gel	1	0	1	0	1	0	0	0
Taper	0	0	0	0	0	0	0	0
Pillar	2	0	2	0	0	0	0	1
Novelty	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	19	6	11	0	1	0	2	2

Table 9. 2011 Candle Fire Incident IDIs by Candle Type and Incident Type

Candle Type	Total Incidents	Container/ Holder Broke or Ignited	Flare-Up	Exploded	Embedded Object Ignited	Tipover	Wax Low	Other
Filled	10	6	3	2	0	0	1	0
Tealight	6	2	3	0	0	0	0	0
Votive	4	2	0	0	0	0	0	2
Gel	2	0	2	0	0	0	0	0
Taper	1	0	1	0	0	0	0	0
Pillar	1	1	1	0	0	0	0	0
Novelty	2	2	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	26	13	10	2	0	0	1	2

Note: In one of the tealight incidents it is unknown what the malfunction was that caused the incident.

Table 10. 2012 Candle Fire Incident IDIs by Candle Type and Incident Type

Candle Type	Total Incidents	Container/ Holder Broke or Ignited	Flare-Up	Exploded	Embedded Object Ignited	Tipover	Wax Low	Other
Filled	4	4	0	0	0	0	1	0
Tealight	1	0	0	0	0	0	0	1
Votive	1	0	1	0	0	0	0	0
Gel	0	0	0	0	0	0	0	0
Taper	0	0	0	0	0	0	0	0
Pillar	1	0	0	0	1	0	0	0
Novelty	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	7	4	1	0	1	0	1	1

Table 11. 2013 Candle Fire Incident IDIs by Candle Type and Incident Type

Candle Type	Total Incidents	Container/ Holder Broke or Ignited	Flare-Up	Exploded	Embedded Object Ignited	Tipover	Wax Low	Other
Filled	4	3	2	1	0	0	0	0
Tealight	0	0	0	0	0	0	0	0
Votive	0	0	0	0	0	0	0	0
Gel	0	0	0	0	0	0	0	0
Taper	0	0	0	0	0	0	0	0
Pillar	0	0	0	0	0	0	0	0
Novelty	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	4	3	2	1	0	0	0	0

It can be seen in Table 4, as well as in the year-by-year data (Tables 5 – 11) that much of what is in the IDIs in each year are incidents involving filled or tealight candles igniting or breaking their containers or flaring up.

Appendix A

Methodology

General:

Estimates of fires and fire losses from fire department-attended candle fires can be derived from the United States Fire Administration's (USFA) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA) annual survey of fire departments. The NFPA survey is a stratified (by size of community protected by a fire department) random sample of fire departments in the United States. The NFPA makes national estimates of fire department-attended residential structure fires and associated deaths, injuries, and property losses. They do this by weighting the sample results based on the proportion of the U.S. population accounted for by communities of each size.

NFIRS is a compilation of voluntarily submitted incident reports by U.S. fire departments. The reports have details about product involvement. Not all fire departments submit reports, and the compilation is not a probability sample. NFIRS data are weighted up to the NFPA totals to produce product specific estimates. There are NFIRS estimates for candle fires, deaths, injuries, and property losses and then appropriate weights are applied to obtain national estimates for candle fires and their associated losses.

NFIRS Coding System Revision:

A new data coding system for NFIRS was introduced in 1999. This is the NFIRS Version 5.0 reporting system. Starting in 1999, fire departments could code their cases in the new version 5.0 system but they also had the choice of coding their cases in the older version 4.1 system. Cases coded in version 4.1 were converted to version 5.0, using computer programs, but conversions are not one-to-one for all variables and codes (there are generally more variables and codes in version 5.0). Consequently, there are some differences between the data coded originally in 4.1 and converted to 5.0 and the data coded originally in version 5.0. The version 5.0 system was phased in gradually, beginning in 1999. By 2005, estimates were computed using only the version 5.0 system.

Historical Fire Loss Estimates:

CPSC has been using NFIRS and NFPA to estimate product-specific fires and fire losses for fire department attended residential structure fires for many years. There are estimates for candles going back to 1980. This report will show estimates since 1990. These estimates over the years give evidence of an upward trend in the amount of candle fires and associated losses in the 1990s and a mostly downward trend since. Since NFIRS is not a probability sample there are no variance estimates associated with the fire and loss estimates. Therefore, statistical inferences cannot be made on the estimates.

Addressability:

Several NFIRS variables were used to determine if a particular incident is a potentially addressable candle fire. Relevant NFIRS variables and codes can be seen in Table B-1 and Table B-2. The variable *heat source* has a code "66 – candle" that is used to identify incidents where a candle provided the heat source for the fire. Whether a candle fire case is deemed potentially addressable depends upon the coding of each of the following three variables: (1) *item first ignited,* (2) *factors contributing to ignition,* and (3) *cause of ignition*.

There are five *item first ignited* codes that can make a candle fire not addressable. These codes are related to flammable liquid or gas. There are nine *factors contributing to ignition* codes that can make a case not addressable. These range from different codes for "misuse of product" such as "19 – Playing with Heat Source" to codes such as "51 – Collision, knock down, run over, turn over" and "66 – Animal". There is a *cause of ignition* code, "4 – Act of Nature" that makes a case not addressable.

Arson fires are excluded from the estimates as are firefighter casualties. The *cause of ignition* variable is used in conjunction with a created variable called *child play*, to identify and eliminate arson cases. Fires coded as "intentional" are deemed arson unless they are found to be child play. Child play cases are considered not potentially addressable.

The word 'potentially' should be stressed here in the phrase 'potentially addressable'. Determinations of potential addressability of candle fires are being made solely by the coding of a few NFIRS variables. NFIRS does not provide a narrative of the incident. An example of a fairly common scenario that we see in the coding is that a candle is the *heat source* and *the item first ignited* is 'Curtains, blinds, drapery, tapestry'. These cases count as potentially addressable, unless there is some other reason in the coding of another variable or variables (*e.g.*, the *factor contributing to ignition* variable indicates 'playing with heat source' was involved). They are deemed potentially addressable because the candle could have tipped over or flared up and in this manner, ignited a curtain for instance. However, the candle may simply have been placed too close to a curtain and led to the fire. This scenario would not be addressable but there is no way of knowing if this is what happened. So, all such cases are considered 'potentially addressable'.

The codes for the different variables that are used to identify 'potentially addressable' or 'not potentially addressable' candle fires are shown in Table B-2.

Because of the difficulty of determining addressability with NFIRS codes, alternatives were attempted. For injuries, a sample of candle fire IDIs was examined to see what proportion was addressable by the candle voluntary standard. For deaths, fire reports and death certificates from a sample of candle fires were read to see what proportion was addressable. The idea was to apply these proportions to the NFIRS estimates of total candle fires and injuries to obtain estimates of addressable candle fires and injuries. However the IDIs, fire reports, and death certificates often did not give enough detail to make a determination of addressability. This was especially true with the deaths, where it could almost never be determined. If the start of a candle fire is not witnessed, it is unlikely that it can be learned whether or not the fire was addressable. At this time the best option remains relying on the NFIRS data to estimate **potentially** addressable candle fires and losses.

Allocation of Unknowns:

It was possible to have unknown[19] values for each of the NFIRS variables used for this analysis. A technique known as raking was used to allocate the unknown values for each of these variables except for child play. Raking involves an iterative mathematical procedure to adjust a cross-tabulation of the data so that the resulting table, without unknowns, maintains the same proportional relationship as the original cross-tabulation. Battaglia, Hoaglin, and Izrael describe the raking algorithm and provide the statistical software (SAS version 6.12; SAS Institute, Inc., Cary, NC).[20]

[19] Some cases have some variables that are not coded so that information is missing. Also, some cases are coded as some form of unknown e.g., the *cause of ignition* code 'U – Cause undetermined after investigation'. In both instances the value for a particular variable is unknown and is allocated.

[20] M. Battaglia, D. Hoaglin and D. Izrael, "A SAS Macro for Balancing a Weighted Sample", SAS Users Group International (SUGI) 25th Annual Conference, April 9 -12, 2000, Paper #258-25.

Child Play:

In the new NFIRS coding system the coding of child play has become more complicated. In the old system a case could be coded as child play explicitly using a code from one variable – *ignition factor*. In the new system there are three variables that must be coded a certain way for a case to count as child play.

In the analysis for another project the inclusion of the child play variable in the raking was found to be problematic and the child play variable was then excluded. It may have been because child play in the new system is defined in a more complicated manner (involving three separate variables). To keep a consistent approach for producing fire loss estimates, child play was excluded from the raking for this analysis. The result is that a case is only considered child play if it is explicitly coded as such. If it has unknown codes for the child play variables it will **not** count as child play. Before raking, the cause variable was changed to 'unintentional' for child play cases if the cause had been 'intentional' or 'unknown'.

A concern would be underestimating child play by excluding it from the raking and, in so doing, counting some cases as potentially addressable that should not be because they are child play. However, Factor Contributing to Ignition is included in the raking and having Factor Contributing to Ignition = '19 - Playing with Heat Source' alone is enough for a case to count as not potentially addressable. So, underestimating child play should not cause an overestimate of potentially addressable candle cases.

Appendix B

Table B-1
NFIRS Version 5.0 Codes Used to Identify Candle Fires

Heat Source	**NFIRS Version 5.0 Codes**
Candle	Candle (66)
Not Candle	All codes except for 66, UU, and blank
Item First Ignited	
Floor or Wall Covering	Floor covering or rug/carpet/mat (14) Interior wall covering excluding drapes, etc. (15)
Upholstered Furniture	Upholstered sofa, chair, vehicle seats (21)
Mattress, Bedding	Mattress, pillow (31) Bedding; blanket, sheet, comforter (32)
Wearing Apparel, Not Worn	Wearing apparel not on a person (34)
Curtains, Blinds, Drapery, Tapestry	Curtains, blinds, drapery, tapestry (36)
Magazine, Newspaper, Writing Paper	Magazine, newspaper, writing paper (92)
Other Addressable Item First Ignited	All other codes including: Other item ignited (00) Furniture, utensils, other (20) Decoration (42) And many more
Not Addressable Item First Ignited	Atomized liquid, vaporized liquid, aerosol (61) Flammable liquid/gas – in/from engine or burner (62) Flammable liquid/gas – in/from final container (63) Flammable liquid/gas in container or pipe (64) Flammable liquid/gas – uncontained (65)
Unknown	Undetermined item ignited (UU) Blank ( )

Table B-2
NFIRS Version 5.0 Codes Used to Identify Addressability for Candle Fires

Variable	Potentially Addressable Candle Fires	Not Potentially Addressable Candle Fires
Item First Ignited	All Other Codes	Atomized liquid, vaporized liquid, aerosol (61) Flammable liquid/gas – in/from engine or burner (62) Flammable liquid/gas – in/from final container (63) Flammable liquid/gas in container or pipe (64) Flammable liquid/gas – uncontained (65)
Factors Contributing to Ignition	No factor contributing to ignition (NN) Abandoned or discarded materials or products (11) Heat source too close to combustibles (12) Improper fueling technique (15) Flammable liquid used to kindle fire (16) Mechanical Failure, Malfunction (20 – 27) Electrical Failure, Malfunction (30 – 37) Installation Deficiency (40 – 44) Accidentally turned on, not turned off (52) Equipment unattended (53) Equipment overloaded (54) Failure to clean (55) Improper startup (56) Equipment used for not intended purpose (57) Equipment not being operated properly (58) Storm (62) High water including floods (63) Earthquake (64) Volcanic action (65) Fire Spread or Control (70 – 75)	Misuse of material or product, other (10) Cutting, welding too close to combustible (13) Flammable liquid or gas spilled (14) Washing part, painting with flammable liquid (17) Improper container or storage (18) Playing with heat source (19) Collision, knock down, run over, turn over (51) High wind (61) Animal (66)
Cause of Ignition	Cause, other (0) Unintentional (2) Failure of equipment or heat source (3)	Intentional (1) Act of Nature (4)

Tab D

Memorandum from William W. Zamula, Directorate of Economic Analysis

Tab D

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

Memorandum

Date: July 15, 2014

TO : Scott Ayers
Project Manager, Candle Petition, ES

THROUGH: Gregory B. Rodgers, Ph.D.
AED, Directorate for Economic Analysis

Deborah V. Aiken, Ph.D.
Senior Staff Coordinator, Directorate for Economic Analysis

FROM : William W. Zamula, Directorate for Economic Analysis

SUBJECT : Candle and Accessories Petition, HP-04-1 and CP-04-01

The U.S. Consumer Product Safety Commission (CPSC) received a petition from the National Association of State Fire Marshals (NASFM), requesting issuance of mandatory fire safety standards for candles and candle accessories. NASFM specifically requested that CPSC mandate the provisions of ASTM PS59-02, *Provisional Specification for Fire Safety for Candles*. NASFM also requested additional performance provisions for stability and end-of-useful-life for candles, flammability of candle accessories, and specific miscibility and flashpoint requirements for gel candles.

This memorandum presents an overview of available information about the market for candles and candle accessories and discusses existing voluntary standards and conformance to the voluntary standards.

Description of Product

Candles

Candles are manufactured from fuels, such as paraffin wax, beeswax, vegetable wax, or gelled mineral oil, to which a wick is added. Frequently added ingredients include fragrance and color.

There are three major types of candles: container, votive, and freestanding. Candles that are fabricated and burned in vessels made of nonflammable materials, such as glass or ceramics, are referred to as container (or filled) candles. Tealights and devotional candles are examples of container candles. Candles that are intended to melt, lose shape, and take the form of a larger container or holder are votives. Candles that are rigid and generally placed on a candleholder for burning are called freestanding candles. Freestanding candles include tapers, pillars, and novelties (candles formed into shapes, such as figurines).

Candle Accessories

Using definitions developed by ASTM (ASTM Standard F1972-05, *Standard Guide for Terminology Relating to Candles and Associated Accessory Items*), a "candle accessory" is "an object designed, intended or marketed for use with a candle." This would include candleholders or candle containers that provide a functional purpose (*i.e.*, holding a candle upright) during candle burning. Such functional candle accessories include: candle sticks, small glass votive holders, candle burners, lanterns, luminaries, candelabra, candle shades, and wall sconces. These objects are generally made of glass, ceramic, plastic, wood, or metal.

Other candle accessories provide a decorative or functional purpose and may be sold as part of a "candle ensemble." An example would be a decorative candle trim ring that encircles a candle. Candle trim rings are generally made of plastic, fabric, and/or plant materials.

Industry Trade Associations

A major trade association that represents manufacturers and suppliers of candles, candle accessories, and candle manufacturing materials is the National Candle Association (NCA). According to NCA, NCA members produce about 90 percent of the U.S. domestic shipments of candles. Included among NCA's members are about 40 U.S. candle manufacturers and distributors. Another U.S.-based organization, comprised of crafts persons, is the International Guild of Candle Artisans, with 800 members from around the world (Gale Group, Inc., 2013). The Latin American Candle Association (ALAFAVE), based in Florida, represents 27 candle manufacturers from North, Central, and South America; Australia; and the Caribbean, as well as 23 suppliers from around the world (ALAFAVE, 2013). The Consumer Specialty Products Association (CSPA), with more than 250 members (Gale Group, Inc., 2013), has an Air Care Products Division, which represents manufacturers of indoor environment products, such as cleaners, air fresheners, fragrances, and candles.

The trade associations whose members supply candle accessories represent a wide range of manufactured products. The Holiday and Decorative Association (HDA), formerly the American Floral Industry Association (AFIA), represents firms specializing in the "permanent botanical, holiday and decorative accessories industry." Mostly importers, HDA members include 21 firms supplying candle rings, candle holders, and candelabra.

Manufacturers

Candle Manufacturers

According to the NCA, there are about 400 manufacturers of candles and hundreds of small craft producers (NCA, 2013) in the United States. The Reference USA database of businesses in the United States identifies 269 candle manufacturers (Reference USA, 2013). All but one of these businesses identified has fewer than 500 employees, the U.S. Small Business Administration's (SBA) threshold for defining a candle manufacturing business as "small." Importers are considered small businesses by the SBA if they have fewer than 100 employees. Most manufacturers and importers are much smaller than either the 500 employee or 100 employee threshold limits specified in the *Code of Federal Regulations (CFR), Title 13, Business Credit and Assistance.* In fact, 170 (or 63 percent of candle manufacturers identified by Reference USA) have fewer than five employees (Reference USA, 2013). Most candle production is labor intensive and not highly automated. Because start-up expenses are generally small, producers of candles may enter and exit the market easily and frequently.

Candle Accessory Suppliers

Many candle manufacturers also market candle accessories. Establishing the number of firms supplying products to the candle accessories market would be difficult because a large proportion of the accessory products sold with candles are likely acquired by the marketers of candles, *i.e.*, candle manufacturers and suppliers. In fact, most members of the ASTM task group developing performance standards for accessories are candle manufacturers, retailers, suppliers, and testing labs. The manufacturers supplying candle accessory products are wide ranging and include, but are not limited to, floral, plastic, wood, metal, glass, and ceramic producers. These manufacturers would include: manufacturers of artificial flowers, producers of molded plastic novelties, glass container manufacturers, decorative glass manufacturers (candleholders), metal crafters (metal works), silversmiths, wood products manufacturers, ceramic producers, and others.

Sales, Pricing, & Marketing

The NCA estimates that retail sales of candles are about $2 billion per year. Retail prices of candles range from about 50 cents for a votive candle, up to $30.00 for a large pillar or jar candle (NCA, 2013). Artisanal candles in elaborate shapes can cost hundreds of dollars.

Candles and their accessories are marketed to consumers and to commercial and institutional establishments, such as restaurants and religious organizations. They are sold through grocery, discount, and department stores, mass merchandise retailers, specialty and gift shops, craft stores, catalogs, the Internet, and through direct sales at in-home shows. National chains of candle stores have not fared well recently. Only Yankee Candle remains as an independent national candle chain; although other national chains, such as Bath and Body Works, feature candles prominently. Mass merchandisers appear to have gained market share at the expense of department stores and other outlets. According to a report on "Petroleum Wax Candles from China" (USITC, 2010), mass merchandisers alone account for 60 percent of the market for

candles. However, this source uses a broad definition of "mass merchandisers," which includes grocery stores and drug stores.

Several trends have contributed to the current year-round popularity of candles and the subsequent decline in the historically strong seasonality of candle sales. One trend is the continuing popularity of using candles to scent the home. According to the National Candle Association, scented candles make up about 80 percent of candle sales (NCA, 2013). Still, the NCA estimates that 35 percent of candle sales occur during the Christmas/Holiday season.

Much of the competition in the candle market is in developing new scents, shapes, and colors. As a result, some large firms market more than a thousand styles of candles (NCA, 2013). Recent trends in candle making include more use of organic or natural components, such as beeswax or vegetable waxes, rather than petroleum-based waxes. Recycled materials are used in candle holders more often. The use of LED lights as candle substitutes and the use of wax warmers to provide scents of candles without the fire appear to be increasing (NCA, 2013). However, the increase in their use has not been enough to affect the overall market for candles (NCA, 2013).

International Trade

Due to the relative weakness of the dollar, exports of candles have increased substantially in recent years, while imports have declined. In 2012, imports amounted to $444 million in nominal 2012 dollars (see the Appendix, Table 1), a decline of 28 percent from $620 million in constant 2012 dollars (from Table 1) in imports in 2007. Of these imports (see Table 2), almost 60 percent originated from Pacific Rim countries, including India. Vietnam replaced China as the most prominent source of imports. Imports from the Americas, mostly Canada, Mexico, and the Dominican Republic, accounted for about 30 percent, while imports from Poland accounted for about 4 percent of imports.

The nominal value of U.S. exports of candles more than doubled to $237 million in 2012 (see the Appendix, Table 1) from $105 million in 2007. When adjusted for changes in the price level (see column 5, Table 1), this represents an increase of more than 87 percent in real terms since 2007. In 2012, the value of U.S. candle exports to the United Kingdom was $119 million, or 50 percent of all U.S. candle exports (see Table 3). The other major purchaser for U.S. candles in 2012 was Canada, which accounts for 29 percent of U.S. exports. Mexico, Australia, and the Netherlands were the only other markets that accounted for more than 2 percent by dollar value of U.S. exports.

Domestic Consumption

U.S. apparent consumption of candles, is defined as U.S. production + imports – exports (Deardoff, 2006). Based on this definition, the apparent U.S. consumption of candles in 2009 (the most recent year for which U.S. production is available), amounted to about $1.39 billion (see Table 4) in constant 2012 dollars (USITC, 2010), a decline in real value of about 35 percent from 2004 levels. The period from 2008 to 2010 includes the recent 18-month recession, beginning at the end of December 2007, and the slow recovery from that recession. Imports maintained a relatively stable share of consumption, representing 32 percent of 2009

consumption, compared to the 28 percent share they held in 2004, and the 32 percent share they held in 1998.

Relevant Voluntary Standards

The standard cited in the petition, PS59-02, *Provisional Specification for Fire Safety for Candles*, was originally published by ASTM in 2002, and subsequently updated in 2004, after receipt of the petition. The current standard, F2417-11, *Standard Specification for Fire Safety for Candles*, published in 2004 as a final standard and subsequently revised, supersedes the PS59-02 provisional standard and was finalized and published in 2011.

The current ASTM candle fire safety standard incorporates the elements of the original provisional standard and adds end-of-useful life requirements for freestanding, tealight and votive candles that the petitioner requested. There is an eight-hour burn test specified for gel candles in the current standard, which addresses flammability issues associated with gel candles.

Flammability specifications for candle accessories, requested by the petitioner, are covered by the current ASTM standard, F2601-09, *Standard Specification for Fire Safety for Candle Accessories*, which addresses stability of certain candle accessories and ensembles, flammability of trim rings, and burn performance of candle/potpourri (tealight) burners. The standard was developed by a subcommittee task group that was expressly set up for this purpose. The ASTM committee continues to add new accessories and requirements as the industry evolves.

Conformance to Voluntary Standards

In comments on the petition, the NCA maintained that its members produce candles and candle products "in accordance with recognized industry standards and practices." Because its members represent 90 percent of candles manufactured in the United States, the NCA argued that U.S. production is in substantial conformance with the current ASTM standards. Likewise, the Consumer Specialty Products Association (CSPA), commented that its members, who include "most of the major candle manufacturers and marketers in the United States [are] in compliance with the current ASTM standards."

According to an NCA representative (Miller, 2013), several of the largest mass merchandisers are involved in voluntary standards activities and conduct independent third party testing on candles and accessories. Staff contacts with three mass merchandisers (Adair, 2013) that participate in voluntary standards activities confirm that these mass merchandisers require their suppliers to conform to the voluntary standards for candles and candle accessories. Also, two of these retailers indicated that their competitors purchase from the same candle suppliers and that they witnessed candle testing of competitors' products when visiting testing labs. This supports the NCA statement that there is a high rate of conformance to the voluntary standards.

Moreover, staff believes that mass merchandisers account for a large proportion of candle imports (IBISWorld, 2012). Due to these large retailers' conformance requirements, a large proportion of imports are likely to conform to the voluntary standards as well. The high level of conformance is corroborated by staff review of candle product PSAs from 2009-2013, which

found that 80 percent of the candle products reported to have a fire safety issue, were compliant with the ASTM voluntary standards. If the conformance of imports is similar to domestic production (due in part to the requirements of the mass merchandisers), then about 90 percent of total U.S. candle consumption would conform to the latest voluntary standards.

Summary

The U.S market for candles has changed since the Commission deferred the petition in 2006. Domestic consumption of candles declined considerably, from 2004 to 2009 and so have candle-related fires, injuries, and deaths (CPSC, 2014). Voluntary standards have changed since the petition was submitted, and the changes embody most of the requests of the petitioner. The broader scope of the current voluntary standards may also have contributed to the decline in candle-related fires, injuries, and deaths. Staff believes that the reductions in candle-related deaths and incidents cannot be attributed to any single factor, but likely the result of a combination of factors, including reduced consumption and substantial compliance with the voluntary standards. Based on these considerations, staff recommends that the Commission deny the petition.

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Appendix

Table 1: Value of Candle Imports[21] and Exports,[22] 2004−2012

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Year	Value of Imports (in millions of dollars)	Value of Imports (in millions of 2012 dollars)	Value of Exports (in millions of dollars)	Value of Exports (in millions of 2012 dollars)
				.
2004	460.7	596.7	68.0	88.1
2005	446.7	563.3	75.9	95.7
2006	470.9	577.4	81.3	99.7
2007	514.8	620.4	105.1	126.7
2008	494.9	566.8	120.0	137.4
2009	398.7	447.6	137.0	153.8
2010	420.1	449.2	166.5	178.0
2011	417.2	427.0	198.4	203.1
2012	444.5	444.5	236.9	236.9

Sources: Data compiled from tariff and trade data from the U.S. Department of Commerce and the U.S. International Trade Commission.

Table 2: U.S Candle Imports by Country of Origin, 2004−2012 (thousands of nominal dollars*)

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Vietnam	1,073	26,940	76,408	130,755	154,996	116,519	151,194	129,104	150,119
Canada	88,899	86,524	103,180	109,068	121,638	99,973	86,171	93,011	99,190
China	219,540	140,162	67,420	47,229	39,731	33,200	41,634	41,721	42,757
India	6,998	17,295	29,228	41,335	42,749	42,138	35,727	38,825	37,965
Poland	5,195	8,778	6,536	7,215	11,412	7,319	8,154	14,994	19,718
Thailand	22,794	24,996	28,625	36,090	35,999	28,086	28,059	22,057	19,674
Mexico	11,038	7,403	8,584	11,001	12,160	12,082	12,718	15,868	17,664
Dominican Republic	584	912	1,561	4,627	8,607	10,264	9,462	12,349	14,867
Hong Kong	26,497	25,445	31,069	29,955	17,962	13,668	14,709	11,951	10,222
All others	78,100	108,282	118,326	97,524	49,714	35,418	32,337	37,372	32,320

*Dollar value is landed duty-paid value, the sum of the cost, insurance, and freight (CIF) plus calculated import duties.
Sources: Data compiled from tariff and trade data from the U.S. Department of Commerce and the U.S. International Trade Commission. Totals may not add due to rounding.

[21] Dollar value is landed duty-paid value, the sum of the cost, insurance, and freight (CIF), plus calculated import duties.
[22] Dollar value is the free alongside ship (FAS) value, the value of exports at the U.S. port.

Table 3: U.S Candle Exports by Receiving Country, 2004−2012
(FAS value, thousands of nominal dollars**)

	2004	2005	2006	2007	2008	2009	2010	2011	2012
United Kingdom	8,790	12,493	13,470	20,803	27,823	50,455	73,159	89,355	119,216
Canada	40,954	44,012	48,597	57,982	60,356	57,520	62,037	71,029	68,108
Mexico	6,122	8,341	5,458	7,740	7,122	3,848	4,086	4,775	8,422
Netherlands	6,167	4,628	5,603	5,601	6,395	6,385	6,982	6,680	6,053
Australia	973	1,296	1,726	2,568	3,324	2,901	4,322	4,605	5,190
Korea	171	104	167	615	547	577	827	1,844	4,587
Japan	681	582	964	2,421	3,617	2,821	3,524	3,767	3,035
Israel	130	122	45	49	55	52	7	134	2,586
Sweden	45	28	36	112	381	493	657	1,101	2,495
United Arab Emirates	99	87	348	529	968	713	1,699	3,139	2,004
All others	3,910	4,172	4,899	6,634	9.395	11,214	9,154	12,015	15,178

**Dollar value is the free alongside ship (FAS) value, the value of exports at the U.S. port.
Sources: Data compiled from tariff and trade data from the U.S. Department of Commerce and the U.S. International Trade Commission. Totals may not add due to rounding.

Table 4: U.S Consumption of Candles and Percent Provided by Imports in Constant 2012 Dollars (1998−2009)

	Candle Consumption $2012 (millions)	Percent of Consumption from Imports
1998	1,931	26.1
2000	2,271	32.1
2002	1,931	28.7
2004	2,168	27.5
2009	1,393	31.8

Source: Based on Table I-5 of "Petroleum Wax Candles from China" Publication 4207, U.S. International Trade Commission, Washington, DC 20436, December 2010 adjusted to 2012 price levels using the annual Producer Price Index for Candles from the U.S. Department of Labor, Bureau of Labor Statistics

Tab E

Memorandum from Shea Henning, Office of Compliance and Field Operations

Tab E

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

Memorandum

July 31, 2013

TO : Scott Ayers, Project Manager, Directorate for Engineering Sciences

THROUGH: Robert J. Howell, Acting Director, Office of Compliance and Field Operations
Mary Toro, Director, Regulatory Enforcement Division

FROM : Allyson Tenney, Team Leader – Textile Flammability Team, Regulatory Enforcement Division, Office of Compliance and Field Operations
Shea Henning, Student Intern, Office of Compliance and Field Operations

SUBJECT : Compliance Actions Involving Candles and Candle Products

I. Introduction

In 2004, the National Association of State Fire Marshalls (NASFM) petitioned the U.S. Consumer Product Safety Commission (CPSC) to issue and enforce mandatory fire safety standards for candle products. NASFM asked that the mandatory standards be based upon the voluntary standards for candles and candle products developed by ASTM International. NASFM requested that the mandatory standards apply to all candle products sold in the United States. CPSC staff sent an options briefing package to the Commission on July 10, 2006, recommending that the Commission defer a decision on the petition from NASFM. The Commission voted on July 19, 2006 to defer the petition, as recommended by the CPSC staff.

ASTM International developed voluntary performance standards for candle products to reduce fire hazards associated with candles and candle accessories. The separate standards address various aspects of fire safety, including cautionary labeling, visible emissions, integrity of glass containers, and flammability. The ASTM International flammability standards prescribe performance requirements for candles that include stability, flame height, secondary ignition, and end-of-useful-life behavior and for the flammability of candle accessories (*i.e.*, candle holders and burners). CPSC staff actively participated in the development of the ASTM International candle-related fire safety standards.

Separate from the activities aimed at addressing the fire hazards associated with candle products, CPSC staff also addressed the potential health issues associated with lead in candles and candle wicks, by issuing a mandatory ban and labeling rule for certain candle products. Effective in October 2003, CPSC banned the manufacture and sale of metal-cored wicks that contain lead and candles with lead-containing wicks under the Federal Hazardous Substances Act (FHSA) (16 C.F.R. Part 1500). While the CPSC Office of Compliance and Field Operations staff is responsible for the enforcement of the requirements under the FHSA, Compliance staff

also initiates actions associated with candles that are defective and pose a substantial product hazard.

II. Summary of Actions and Role of the Office of Compliance and Field Operations Involving Candle Products

The Office of Compliance and Field Operations is responsible for the enforcement of mandatory regulations, identifying hazards associated with defects in consumer products, and initiating corrective actions. Corrective Actions include: removing products from the marketplace, correcting and reconditioning products, and requesting recalls of violative or potentially hazardous products. Compliance staff works with firms to negotiate joint recalls, using resources to help firms initiate corrective action plans, as necessary. Compliance staff also conducts Fast-Track recalls where no formal hazard determination is made to quickly get products off the market and out of households. Compliance staff also works with U.S. Customs and Border Protection (CBP) staff to obtain products for compliance monitoring before they enter the United States. CBP will notify our network of field investigators about shipments of goods that may have potential problems. CPSC may detain and sample shipments at import. Samples are then tested by CPSC staff and assessed for possible product hazards.

The Office of Compliance and Field Operations staff has played an active role monitoring incidents associated with the candle industry. CPSC staff from the Office of Compliance and Field Operations monitors the industry conformance to the ASTM International voluntary candle standards as part of our evaluation of whether these products pose a substantial product hazard under Section 15 of the CPSA. From January 1, 2009 to July 8, 2013, CPSC staff collected and assessed 213 samples of candle and candle accessory products. Staff initiated consumer-level recalls for 21 candle products that were determined to be potentially hazardous. The 21 recalls involved 2,393,454 products that could have potentially led to fires or burns to consumers. There were no reported deaths from any of the products recalled between 2009 and July 2013.

Included in the 21 candle product recalls were 11 recalls involving candle holders and warmers. The most common reason for initiating a recall of the candle accessories was irregular burning, including high flame height and flare ups/flashovers when using the accessory. The second most common reason was overheating that led to the shattering of casing, creating laceration hazards.

Of the 21 candle and candle accessory-related recalls, 14 were imported products, and seven products were made domestically. The country of origin with the most candle products recalled during this period is China. Other recalled candle products originated in India, Thailand, Vietnam, and the United Kingdom.

In addition, CPSC staff reviewed incident reports and product complaints regarding candles and candle accessories. To assist in determining whether a defect existed or whether a violation of the mandatory standard was present, along with the possible need for compliance action, CPSC staff monitored incident and injury data. Injuries mainly consisted of minor and moderate burns to hands and lacerations from shattered glass. Reported incidents ranged from

minor property damage, most often from scorching, to extensive property damage caused by large fires. Most property damage reported in the data mentioned destruction of surrounding surfaces, rugs, carpeting, and household items.

III. Conclusion

CPSC staff continues to monitor the candle industry by responding to trade complaints and investigating incident reports. CPSC staff requests corrective action to address candles that are found to pose a substantial product hazard. CPSC Compliance and Field Operations staff collects and analyzes samples, conducts hazard determinations, and initiates corrective actions to address candles that are found to pose a substantial product hazard. CPSC staff also provides advice and guidance to the industry. CPSC staff strongly encourages manufacturers to design, develop, and produce products that meet applicable voluntary (consensus) safety standards, to ensure that safer candles and candle products are produced. CPSC staff encourages manufacturers to test and evaluate their products in accordance with the applicable voluntary standards and encourages retailers and distributors to consider specifying conformance to the applicable voluntary standards.

Tab F

Memorandum from Sharon R. White, Division of Human Factors

Tab F

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

Memorandum

Date: August 23, 2013

TO : Scott Ayers
Project Manager, Candle Petition

THROUGH: George A. Borlase, Ph.D., PE., Associate Executive Director for Engineering Sciences
Bonnie Novak, Director, Division of Human Factors

FROM : Sharon R. White
Division of Human Factors

SUBJECT : Response to Comments on Petition CP 04-1/HP 04-1, Petition for Fire Safety Standard for Candles and Candle Accessories

The National Association of State Fire Marshals (NASFM) petitioned the U.S. Consumer Product Safety Commission (Commission or CPSC) to mandate fire safety standards for candles and candle accessories. On March 10, 2004, the CPSC's Office of the General Counsel docketed the request as petition CP 04-1/HP 04-1. The Commission published a *Federal Register* notice, soliciting public comments on the petition, on April 6, 2004. CPSC staff sent an options briefing package to the Commission on July 10, 2006,[23] recommending that the Commission defer a decision on the petition to provide staff additional time to continue to work with the ASTM subcommittee and to assess the impact of the recently developed ASTM voluntary standards on candle and candle accessory-related incidents. On July 19, 2006, the Commission voted to defer the decision on the petition, as recommended by staff, and directed staff to continue working with ASTM in developing standards for candle-related products and to provide periodic status updates on standards development to the Commission.

This memorandum responds to Human Factors (HF) issues raised by two commenters on Petition CP 04-1/HF 04-1. Staff previously addressed the comments on the petition in the briefing package submitted to the Commission on July 10, 2006. Staff's responses were based on an analysis of 179 In-Depth Investigations (IDIs). These incidents occurred during the period from January 1, 2003 to January 6, 2005.

[23] Tenney, Allyson (2006). Briefing Package-Options to Address Petition from National Association of State Fire Marshals (NASFM) Requesting Mandatory Candle Standards. Bethesda, Md.: U.S. Consumer Product Safety Commission, http://www.cpsc.gov/PageFiles/88038/candleballot.pdf.

Staff reviewed an additional 114 IDIs since the 2006 briefing package was submitted to the Commission. Staff revisited the comments received to determine whether staff's responses would change as a result of the additional IDIs. Staff's responses are the same. The IDIs reviewed are not a random sample of candle incidents and should not be considered representative of candle incidents as a whole. However, the IDIs reviewed do provide insight into some candle fire scenarios.

The incidents occurred during the period from January, 2007 to March, 2013.[24] The incident scenarios identified from the IDIs are as follows: flare-ups, explosions, tip overs, candle holders, low wax, container breaking/cracking/shattering, candles too close to combustibles and candles within reach of children. The product types include filled candles, tapered candles, tealights in metal and/or plastic containers, pillar or column-type candles, votives, and gel candles.

Comment 1

The commenter designated as CH04-4-1 expressed the belief that "it is consumer misuse and inattention to basic fire safety precautions that leads to candle fires." The commenter labeled as misuse: consumers leaving lit candles unattended, placing candles too close to combustibles, or placing them within the reach of children and pets. The commenter expressed the belief that "only the education of consumers as to the proper burning of candles and observance of candle fire safety rules can have an impact in reducing these candle fires."

Staff Response

The staff agrees that consumer misuse and inattention to basic fire safety precautions may lead to candle fires. However, staff believes that this is foreseeable behavior. Based on the 114 IDIs that ESHF staff analyzed, 58 (51%) involved filled-type (non-tealight) candles, mostly contained in a glass jar; 31 (27%) involved tealight candles, mostly in glass and ceramic candle holders. The remaining incidents (25) involved tapered candles burning down too rapidly, candles melting plastic candle holders, candle holder accessories melting, candle wax leaking through a coconut shell, floating candles igniting, and similar incidents.

Filled candle jars are thick and heavy and give the impression of sturdiness. Additionally, tealights placed to burn in larger containers may give the impression that the candle is safe because the flame appears contained. Furthermore, all of the candles from the very small tealights to the large pillar-type candles have long burn times. Thus, it is foreseeable that if a user believes that a candle is sturdy and safe and has a long burn time, the consumer may leave the candle unattended to answer the phone or the door, or to tend to cooking or some other activity. For example, this was demonstrated during a personal conversation with an experienced candle user who stated that she feels safer leaving a candle unattended when the candle is contained in a thick jar. Additionally, if a candle appears to be burning properly, this may reinforce the notion that it is safe to leave a lit candle unattended. These factors may lead inadvertently to a situation in which a candle is accessible to a child or a pet.

[24] The petition was deferred in July 2006. Based on team consensus, 2007 was selected because it was the next full year.

Candles are also a familiar product. According to the research, the more familiar users are with a product, the less likely they perceive a hazard associated with it (Wogalter and Leonard, 1999).[25] And, because people frequently use a product without having had a prior incident, quite naturally, they become less concerned about the product's dangers, and therefore, more confident in the use of the product. Therefore, the familiarity effect and past positive experiences may also explain why some users feel comfortable leaving a candle unattended. Sixty-nine of 114 cases that mentioned consumers' familiarity and past positive experiences with a candle illustrate this point.

As for placing a candle too close to combustibles, people generally lack knowledge about combustible materials and/or conditions that can lead to a fire (Woodson, Tillman, and Tillman, 1992).[26] Therefore, they may inadvertently initiate a situation that can lead to hazardous conditions.

Generally, the success of an information and education campaign (I & E) depends on a number of variables, including the user's perception of the hazard, familiarity, and experience with the product (Ayers, T.; Gross, M.; Wood, C.; Horst, D.; Beyer, R.; and Robinson, J. (1984).[27] Due to the low perceived hazard associated with these products, consumers' familiarity and past positive experiences with the product, an I & E campaign may have limited effectiveness. Therefore, CPSC staff believes that educating consumers on candle safety is not enough to have an impact on reducing candle fires.

Comment 2

The commenter designated as CH04-4-2 supported the petition and stated: "while consumer behavior is a factor in most candle fires, . . . product problems have often played a role . . .."

Staff Response

Staff agrees. Staff continues to review cases where the candle or container/holder malfunctions.

[25] Wogalter, M. and Leonard, S. (1999). *Warnings and Risk Communication.* London: Taylor & Francis.
[26] Woodson, W.; Tillman, B.; and Tillman, P. (1992). *Human Factors Design Handbook.* New York: McGraw Hill.
[27] Ayers, T.; Gross, M.; Wood, C.; Horst, D.; Beyer, R.; and Robinson, J. (1984). *What is a Warning and When Will It Work? Proceedings of the Human Factors Society's 33rd Annual Meeting.*