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

DATE: May 13, 2015

BALLOT VOTE SHEET

This document has been electronically approved and signed.

TO: The Commission
Todd A. Stevenson, Secretary

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

FROM: Patricia M. Pollitzer, Assistant General Counsel
Mary A. House, Attorney, OGC

SUBJECT: Petition for Change to the Bunk Bed Standard and
Petition Requesting Standard for Bunk Bed Cornerposts

BALLOT VOTE DUE May 19, 2015

Staff forwarded a briefing package updating the Commission on the status of two petitions for rulemaking related to 16 C.F.R. parts 1213, 1500, and 1513, referred to collectively as the "Bunk Bed Standard":

- Petition CP 10-2 & HP 10-1, *Petition for Change to the Bunk Bed Standard* ("Side Entrapment Petition")
- Petition CP 03-1 & HP 03-1, *Petition Requesting Standard for Bunk Bed Cornerposts* ("Corner Post Extension Petition")

CPSC staff recommends that the Commission deny both petitions because current information would not support a conclusion that a rule is reasonably necessary to reduce an unreasonable risk of injury. Staff's briefing package states that ASTM's voluntary standard for bunk beds has been revised to include provisions that address the hazards identified in each petition. Staff believes that the revisions to the voluntary standard adequately address the risk of injury and death raised in the petitions and that industry compliance with the voluntary standard is likely to be substantial.

Please indicate your vote for each petition on the following options:

I. Side Entrapment Petition.

A. Grant the petition.

_____ _____
(Signature) (Date)

B. Defer the petition.

(Signature) (Date)

C. Deny the petition.

(Signature) (Date)

D. Take other action. (Please specify.)

(Signature) (Date)

II. Corner Post Extension Petition.

A. Grant the petition.

(Signature) (Date)

B. Defer the petition.

(Signature) (Date)

C. Deny the petition.

_____ _____

(Signature) (Date)

D. Take other action. (Please specify.)

_____

_____

_____

_____

_____ _____

(Signature) (Date)

Attachment: Staff Update on Petition CP 10-2 & HP 10-1, *Petition for Change to the Bunk Bed Standard*, with an Additional Update on Petition CP 03-1 & HP 03-1, *Petition Requesting Standard for Bunk Bed Cornerposts*, dated May 13, 2015

BRIEFING PACKAGE:

Petition CP 10-2 & HP 10-1, *Petition for Change to the Bunk Bed Standard*, and Petition CP 03-1 & HP 03-1, *Petition Requesting Standard for Bunk Bed Cornerposts*

May 13, 2015

For additional information, contact:

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EXECUTIVE SUMMARY

In this briefing package, staff of the U.S. Consumer Product Safety Commission (CPSC or Commission) updates the Commission on the status of two petitions for rulemaking related to 16 C.F.R. parts 1213, 1500, and 1513, referred to collectively as the "Bunk Bed Standard." Staff recommends that the Commission deny both petitions.

On April 16, 2010, the Commission was petitioned (Petition CP 10-2 & HP 10-1) to initiate rulemaking to revise the Bunk Bed Standard to incorporate requirements for head and neck entrapment testing in spaces created by side structures, such as ladders, provided with the bunk bed (Side Entrapment Petition). At the time, neither the Bunk Bed Standard, nor the ASTM International (ASTM) voluntary standard for bunk beds, ASTM F1427, *Standard Consumer Safety Specification for Bunk Beds*, included provisions intended to address side-structure entrapments.

CPSC staff analyzed 20 years of potentially relevant incident data and identified nine incidents that involved head or neck entrapment in a bunk-bed side structure that is not subject to entrapment testing in the Bunk Bed Standard. These nine incidents resulted in four fatalities and one minor injury. Staff's review of the incidents suggests that two of the four fatalities, the one minor injury, and two of the four incidents without injury, most likely would have been prevented by the provisions suggested by the petitioner. In response to the petition, the ASTM F15.30 Bunk Bed Subcommittee formed a task group charged with recommending revisions to the ASTM voluntary standard. Thus, CPSC staff forwarded to the Commission a briefing package with a recommendation to defer its decision on the petition. On April 12, 2011, the Commission voted unanimously to defer its decision and directed staff to work with the ASTM Bunk Bed Subcommittee to develop voluntary standard requirements that would address head and neck entrapments in side structures.

Since then, staff worked collaboratively with the ASTM Bunk Bed Subcommittee and the petitioner to develop entrapment provisions for bunk bed ladders and other side structures. On April 15, 2013, ASTM published a revision to the voluntary standard, ASTM F1427 – 13, that includes requirements for entrapment testing between all ladder structures, between ladder steps and the upper-bunk boundary, and along the entire boundary of the bunk bed between the lower-bunk foundation and the upper-bunk foundation (rather than in the end structures only). This testing is performed using the same probes that are specified in the mandatory Bunk Bed Standard and are based on the anthropometric dimensions of children at greatest risk of entrapment. The revised voluntary standard also requires, for bunk beds whose ladders are attached to the side of the lower bunk, that any gaps between the ladder and the lower-bunk mattress must be smaller than 1.88 inches or larger than 9 inches to avoid the potential for entrapment. These dimensions are based on child anthropometric data and the probes used in the Bunk Bed Standard for entrapment testing. Staff believes that these new provisions would have prevented the same fatalities and injury that would have been addressable through the petitioner's requested rulemaking.

In addition, staff's examination of incidents that the entrapment probes in the Bunk Bed Standard were intended to address reveals a substantial drop in reported incidents after 1995, with levels remaining low from 2005 onward. These data support the conclusion that the risk of head and

neck entrapment in end structures and guardrails is low, and suggest that testing with the probes specified in the Bunk Bed Standard is effective at reducing the incidence of head and neck entrapments, in general. Thus, staff believes that industry compliance with the voluntary standard's new side entrapment provisions would adequately address the risk of injury and death raised in the Side Entrapment Petition.

In addition to the Side Entrapment Petition, the Commission also was petitioned previously, on September 26, 2002, to establish a mandatory standard that prohibits bunk bed corner post extensions and finials (Petition CP 03-1 & HP 03-1; Corner Post Extension Petition). The petitioner asserted that these parts pose a substantial risk of injury or death to children from hanging, when clothing, bedding, or other items become caught on the extensions and finials. At the time of the petition, neither the Bunk Bed Standard, nor ASTM F1427, included requirements for corner post extensions and finials.

CPSC staff analyzed potentially relevant incident data covering nearly 24 years and identified six unintentional strangulations (fatalities) that are known to have involved a corner post extension or finial. Therefore, limiting or eliminating the height of corner post extensions and finials most likely would have addressed most or all these incidents. The ASTM Bunk Bed Subcommittee responded to the petition by committing to develop provisions to address the hazard posed by bunk bed corner post extensions and finials. As the Subcommittee was developing design or performance criteria, CPSC staff forwarded to the Commission a briefing package recommending that the Commission defer its decision on the petition. On July 30, 2004, the Commission voted unanimously to defer its decision and directed staff to work with the Bunk Bed Subcommittee to develop requirements to address the hanging hazard associated with corner post extensions and finials.

CPSC staff worked with the ASTM Bunk Bed Subcommittee to develop vertical protrusion provisions for bunk beds. Since 2007, the ASTM voluntary standard has included provisions that prohibit vertical protrusions and differences in fit between components on the top surface of an upper bunk that exceed $^{3}\!/_{16}$ inch (5 mm). The voluntary standard also requires all caps that are affixed to the top surface of bunk beds to taper, fit flush with the top of a corner post, and minimally overhang the edge of a corner post. Staff believes that conformance to these requirements adequately addresses the strangulation hazard posed by bunk bed corner post extensions and finials, and most likely would address the same six fatalities as the petitioner's requested rulemaking. Staff also notes that since ASTM added the vertical-protrusion provisions into the voluntary standard in 2007, the frequency of fatalities potentially relevant to the petition has declined, and there have been no confirmed fatalities involving a corner post extension or finial. Thus, staff believes that industry compliance with the revised voluntary standard would adequately address the risk of injury and death raised in this petition.

Besides staff's belief that the provisions in the current ASTM voluntary standard for bunk beds adequately address the risk of injury and death raised in both petitions, staff also believes that industry compliance with the voluntary standard is likely to be substantial. For example, industry conformance to the voluntary standard was previously estimated to be at least 90 percent and no evidence was obtained that would change this assessment. Furthermore, bunk bed manufacturers and their trade association, AHFA, report high levels of conformance; AHFA advocates conformance to the voluntary standard; many major retailers require that suppliers provide only

consumer products conforming to existing voluntary standards; and the incremental costs of conforming to the relevant voluntary standard provisions are low. Unlike the period before publication of the mandatory Bunk Bed Standard in 1999, small manufacturers now are more likely to be aware of the ASTM voluntary standard for bunk beds. Moreover, the risk of injury relevant to each petition is considerably lower than the risk of injury presented in 1999. All of these factors indicate that there is likely to be substantial compliance with the voluntary standard.

In conclusion, CPSC staff recommends that the Commission deny both petitions.

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
ROCKVILLE, MD 20850

This document has been electronically approved and signed.

MEMORANDUM

DATE: May 13, 2015

TO: The Commission
Todd A. Stevenson, Secretary

THROUGH: Stephanie Tsacoumis, General Counsel
Patricia H. Adkins, Executive Director
Robert J. Howell, Deputy Executive Director for Safety Operations

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

Timothy P. Smith, Bunk Bed Petition Project Manager,
Division of Human Factors, Directorate for Engineering Sciences

SUBJECT: Staff's recommendations regarding Petition CP 10-2 & HP 10-1, *Petition for Change to the Bunk Bed Standard*, and Petition CP 03-1 & HP 03-1, *Petition Requesting Standard for Bunk Bed Cornerposts*

I. INTRODUCTION

Staff of the U.S. Consumer Product Safety Commission (CPSC or Commission) prepared this memorandum to update and provide recommendations to the Commission regarding two petitions that requested amendments to the Commission's standard for bunk beds:

- Petition CP 10-2 & HP 10-1, *Petition for Change to the Bunk Bed Standard*, which requested the addition of requirements to protect against head and neck entrapment in the side structures of bunk beds ("Side Entrapment Petition")

- Petition CP 03-1 & HP 03-1, *Petition Requesting Standard for Bunk Bed Cornerposts*, which requested that the Commission ban corner post extensions and finials on bunk beds ("Corner Post Extension Petition")

Staff believes that current information does not support a conclusion that a rule is reasonably necessary to reduce an unreasonable risk of injury. At the time the respective petitions were submitted to the Commission, no requirements in voluntary or mandatory standards addressed the identified hazards. However, the ASTM International[1] (ASTM) voluntary standard, ASTM F1427, *Standard Consumer Safety Specification for Bunk Beds*, now includes provisions that address the hazards identified in both petitions. CPSC staff believes that these provisions

[1] Formerly known as the American Society for Testing and Materials.

adequately address the risk of injury and death raised in each petition. Additionally, staff believes that industry compliance with the voluntary standard is likely to be substantial. Therefore, CPSC staff recommends that the Commission deny both petitions.

II. BACKGROUND

A. FRAMEWORK FOR PETITIONS

The Commission's regulations governing petitions set out factors for the Commission to consider in granting or denying a petition. From 16 C.F.R. § 1051.9, these factors include:

- whether the product involved presents an unreasonable risk of injury;
- whether a rule is reasonably necessary to eliminate or reduce the risk of injury; and
- whether failure to initiate rulemaking would unreasonably expose petitioner or others to risk alleged by petitioner.

The Commission should consider these factors when determining the appropriate action for the two bunk bed petitions. In addition, 16 C.F.R. § 1051.9(b) states that, in considering these factors, the Commission shall consider the relative priority of the risk of injury identified in the petition and the Commission's resources available with respect to that risk of injury.

B. THE PRODUCT AND MARKET

A bunk bed is any bed or sleep structure with at least one mattress foundation whose underside is higher than 30 inches above the floor.[2] Typically, a bunk bed consists of two or more beds stacked above one another, with upright end structures at the head and foot of the bed. These end structures are joined by side elements that include support rails for each bed and, for each bed whose mattress-foundation underside is higher than 30 inches above the floor (commonly called an "upper bunk"), guardrails intended to prevent falls. Mattress foundation supports span the side support rails. Access to the upper bunk normally is provided by a ladder, which might lean onto the upper bunk, secure to the upper and lower bunks, or integrate into a side structure or end structure of the bunk bed.

CPSC staff estimates that more than 700 entities domestically manufacture or import bunk beds. According to staff of CPSC's Directorate for Economic Analysis (EC), consumers can acquire bunk beds through several channels, including furniture stores, department stores, specialty stores, mail orders, and the Internet. Consumers also may acquire used bunk beds through secondary markets. About 500,000 new bunk beds are sold annually, and the average retail price of a new bunk bed is about $350, with most priced from $150 to $1,400. Hence, the annual retail value of new bunk beds sold for residential use is about $175 million. Trade sources estimate the expected useful life of a bunk bed to be between 13 and 17 years. Based on this information, about 9 million bunk beds may be in use currently. (Peternel, 2011)

[2] 16 C.F.R. § 1213.2 and 1513.2 define a "bunk bed" as "a bed in which the underside of any foundation is over 30 inches (760 mm) from the floor." ASTM F1427 – 13, *Standard Consumer Safety Specification for Bunk Beds*, defines a "bunk bed" as "any structure that includes at least one sleeping surface in which the underside of any of its foundations is over 30 in. (762 mm) from the floor" (Section 3.1.5).

C. RELEVANT U.S. STANDARDS

The Commission regulates bunk beds under two statutes: the Consumer Product Safety Act (CPSA), for adult bunk beds, and the Federal Hazardous Substances Act (FHSA), for children's bunk beds. The regulations under both statutes are virtually identical and are codified at 16 C.F.R. parts 1213, 1500, and 1513, referred to collectively as the "Bunk Bed Standard." The Bunk Bed Standard was published in the *Federal Register* in 1999 (64 FR 71888), became effective on June 19, 2000, and applies to all bunk beds manufactured in the United States, or imported to the United States, on or after that date.

The Bunk Bed Standard is intended to reduce or eliminate the risk that children will die or be injured from entrapment between the upper bunk and the wall, in openings within and below the guardrails, or in openings in the end structures of bunk beds. The Bunk Bed Standard requires that bunk beds be tested for entrapment hazards using a wedge block that simulates the torso of a small 2-year-old child. The wedge block, illustrated in Figure 1, is used to probe spaces in the upper-bunk guardrails, between the guardrails and the upper-bunk mattress foundation, and in the end structures of the bunk bed, to identify openings that could allow feet-first torso entry and lead to head or neck entrapment. During testing, the wedge block must not pass through any opening in the upper-bunk end structure, or in any space between the uppermost member of the upper-bunk guardrail and the underside of the upper-bunk foundation. Openings in the lower-bunk end structure also must not permit passage of the wedge block, unless the openings are large enough to permit passage of a 9-inch diameter rigid sphere, which represents the space needed to withdraw a 5-year-old child's head. Furthermore, openings that permit passage of the 9-inch sphere must be tested for neck entrapment, using a specially designed probe that simulates a child's head and neck, illustrated in Figure 2. These entrapment tests are performed first with no mattress on the bed, and then with the manufacturer's recommended maximum-thickness mattress in place.

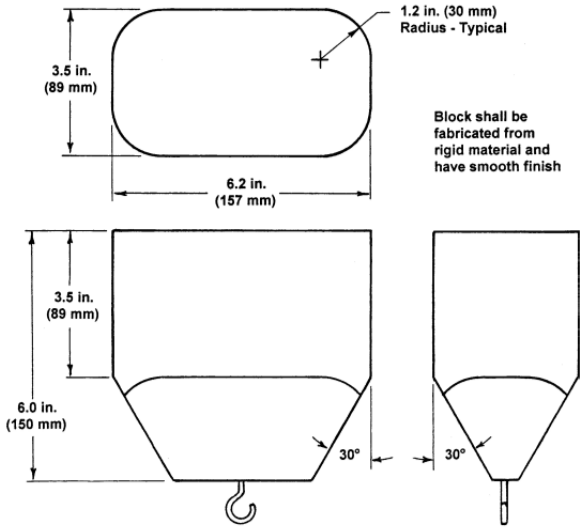

FIGURE 1. Torso entrapment probe (wedge block).
From 16 CFR parts 1213 and 1513.

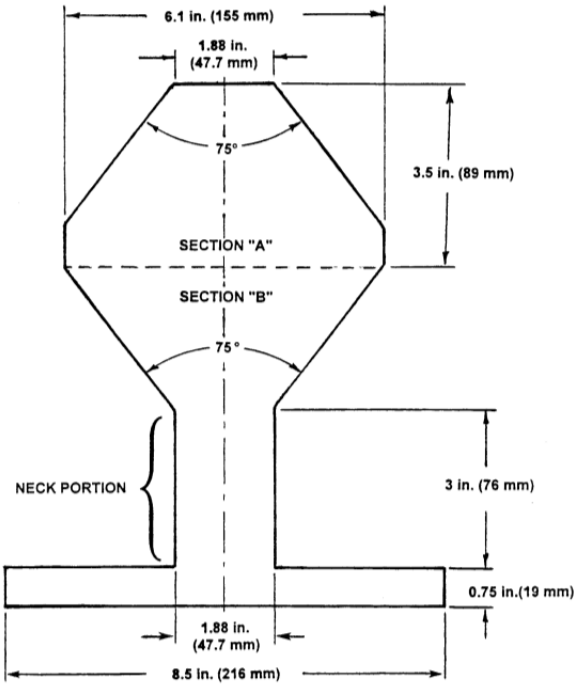

FIGURE 2. Neck entrapment probe.
From 16 CFR parts 1213 and 1513.

The ASTM voluntary standard, ASTM F1427, *Standard Consumer Safety Specification for Bunk Beds*, was developed by the ASTM F15.30 Subcommittee on Bunk Beds and contains additional requirements for the design and performance of bunk beds. These additional requirements address hazards associated with falls from the upper bunk, entrapments, the structural integrity of the foundation support system, and hangings from vertical protrusions. Some of these requirements, namely those that are relevant to the petitions to be discussed, are described below. The current version of the standard was published in 2013 (ASTM F1427 – 13).

III. SIDE ENTRAPMENT PETITION

A. PETITION INFORMATION AND INITIAL STAFF BRIEFING PACKAGE

On April 16, 2010, Carol Pollack-Nelson, Ph.D., of Independent Safety Consulting (the petitioner), requested that the Commission initiate rulemaking to revise the Bunk Bed Standard to add requirements for head and neck entrapment testing in spaces created by side structures, such as ladders, provided with the bunk bed. The Bunk Bed Standard does not include provisions to address entrapments in side structures other than upper-bunk guardrails. Likewise, when Dr. Pollack-Nelson petitioned the Commission, the ASTM F1427 voluntary standard on bunk beds also lacked provisions intended to address side-structure entrapments.[3]

On April 6, 2011, CPSC staff forwarded to the Commission a briefing package containing staff's initial assessment of the petition and recommendation for Commission action (Smith, 2011). As described in that package, staff examined 17 years of incident data—covering 1993 through 2009—and identified eight incidents that involved head or neck entrapment in a bunk-bed side structure that the Bunk Bed Standard does not require to be tested for entrapment. Four of the eight incidents were fatalities, and one incident was a minor injury; the remaining three incidents did not result in injury.

Based on its review of the incidents, staff concluded that two of the four fatalities, the one minor injury, and two of the three incidents without injury, most likely would have been prevented with the provisions suggested by the petitioner. The three remaining incidents involved children younger than 2 years old, which is the low end of the age range on which the entrapment probes in the Bunk Bed Standard are based.[4] However, because the probes were designed based on the anthropometric dimensions of the *smallest* 2-year-olds, some children younger than 2 years old will have dimensions that are physically larger than the probe dimensions. Thus, one or more of the incidents involving these younger children also might have been prevented with the provisions suggested by the petitioner.

Before staff completed the initial briefing package, the ASTM F15.30 Bunk Bed Subcommittee formed a task group charged with recommending revisions to the ASTM F1427 voluntary standard to address the concerns raised by the petition. Thus, staff concluded the briefing package with a recommendation that the Commission defer its decision on the petition while work on changing the voluntary standard was underway. On April 12, 2011, the Commission

[3] The then-current published version of the voluntary standard was ASTM F1427 – 07.
[4] For example, as mentioned earlier, the wedge block was designed based on the anthropometric dimensions of a small 2-year-old.

voted unanimously (5–0) to defer its decision on the petition and directed staff to work with the ASTM Bunk Bed Subcommittee to develop voluntary standard requirements that would address head and neck entrapments in side structures.

B. SUBSEQUENT STAFF UPDATES AND BUNK BED SUBCOMMITTEE ACTIVITIES

Since the Commission's initial deferral, CPSC staff worked collaboratively with the Bunk Bed Subcommittee and the petitioner to develop provisions to ASTM F1427 that would address head and neck entrapments in side structures. These development efforts have been described in detail in two separate memoranda to the Commission that provided updates on the progress of the Bunk Bed Subcommittee in developing such provisions (Smith, 2011a; Smith, 2012). On April 15, 2013, ASTM published a revised voluntary standard, ASTM F1427 – 13, that adds the following requirements:

- Entrapment testing with the probes used in the CPSC Bunk Bed Standard must be performed
    - along the entire boundary of the bunk bed between the lower-bunk foundation and the upper-bunk foundation, not just at the end structures;
    - between all ladder structures, including ladder steps or rungs; and
    - between ladder steps and the upper-bunk boundary.
- For ladders attached to the side of the lower bunk, any gaps between the ladder and the lower-bunk mattress must be smaller than 1.88 inches or larger than 9 inches.[5]

These requirements meet or exceed the requirements sought by the petitioner, and therefore, would address the same fatalities and injury that would be addressable through the requested rulemaking. In addition, as discussed in section III.E.1 of this memorandum, *Adequacy of Voluntary Standard Provisions* (p. 7), staff believes that these requirements adequately address the risk of injury.

C. INCIDENT DATA UPDATE

As discussed in Tab A, staff of CPSC's Division of Hazard Analysis, Directorate for Epidemiology (EPHA), searched CPSC data sources for petition-relevant incidents that were reported to CPSC from the end of 2009, which was the end date for data included in the original 2011 briefing package, through the end of 2012. A multidisciplinary team of CPSC staff then reviewed the incidents uncovered by EPHA staff and concluded that one additional incident from

[5] More specifically, this measurement refers to the distance between the interior vertical stiles, which are the upright components of the ladder, and the portion of the manufacturer's recommended mattress height above the side rail. The 1.88-inch measurement is based on child anthropometric data and the compressibility of the neck, and is the relevant dimension used in the Bunk Bed Standard's neck entrapment probe. The 9-inch measurement is based on the 9-inch sphere that is used in the Bunk Bed Standard and elsewhere in the ASTM voluntary standard for entrapment testing.

this timeframe might be within the scope of the petition. Therefore, the total number of petition-relevant incidents over the 20 years from 1993 through 2012 is nine.

The one additional incident involved an 18-month-old and did not result in injury. Like the other in-scope incidents involving children younger than 2 years old, staff cannot be certain whether the petitioner's proposed entrapment provisions for side structures would have prevented the incident. More importantly, the details surrounding the incident suggest that the use of a wrong-size mattress was a contributing factor. Thus, staff believes that side-entrapment provisions are unlikely to have addressed this incident.

In summary, the available incident data suggest that the side-entrapment provisions sought by the petitioner most likely would have prevented five incidents—two fatalities, one minor injury, and two incidents without injury—based on the 20 years of incident data staff examined. The provisions also might have addressed one or more incidents involving children younger than 2 years old.

D. RELEVANT RECALLS

As discussed in Tab B, staff of CPSC's Division of Regulatory Enforcement, Office of Compliance (CRE), examined bunk bed-related recalls conducted by the Office of Compliance and Field Operations from 1990 to the present. Staff identified 50 consumer-level recalls during this timeframe. None of these recalls involved entrapment in a side structure or in the spaces created by a side structure (*i.e.*, the hazard identified in the petition).

E. ANALYSIS OF PETITION FACTORS

Earlier in this memorandum, CPSC staff identified the following factors for the Commission to consider in granting or denying a petition (16 C.F.R. § 1051.9):

- whether the product involved presents an unreasonable risk of injury
- whether a rule is reasonably necessary to eliminate or reduce the risk of injury
- whether failure to initiate rulemaking would unreasonably expose petitioner or others to risk alleged by petitioner

Additionally, as mentioned earlier, 16 C.F.R. § 1051.9(b) states that when considering the above factors, the Commission shall consider the relative priority of the risk of injury identified in the petition and the Commission's resources available for that risk of injury.

Staff believes that the relative infrequency of petition-relevant injuries and deaths in the incident data, combined with the lack of recalls related to entrapment in side structures, do not support a conclusion that bunk beds present an unreasonable risk of injury from entrapments in spaces created by side structures provided with the beds. Specifically, staff has identified only two deaths and one minor injury over 20 years that are likely to be addressable by side-entrapment provisions, and there have been no recalls relevant to the petition in more than 24 years. Furthermore, given the ASTM voluntary standard's adoption of provisions intended to address the risk identified in the petition, staff believes that current information does not support a conclusion that a rule is reasonably necessary to reduce the risk of injury, or that failure to

initiate rulemaking would unreasonably expose the petitioner or others to the risk of injury. These issues are discussed in more detail below.

1. ADEQUACY OF VOLUNTARY STANDARD PROVISIONS

As mentioned earlier, ASTM has published a new revision of the voluntary standard for bunk beds, ASTM F1427 – 13, *Standard Consumer Safety Specification for Bunk Beds*, which includes entrapment provisions for ladders and other side structures. These provisions address the risk of injury identified by the petition, by requiring entrapment testing between all ladder structures, between ladder steps and the upper-bunk boundary, and along the entire boundary of the bunk bed between the lower-bunk foundation and the upper-bunk foundation (rather than in end structures only). This entrapment testing is performed using the same probes that are specified in the mandatory Bunk Bed Standard and is designed based on the anthropometric dimensions of those children at greatest risk of entrapment.

In addition, for bunk beds whose ladders are attached to the side of the lower bunk, the revised voluntary standard requires any gaps between the ladder and the lower-bunk mattress to be smaller than 1.88 inches or larger than 9 inches, to avoid the potential for entrapment. The 1.88-inch measurement is based on child anthropometric data and the compressibility of the neck, and is the relevant dimension used in the Bunk Bed Standard's neck entrapment probe (see Figure 2, earlier in this memorandum). The 9-inch measurement is based on the 9-inch sphere that is used during entrapment testing, as specified in the Bunk Bed Standard and the voluntary standard.

The Bunk Bed Subcommittee worked collaboratively with CPSC staff and the petitioner to develop the entrapment provisions, which meet or exceed the provisions originally sought by the petitioner. Because these provisions require testing that relies upon the same probes and anthropometric data specified in the mandatory Bunk Bed Standard, and because bunk beds that conform to these provisions would physically prevent most children from becoming entrapped, staff believes that the provisions are likely to be effective at reducing or eliminating the risk of entrapment. Thus, staff believes that the new voluntary standard provisions adequately address the risk of injury identified in the petition.

Another indication of the effectiveness of the new voluntary standard provisions would be a change in the incidence of injuries and deaths related to the risk of injury identified in the petition. However, the recent (2013) publication date of the revised ASTM voluntary standard does not provide a sufficient period in which to assess the impact of the voluntary standard provisions on side-entrapment incidents. Furthermore, even if the post-publication timeframe were longer, the rarity of these types of incidents, and the 13- to 17-year useful life of a bunk bed, suggest that a pre- versus post-publication assessment of the effect of the voluntary standard's provisions in reducing these incidents would be extremely difficult.

Nevertheless, the new provisions' reliance on the probes specified in the mandatory Bunk Bed Standard suggests that assessing the likely impact of these provisions might be possible by evaluating the apparent effectiveness of the Bunk Bed Standard in addressing entrapments in end structures and guardrails via these probes. For example, a decline in entrapments in end structures and guardrails since the Bunk Bed Standard became effective might suggest that the voluntary standard's reliance on the same probes to address side entrapments is likely to be

effective.[6] To provide some insight into this issue, EPHA staff searched CPSC data sources for incidents that occurred from 1990 through 2012, that the entrapment probes in the Bunk Bed Standard were intended to address. As discussed in Tab C, staff identified 142 relevant and potentially relevant incidents, distributed as shown in Figure 3. These are only reported incidents and may not represent the true number of incidents of entrapment over time. Figure 3 shows that reported incidents dropped substantially after 1995, with levels remaining low from 2005 onward.

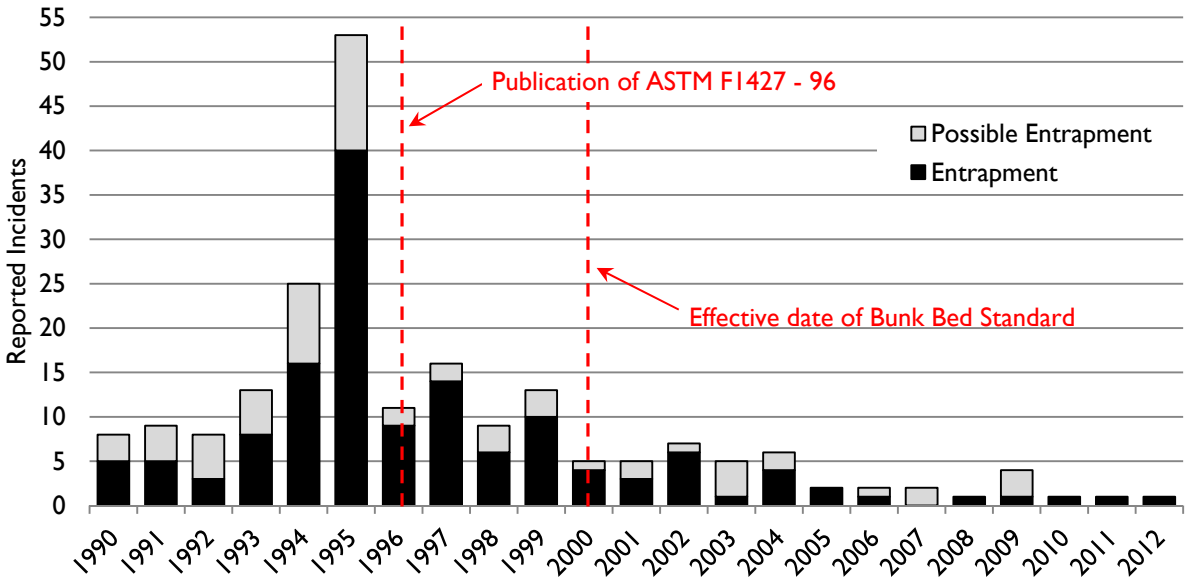

FIGURE 3. Reported incidents of entrapments addressed by the Bunk Bed Standard.
Based on Figure 1 in EPHA staff memorandum, Tab C.

Although, as Figure 3 indicates, the Bunk Bed Standard did not become effective until June 19, 2000, versions of the voluntary standard that preceded the Bunk Bed Standard included some provisions for entrapment testing using probes that ultimately were incorporated into the Bunk Bed Standard. For example, ASTM F1427 – 96, published in September 1996 (also indicated in Figure 3), required entrapment testing in guardrails and in the upper- and lower-bunk end structures with the wedge probe. Prior versions of the voluntary standard also required entrapment testing using the wedge probe, albeit to a lesser extent.[7] Thus, a drop in reported entrapments before the Bunk Bed Standard took effect is not surprising, and the relatively steady drop in reported entrapments since 1995 is encouraging. These data support the conclusion—acknowledged in the petition—that the risk of head and neck entrapment in end structures and guardrails is low. In addition, these data suggest that testing with the probes specified in the Bunk Bed Standard is effective at reducing the incidence of head and neck entrapments, in general.

[6] Staff recognizes, however, that the magnitude of any decline also depends on the level of industry conformance to the Bunk Bed Standard.
[7] For example, in the 1994 version of the voluntary standard, lower-bunk end structures were not required to be tested for entrapment using the wedge probe.

In conclusion, the available petition-relevant incident data suggest that the side-entrapment provisions sought by the petitioner most likely would have prevented two fatalities, one minor injury, and two incidents without injury during the 20 year-period examined. CPSC staff believes that the side-entrapment provisions that have been incorporated into the latest revision of the ASTM voluntary standard would prevent the same fatalities and injury. Thus, staff believes that industry compliance with the revised voluntary standard would adequately address the risk of injury and death raised in the petition.

2. COMPLIANCE WITH VOLUNTARY STANDARD

The CPSA and FHSA state that the Commission may not deny a petition on the basis of an existing voluntary standard, unless the Commission has determined that the voluntary standard is likely to result in the elimination or adequate reduction of the risk of injury identified in the petition, and compliance with that standard is likely to be substantial.[8] Neither the CPSA nor the FHSA define "substantial compliance," and this phrase does not imply that industry conformance to the voluntary standard must be a particular percentage. Rather, the relevant issue is whether the level of compliance is sufficient to adequately reduce the risk, assuming that the risk in question is an unreasonable one.

In 1999, when the CPSC Bunk Bed Standard was published, staff estimated industry conformance with the ASTM voluntary standard to be 90 percent or more of bunk beds in production (Preston, 1999; specifically, see Karels, 1999), and received no adverse comment on this assessment. Despite the high level of conformance, the Commission concluded that there was not "substantial compliance" with the voluntary standard (64 FR 71888). The primary grounds for the Commission's decision appear to be twofold:

1. Tolerance for nonconformance "must bear some relationship to the magnitude and manageability of the hazard addressed," and the risk of injury to infants and young children was high enough that the industry's compliance rate was not "substantial."

2. Smaller manufacturers might be less aware than larger manufacturers of a standard for bunk beds, because the only standard in effect was the voluntary one.

Comprehensive data on the current level of industry conformance to the ASTM F1427 voluntary standard are not available. However, for the following reasons, CPSC staff believes that compliance is substantial (Tab D):

- *A recent survey of bunk bed manufacturers and importers, by the trade association that represents the bunk bed industry, did not identify any companies that failed to conform.* The American Home Furnishings Alliance (AFHA), a trade organization that represents

[8] See section 9(i) of the CPSA, 15 U.S.C. 2058(i), and section 3(j) of the FHSA, 15 U.S.C. 1262(j). In addition, the CPSA and FHSA state that if the Commission were to grant the petition and begin rulemaking, the Commission could not issue a rule unless the Commission finds that: (1) compliance with the voluntary standard is unlikely to eliminate or adequately reduce the risk of injury, or (2) substantial industry compliance with the voluntary standard is unlikely. See section 9(f)(3)(D) of the CPSA, 15 U.S.C. 2058(f)(3)(D), and section 3(i)(2) of the FHSA, 15 U.S.C. 1262(i)(2).

the home furnishings industry, has reported that all 11 of its member companies that produce or import bunk beds conform to the ASTM voluntary standard. In addition, all 15 non-member companies who responded to AHFA's inquiry about their awareness of, and conformance to, the voluntary standard reported that they comply.[9] Another two non-member companies did not reply but made statements of conformance on their websites. The AHFA did not identify any companies that did not conform.

- *AHFA promotes conformance to the voluntary standard.* The bunk bed market has undergone changes in recent years, with a greater proportion of bunk beds produced abroad. AFHA recognized this changing market and responded by expanding its membership criteria to include importers.[10] A representative of the AHFA serves as the Chairman of the ASTM Bunk Bed Subcommittee, and the AHFA promotes the voluntary standard to its members. One of the AHFA's product safety goals for 2013 was to engage in consumer education that promotes member company products that comply with voluntary safety standards.[11] Staff expects this education and promotion to continue.

- *Bunk bed manufacturers have reported to CPSC staff that they conform or intend to conform*. EC staff identified and contacted seven bunk bed manufacturers to inquire about their conformance to the ASTM voluntary standard. Five responded, but two no longer manufacture bunk beds. All three of the remaining bunk bed manufacturers confirmed that they either conform or intend to conform to the voluntary standard.

- *Many major retailers require that suppliers provide only consumer products conforming to existing voluntary standards*. Leading bunk bed retailers may specify that bunk beds are to meet both the mandatory and voluntary standards. For example, EC staff has confirmed that Walmart requires bunk beds to conform to the ASTM voluntary standard.

- *The costs to conform to the new side-entrapment provisions are low.* According to staff of CPSC's Division of Mechanical Engineering, Directorate for Laboratory Sciences (LSM; see Tab E), testing to the ASTM voluntary standard's new side-entrapment provisions requires neither substantial extra time, nor new materials, and updating existing bunk bed designs or retrofitting current stock to meet the new requirements is unlikely to be overly burdensome. Moreover, recent discussions between EC staff and bunk bed manufacturers' representatives suggest that conformance to the revised ASTM voluntary standard could be done easily, with only small marginal increases in costs.

- *Smaller manufacturers are likely to be more aware of bunk bed standards now than they were before publication of the mandatory Bunk Bed Standard*. Although CPSC staff

[9] AFHA attempted to contact 36 non-member companies regarding this issue.
[10] In 1999, the trade organization—then known as the American Furniture Manufacturer's Association—limited membership to companies with manufacturing facilities in the U.S. However, in 2004, AHFA dropped this requirement to open membership to any company that makes or imports home furnishings products, including bunk beds, for wholesale distribution.
[11] See the AFHA's Annual Membership Report, *2012 Year in Review, 2013 Look Ahead*, at http://www.ahfa.us/uploads/documents/yearinreview.pdf.

acknowledges that firms generally are more likely to be aware of mandatory standards than voluntary standards, the current existence and enforcement of the Bunk Bed Standard arguably raises small manufacturers' awareness of all bunk bed standards, relative to 1999.[12] Thus, smaller manufacturers are more likely to be aware of the ASTM voluntary standard, and manufacturers who were unaware of the voluntary standard before 1999 are more likely now to be aware. Moreover, CPSC staff has called attention to the voluntary standard and has stated that CPSC will consider this standard when investigating whether a bunk bed presents a substantial risk of injury that might require corrective action.

Given the factors above, CPSC staff believes that industry conformance to the voluntary standard is likely to be at least at the same 90-percent level estimated in 1999. Furthermore, staff believes that most bunk beds will continue to be produced in conformance with the current ASTM voluntary standard.

As noted earlier in this memorandum, of the primary grounds on which the Commission previously (in 1999) decided that 90 percent conformance to the voluntary standard was not "substantial compliance" was that tolerance for nonconformance "must bear some relationship to the magnitude and manageability of the hazard addressed" (64 FR 71888). CPSC staff notes that the risk of injury and death relevant to the petition is considerably smaller than the risk presented in 1999, when staff recommended that the Commission issue a final rule for bunk beds. At that time, staff identified 57 rulemaking-relevant entrapment deaths over a span of about 9 ½ years, and estimated that about 10 bunk bed-related entrapment deaths had occurred in the United States each year since 1990. In contrast, staff has identified only four entrapment deaths over 20 years that are relevant to the current petition.[13] This equates to roughly one death every 5 years,[14] and the Commission previously noted that a strict substantial-compliance analysis may not be required for products that rarely cause death (64 FR 71888). Furthermore, the two petition-relevant deaths that occurred during the most recent 10 years of examined incident data involved manufacturers who are represented in the Bunk Bed Subcommittee and who are committed to producing bunk beds that conform to the latest revision of the voluntary standard. Thus, staff believes that, taking into consideration the risk identified in the petition, the current level of industry conformance to the ASTM voluntary standard could reasonably be considered substantial.

In conclusion, CPSC staff believes that the revised ASTM voluntary standard for bunk beds adequately addresses the risk of injury and death identified in the petition and also believes that industry compliance with the voluntary standard is likely to be substantial.

[12] As noted in the 1999 final rule (64 FR 71888), what constitutes "substantial compliance" is a function of the point in time at which the issue is examined.
[13] Only two are most likely to be addressable by the petitioner's requested rulemaking.
[14] One death every 10 years, if one focuses on the fatalities most likely to be addressable by the petitioner's requested rulemaking.

IV. CORNER POST EXTENSION PETITION

A. PETITION INFORMATION AND INITIAL STAFF BRIEFING PACKAGE

On September 26, 2002, the Danny Foundation (the petitioner) requested that the Commission establish a mandatory standard banning corner post extensions and finials.[15] The petitioner asserted that corner post extensions, which are the purely decorative portions of the uppermost corner post, and ornamental finials on bunk beds pose a substantial risk of injury or death to children from hanging when their clothing, bedding, or other items catch on these parts of the bunk bed. At the time the petition was submitted, neither the Bunk Bed Standard nor ASTM F1427 included requirements for corner post extensions and finials. CPSC's Office of the General Counsel docketed the request for rulemaking as Petition CP 03-1, under provisions of the CPSA, and as Petition HP 03-1, under provisions of the FHSA.

On April 13, 2004, CPSC staff forwarded to the Commission a briefing package containing staff's initial assessment of the petition and recommendation for Commission action (Sweet, 2004). As described in that package, staff identified four fatal hanging incidents during the 13-year period from 1990 through 2002 that were known to have involved a bunk bed corner post extension or finial. Staff identified 43 other bunk bed-related hanging incidents, and some of these incidents also might have involved a corner post extension or finial. As staff prepared its briefing package, the ASTM Bunk Bed Subcommittee committed to developing voluntary standard provisions for bunk bed corner post extensions and finials, and already had developed draft warning label language related to the hanging hazard. By the time the briefing package went to the Commission, the Subcommittee was developing design or performance criteria for corner post extensions and finials.

Staff's briefing package concluded with a recommendation that the Commission defer its decision on the petition. On July 30, 2004, the Commission voted unanimously (3–0) to defer the petition and directed staff to work with the Bunk Bed Subcommittee to develop voluntary standard requirements to address the hanging hazard associated with corner post extensions and finials.

B. BUNK BED SUBCOMMITTEE ACTIVITIES

As staff of CPSC's Office of Hazard Identification and Reduction (EXHR) discusses in Tab F, and as mentioned previously, the Bunk Bed Subcommittee began to pursue two courses of action in 2004 to address the hanging hazard associated with corner post extensions and finials. First, the Subcommittee developed strangulation warning language intended to mitigate incidents of consumers tying extraneous items that could act as ligatures, such as belts and jump ropes, to various parts of the bed. Concurrently, the Bunk Bed Subcommittee began to develop performance and design requirements intended to prevent items that are worn on the body from

[15] The petitioner originally requested that the Commission establish a mandatory standard for corner posts and finials. However, a corner post is a functional support column that extends from the floor to the top of the upper bunk guardrail or end panel. Staff confirmed with the petitioner that the request for rulemaking was specific to corner post *extensions*, which are the portions of corner posts that do not provide support or a means of attachment for the guardrail or end panel.

catching on corner post extensions, or similar vertical protrusions on the top surfaces of a bunk bed, as the occupant descends. The vertical protrusion requirements were intended to address the specific hazard raised in the petition.

Since then, the Subcommittee developed the following two provisions to ASTM F1427 for vertical protrusions:[16]

- All vertical protrusions along the top inside surfaces of any individual component (including but not limited to bed end structures and guard rails) of the upper bunk shall not extend more than $^{3}\!/_{16}$ in. (5 mm) above the upper edge of the adjacent surface. Ladder stiles (uprights) shall not extend more than $^{3}\!/_{16}$ in. (5 mm) above the upper edge of the adjacent surface.

- Any cap used along the top surface of the upper bunk shall not have a vertical protrusion greater than $^{3}\!/_{16}$ in. (5 mm) at the edge of the protrusion above the upper edge of the adjacent surface. If the cap is flush with or overhangs the edge of the corner post or other vertical protrusion, the maximum vertical protrusion shall not exceed $^{3}\!/_{16}$ in. (5 mm). The cap shall have a maximum height of no more than 20 % of the width or diameter of the cap. At no point shall the cap overhang the post more than $^{1}\!/_{16}$ in. (2 mm). The cap shall fit flush with the top of the corner post.

Essentially, these provisions prohibit vertical protrusions and differences in fit between components on the top surface of an upper bunk that exceed $^{3}\!/_{16}$ inch (5 mm). The second provision also requires caps to taper, fit flush with the top of a corner post, and minimally overhang the edge of a corner post. ASTM published the revision to ASTM F1427 that included these vertical protrusion provisions in August 2007 (ASTM F1427 – 07).

C. INCIDENT DATA UPDATE

As discussed in Tab G, EPHA staff completed a new search of CPSC data sources for bunk bed-related incidents that most likely are relevant to the petition because they involve hangings or strangulations associated with a corner post of a bunk bed, and therefore, might have involved a corner post extension or finial.[17] Staff identified 16 cases of unintentional strangulation involving bunk bed corner posts from 1990 through October 31, 2013, a period of nearly 24 years. Fifteen of the incidents resulted in a fatality and the remaining one resulted in minor bruising. Six of the 16 cases—all fatalities—are known to have involved a corner post extension or finial and clearly are within the scope of the petition. Thus, limiting or eliminating the height of corner post extensions and finials would have addressed most or all these six incidents, in all likelihood. In

[16] In the standard, one of these provisions includes a reference to a supporting figure. Staff removed this reference here to avoid confusion. The "caps" identified in the second provision refer to ones that are affixed to the top surface of some bunk beds, typically at the corner posts, to cover holes that are intended to allow for flexibility of features if a bunk bed is no longer in a bunked configuration.

[17] Except for those incidents that staff could not rule out because the incidents were known to have involved a portion of the corner post other than a corner post extension or finial. Such cases of strangulation typically involved a secondary product tied to some lower portion of the corner post.

the remaining 10 incidents involving a corner post, staff could not determine whether the ligature was tied to the functional lower corner post or became caught on a decorative corner post extension or finial. Some of these 10 incidents might have involved a corner post extension or finial, and also might be addressable by limiting or eliminating the heights of these portions of the bunk bed.

EPHA staff identified 52 other reported incidents that involved strangulation on a bunk bed during the same timeframe (1990 through October 31, 2013), but could not determine what part of the bunk bed, if any, was involved. Some of these 52 incidents might be within the scope of the petition, but staff found that most strangulation incidents that include enough details to identify the part of the bunk bed involved do not involve a corner post.[18] Thus, few of the 52 unknown incidents are likely to have involved a corner post, and even fewer are likely to have involved a corner post extension or finial.

In summary, a ban on corner post extensions and finials, as the petitioner requested, most likely would have prevented six fatalities during the nearly 24 years of incident data that staff examined, and such a ban might have prevented some additional incidents during this timeframe.

D. RELEVANT RECALLS

As discussed earlier concerning the Side Entrapment Petition, and as detailed in Tab B, CRE staff examined bunk bed-related recalls conducted by the Office of Compliance and Field Operations from 1990 through the present. Staff identified 50 consumer-level recalls during this timeframe: 26 recalls associated with entrapment hazards and 24 recalls associated with collapse or fall hazards. None of these recalls involved the strangulation hazard posed by corner post extensions or finials.

E. ANALYSIS OF PETITION FACTORS

Again, staff refers the reader to the following factors for the Commission to consider in granting or denying a petition (16 C.F.R. § 1051.9):

- whether the product involved presents an unreasonable risk of injury
- whether a rule is reasonably necessary to eliminate or reduce the risk of injury
- whether failure to initiate rulemaking would unreasonably expose petitioner or others to risk alleged by petitioner

Additionally, as mentioned earlier, 16 C.F.R. § 1051.9(b) states that when considering the above factors, the Commission shall consider the relative priority of the risk of injury identified in the petition and the Commission's resources available with respect to that risk of injury.

As with the Side Entrapment Petition, staff believes that the relative infrequency of petition-relevant injuries and deaths, combined with the lack of relevant recalls, do not support a

[18] EPHA staff identified 91 bunk bed-related strangulation incidents. As noted earlier, in 52 incidents staff could not determine the part of the bunk bed, if any, was involved in the strangulation. Of the remaining 39 incidents, 23 involved strangulation on a part of the bunk bed other than the corner post.

conclusion that bunk beds present an unreasonable risk of injury from strangulations on corner post extensions and finials. Specifically, over a period of about 24 years, staff has identified only six deaths that are likely to be relevant to the petition, and there have been no relevant recalls. Furthermore, given the ASTM voluntary standard's adoption of provisions intended to address the risk identified in the petition, staff believes that current information does not support a conclusion that a rule is reasonably necessary to reduce the risk of injury, or that failure to initiate rulemaking would unreasonably expose the petitioner or others to the risk of injury. These issues are discussed in more detail below.

1. ADEQUACY OF VOLUNTARY STANDARD PROVISIONS

As discussed earlier, ASTM F1427 has included provisions since 2007 that address the risk of injury identified by the petition by prohibiting vertical protrusions and differences in fit between components on the top surface of an upper bunk that exceed $^{3}/_{16}$ inch (5 mm), and requiring caps to taper, fit flush with the top of a corner post, and minimally overhang the edge of a corner post. The Bunk Bed Subcommittee previously concluded that the $^{3}/_{16}$ inch (5 mm) dimension is the tightest achievable tolerance in the mass production of bunk beds.[19] In addition, as discussed in Tab F, the vertical protrusion performance requirements specified in ASTM F1427 are nearly identical, in terms of maximum height and tapered shape, to those specified in the sole international standard for bunk beds that includes such requirements: the Australian and New Zealand Standard, AS/NZS 4220 *Bunk Beds and Other Elevated Beds*. Thus, staff believes that conformance to these requirements most likely would address the same six fatalities as the petitioner's requested rulemaking, and that the voluntary standard provisions adequately address the risk of injury identified in the petition.

Given the infrequency of incidents relevant to the petition, and the relatively long useful life of a bunk bed, assessing the impact of the voluntary standard provisions on reducing injuries or deaths is challenging, and a definitive answer to this question may be unattainable. Nevertheless, the available incident data provide some limited insight into this issue. As noted earlier, and as EPHA staff discusses in Tab G, staff identified 16 unintentional strangulations involving bunk bed corner posts over about 24 years. Fifteen of these 16 strangulations were fatal. Figure 4 (next page) plots these 15 fatalities over time,[20] and distinguishes between those fatalities known to have involved a corner post extension or finial, and those fatalities that only might have involved a corner post extension or finial.

As Figure 4 illustrates, the frequency of fatalities relevant to the petition seems to decline after publication of ASTM F1427 – 07. For example, staff has received reports of six fatalities, four of which definitely involved a corner post extension, in the 6 years before publication of ASTM F1427 – 07 (2001–2006). In contrast, staff has received reports of three fatalities, *none* of which are confirmed to have involved a corner post extension, in the 6 years after publication (2008–2013). In addition, all six fatal incidents that are known to have involved a corner post extension

[19] According to a 2006 Subcommittee ballot item related to the vertical protrusion requirement, cited in correspondence dated July 3, 2006, to the Subcommittee Chair by Susan Bathalon. (Available online at http://www.cpsc.gov/PageFiles/114730/f1427.pdf)

[20] The one injury (minor bruising) that occurred during the same timeframe and might have involved a corner post extension happened in 1994.

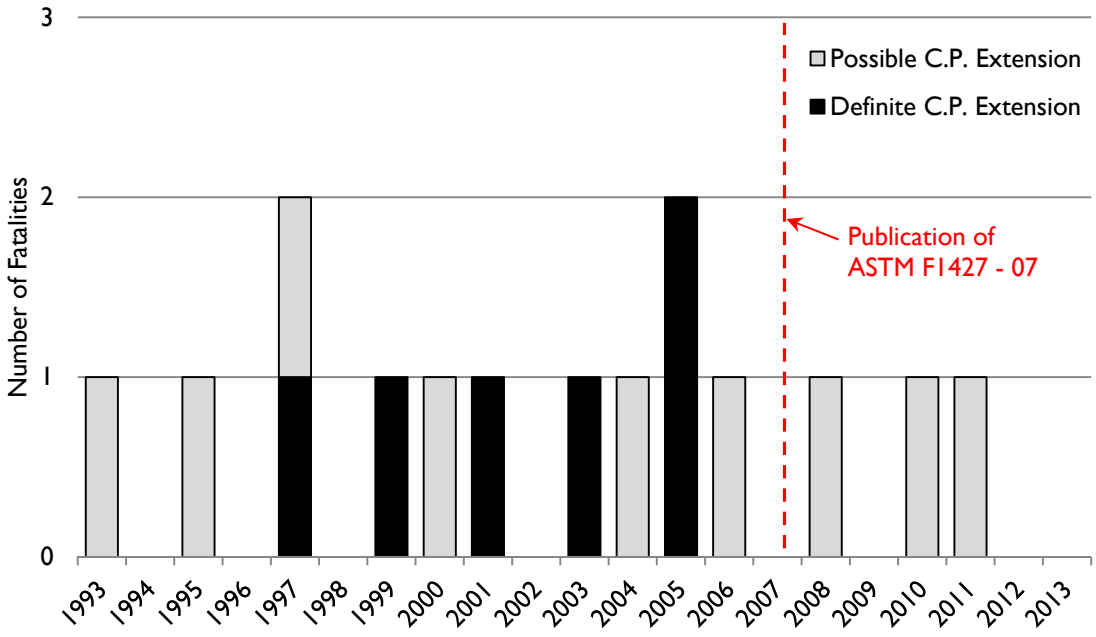

FIGURE 4. Fatalities relevant to the Corner Post Extension Petition.

or finial happened before publication; in other words, there have been no confirmed fatalities involving a corner post extension or finial since ASTM incorporated the vertical protrusion provisions into the voluntary standard. Although staff recognizes that these data do not prove that the voluntary standard's vertical protrusion provisions have been effective, the data are consistent with this hypothesis.

In conclusion, the available petition-relevant incident data suggest that the petitioner's sought-after ban on corner post extensions and finials most likely would have prevented six fatalities during the 24 years for which incident data were examined. Staff believes that the vertical protrusion provisions that have been added to the voluntary standard are likely to have addressed the same six fatalities. Moreover, there have been no confirmed fatalities involving a corner post extension or finial since these provisions were added in 2007. Thus, staff believes that industry conformance with the revised voluntary standard would adequately address the risk of injury and death raised in the petition.

2. COMPLIANCE WITH VOLUNTARY STANDARD

As discussed earlier regarding the Side Entrapment Petition, both the CPSA and FHSA state that the Commission may not deny a petition on the basis of an existing voluntary standard, unless the Commission has determined that the voluntary standard is likely to result in the elimination or adequate reduction of the risk of injury identified in the petition, and compliance with that standard is likely to be substantial.[8] CPSC staff believes that industry conformance with the ASTM voluntary standard is likely to be high for the same reasons discussed earlier regarding the Side Entrapment Petition (see staff's earlier discussion, starting on page 9). Staff also believes that the costs to conform to the vertical protrusion provisions in the voluntary standard are low because testing involves taking simple measurements, and manufacturing bunk beds to

conform to the relevant requirements most likely would entail making simple design changes, such as eliminating or reducing the height of vertical protrusions on the top surface of the upper bunk.

Lastly, pertaining to the issue of tolerance for nonconformance, the risk of injury relevant to this petition is considerably lower than the risk of injury presented during the 1999 bunk bed rulemaking. Staff has identified only six deaths that are most likely to be relevant to the petition over nearly 24 years. This equates to roughly one death every 4 years. In contrast, in 1999, staff identified 57 rulemaking-relevant entrapment deaths over a span of about 9 ½ years, and estimated that about 10 bunk bed-related entrapment deaths had occurred in the United States every year since 1990, on average. Thus, taking into consideration the risk identified in the petition, staff believes that the current level of industry conformance to the ASTM voluntary standard could reasonably be considered substantial. Furthermore, the available incident data suggest that fatalities relevant to this petition might be declining (see Figure 4). If true, this finding would suggest not only that the provisions are effective, but also that industry is conforming to these requirements.

In conclusion, CPSC staff believes that the ASTM voluntary standard for bunk beds adequately addresses the risk of injury and death identified in the petition, and also believes that industry compliance with the voluntary standard is likely to be substantial.

V. COMMISSION OPTIONS

A. SIDE ENTRAPMENT PETITION

Options for Commission action to address the Side Entrapment Petition include:

1. Grant the Petition

If, based on the information contained in this briefing package, the Commission concludes that bunk-bed side structures may present an unreasonable risk of injury or death, and that amending the provisions in the Bunk Bed Standard may be reasonably necessary to eliminate or adequately reduce that risk, the Commission may grant the petition and direct staff to develop an advance notice of proposed rulemaking (ANPR) or a notice of proposed rulemaking (NPR) under the authority of the Consumer Product Safety Act (CSPA) and the Federal Hazardous Substances Act (FHSA).

2. Deny the Petition

If the Commission concludes that the available information does not support a finding that bunk-bed side structures present an unreasonable risk of injury or death, or that the current voluntary standard is likely to result in the elimination or adequate reduction of the risk of injury identified in the petition, and industry compliance with the voluntary standard is likely to be substantial, the Commission may deny the petition.

3. Defer Decision on the Petition

If the Commission concludes that there is insufficient information to make a decision on whether to grant or deny the petition, and that staff could obtain such information, the Commission could defer its decision and direct staff to obtain the additional information or continue to work on the voluntary standards.

B. CORNER POST EXTENSION PETITION

Options for Commission action to address the Corner Post Extension Petition include:

1. Grant the Petition

If, based on the information contained in this briefing package, the Commission concludes that bunk-bed corner post extensions and finials may present an unreasonable risk of injury or death, and that amending the provisions in the Bunk Bed Standard may be reasonably necessary to eliminate or adequately reduce that risk, the Commission may grant the petition and direct staff to develop an ANPR or an NPR under the authority of the CSPA and the FHSA.

2. Deny the Petition

If the Commission concludes that the available information does not support a finding that bunk-bed corner post extensions and finials present an unreasonable risk of injury or death, or that the current voluntary standard is likely to result in the elimination or adequate reduction of the risk of injury identified in the petition, and industry compliance with the voluntary standard is likely to be substantial, the Commission may deny the petition.

3. Defer Decision on the Petition

If the Commission concludes that there is insufficient information to make a decision on whether to grant or deny the petition, and that staff could obtain such information, the Commission could defer its decision and direct staff to obtain the additional information or continue to work on the voluntary standards.

VI. STAFF CONCLUSIONS AND RECOMMENDATIONS

On April 15, 2013, ASTM published a new version of the voluntary standard for bunk beds, ASTM F1427 – 13, *Standard Consumer Safety Specification for Bunk Beds*. This revision includes requirements for entrapment testing between all ladder structures, between ladder steps and the upper-bunk boundary, and along the entire boundary of the bunk bed between the lower-bunk foundation and the upper-bunk foundation (rather than in end structures only). In addition, for bunk beds whose ladders are attached to the side of the lower bunk, any gaps between the ladder and the lower-bunk mattress must be smaller than 1.88 inches or larger than 9 inches to avoid the potential for entrapment. CPSC staff believes that these new provisions would have prevented the same fatalities and injury that would have been addressable through the requested rulemaking to incorporate into the Bunk Bed Standard head and neck entrapment testing for spaces created by side structures, such as ladders, provided with the bunk bed. Thus, staff

believes that these requirements adequately address the risk of injury and death raised in the Side Entrapment Petition.

Since 2007, the voluntary standard also has included provisions that prohibit vertical protrusions and differences in fit between components on the top surface of an upper bunk that exceed $^{3}/_{16}$ inch (5 mm), and require any caps affixed to the top surface to taper, fit flush with the top of a corner post, and minimally overhang the edge of a corner post. Staff believes that these requirements adequately address the strangulation hazard posed by bunk bed corner post extensions and finials, as identified in the Corner Post Extension Petition, and most likely would address the same fatalities as the petitioner's requested rulemaking.

Besides staff's belief that the provisions in the current ASTM voluntary standard for bunk beds adequately address the risk of injury and death raised in both petitions, for the reasons discussed above, staff also believes that industry compliance with the voluntary standard is likely to be substantial.

In conclusion, CPSC staff recommends that the Commission deny both petitions.

VII. REFERENCES

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TAB A

EPHA Staff Memorandum,

"Entrapments in Side Structures of Bunk Beds, 1993-2012"

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

Memorandum

Date: April 6, 2015

TO : Timothy Smith, Engineering Psychologist
Division of Human Factors, Directorate for Engineering Sciences

THROUGH: Kathleen Stralka, Assistant Executive Director
Directorate for Epidemiology

Stephen Hanway, Division Director
Hazard Analysis Division

FROM : Craig O'Brien, Branch Chief[1]
Data Intake and Injury Information Branch

SUBJECT : Entrapments in Side Structures of Bunk Beds, 1993-2012

I. OVERVIEW

Bunk beds are regulated by the Consumer Product Safety Commission (CPSC), as codified by 16 C.F.R. parts 1213, 1500, and 1513 (Bunk Bed Standard). The CPSC was petitioned in 2010 concerning the risk of head and neck entrapment in the side structures of beds complying with the Bunk Bed Standard as those structures are not mentioned in the standard. This memorandum examines the incidents reported to the CPSC staff involving head and neck entrapments in side structures of bunk beds that are not covered by the standard, to aid in the evaluation of the risk of such injuries.

II. RESULTS

CPSC staff searched for bunk bed related incidents in CPSC data sources, as described in Section III (Methodology). These incident reports were reviewed by a multidisciplinary team of CPSC staff to include only incidents involving head and neck entrapment in the side structures of the bunk beds, except top bunk guardrails. Nine incidents associated with bunk beds and involving head and neck entrapments in the side structures were reported to the CPSC from 1993 through 2012. Four of the incidents resulted in no injury to the child; one incident resulted in a minor injury (bruising); and four incidents resulted in fatalities. The ages of the children ranged from 17 months to 6 years. In one case, the child was trapped between the mattress and a guardrail on the lower bunk; in six cases, the child was trapped between the mattress and a ladder; and in two cases, the child was trapped between two rungs of the ladder. Table 1 (next page) provides narrative descriptions of all nine incidents.

[1] During this memorandum's initial writing, staff was a Mathematical Statistician in the Hazard Analysis Division.

Table 1: Narrative Descriptions of Reported Head and Neck Entrapments in Side Structures of Bunk Beds, 1993-2012

Year	Document Number	Age	Verbatim Narrative
1995	H9590259A	2 yr.	A 2YOM WAS BRUISED WHEN CAUGHT BETWEEN THE BOTTOM SIDE RAIL AND MATTRESS ON HIS BUNKBED.
1998	980112CCN0130	22 mo.	A DEVELOPMENTALLY DISABLED 22-MONTH-OLD CHILD ENTRAPPED HIS NECK BETWEEN A LADDER RUNG AND THE MATTRESS TOP OF THE LOWER BUNK BED IN WHICH HE HAD BEEN SLEEPING. THE CORONER DETERMINED HE DIED FROM ASPHYXIA DUE TO NECK COMPRESSION.
2000	000525HCC0705	2 yr.	A 2-YEAR-OLD FEMALE, PLAYING ON AND ABOUT THE BUNK BED SET IN HER BEDROOM, TWICE BECAME "STUCK" IN THE TOP OF THE BUNK BED LADDER. BOTH TIMES SHE WAS EXTRICATED BY HER FATHER, NO INJURY OR MEDICAL ATTENTION REQUIRED.
2000	000224CCC2320	6 yr.	A BOY, AGE 6, COULD HAVE BEEN INJURED WHEN HE GOT HIS HEAD LODGED BETWEEN THE MATTRESS AND LADDER OF HIS BUNK BED AS HIS BODY FELL TO THE FLOOR.
2001	J0380003A	17 mo.	A 17-MONTH-OLD MALE DIED WHEN HE BECAME ENTRAPPED BETWEEN THE LOWER BUNK BED MATTRESS AND THE HORIZONTAL LADDER RUNG OF A CONVERTIBLE BUNK BED.
2003	050815CWE5005	18 mo.	COMPLAINANT'S 18-MONTH-OLD DAUGHTER'S HEAD BECAME ENTRAPPED IN A 31/4" OPENING BETWEEN THE MATTRESS AND A BUNK BED LADDER, WHILE PLAYING AROUND ON THE LOWER BUNK BED. THE MOTHER FREED HER DAUGHTER BY PUSHING DOWN ON THE MATTRESS TO RELEASE HER HEAD. SHE WAS NOT INJURED.
2003	030115CCN0277	2 yr.	A GIRL, AGE 2, WAS HOSPITALIZED AND LATER DIED AFTER TRYING TO CLIMB UP A LADDER OF A BUNK BED. HER HEAD GOT CAUGHT BETWEEN TWO RUNGS OF THE LADDER AND THE BED FRAME AT A HOME DAYCARE.
2008	081021HWE7802	4 yr.	A FOUR-YEAR-OLD MALE DIED AS A RESULT OF ASPHYXIA BY NECK COMPRESSION WHEN HIS HEAD BECAME WEDGED BETWEEN THE LADDER AND MATTRESS OF HIS BUNK BED. THE VICTIM HAD BEEN PLACED OVERNIGHT ON THE BOTTOM BUNK OF A BUNK BED. THE VICTIM'S MOTHER FOUND THE VICTIM IN THE MORNING WHEN SHE WENT IN TO WAKE HIM FOR THE DAY. THE MOTHER FREED THE CHILD AND CALLED 911. THE VICTIM WAS PRONOUNCED AT THE SCENE.
2012	I1210457A	18 mo.	18 MOM USES THE BOTTOM BUNK OF A BUNK BED AND HIS HEAD BECAME ENTRAPPED BETWEEN THE MATTRESS AND THE BOTTOM RUNG OF THE LADDER. CONSUMER FREED HIM AND HE WAS UNINJURED. CONSUMER BELIEVES THAT HE WAS ENTRAPPED BECAUSE THE MATTRESS WAS TOO THICK FOR THE BED.

In addition to the nine incidents in Table 1, there were 21 incidents that did not provide enough information to include them in this analysis. Reasons for incidents being unclear included the entrapment occurred in rails that were not clearly guard rails (8 incidents), the entrapment occurred in guard rails that may have been upper bunk guard rails (5 incidents), the entrapment occurred in a ladder that may have been an end structure (5 incidents), the entrapment occurred with a part of the bunk bed that was not specified (2 incidents), and the entrapment occurred with

an object that was not clearly attached to the bunk bed (1 incident). Of the unclear incidents, 8 involved no injury to the child; 2 involved injuries; and 11 were fatalities. The age range for children in the unclear incidents was 7 months to 11 years.

III. METHODOLOGY

The incidents reported in Table 1 were derived from four sources: the National Electronic Injury Surveillance System (NEISS), the CPSC's death certificate database, the CPSC's Injury and Potential Injury Incident file (IPII), and the CPSC's Consumer Product Safety Risk Management System (CPSRMS).

NEISS is a probability sample of approximately 100 U.S. hospitals having 24-hour emergency rooms (ERs) and more than six beds. NEISS collects injury data from these hospitals. Coders in each hospital code the data from the ER record, and the data is then transmitted electronically to the CPSC.

The CPSC purchases death certificates from all 50 states, New York City, the District of Columbia, and some territories. Only those certificates in certain E-codes (based on the World Health Organization's International Classification of Diseases ICD-10 system) are purchased. These are then examined for product involvement before being entered into the CPSC's death certificate database. The result is neither a statistical sample, nor a complete count of product-related deaths; nor does the result constitute a national estimate. The database provides only counts for product-related deaths from a subset of E-codes. For this reason, these counts tend to be underestimates of the actual numbers of product-related deaths. Death certificate collection from the states also takes time. As of December 2012, the Death Certificates database was considered 99 percent complete for 2009, 96 percent complete for 2010, 90 percent complete for 2011, and 55 percent complete for 2012.

The CPSC's IPII is a database containing reports of injuries or potential injuries made to the Commission. These reports come from news clips, consumer complaints received by mail or through the CPSC's telephone hotline or website, Medical Examiners and Coroners Alert Program (MECAP) reports, letters from lawyers, and similar sources. While the IPII database does not constitute a statistical sample, this database can provide CPSC staff with guidance or direction in investigating potential hazards.

The CPSC's CPSRMS combines the functionality of the death certificate database and IPII. CPSRMS was implemented in 2011.

In November 2010, all data coded was pulled from the above databases that had product code 661 (Bunk Beds) and one of the following keywords: between, hang, rail, ladder, neck, or side. These reports were reviewed by CPSC staff to include only head and neck entrapments involving the side structures of the bunk beds, except top bunk guard rails. An update of the data was performed in April 2013. All of the reports were reviewed by CPSC staff using the same criteria used in 2010.

TAB B

CRE Staff Memorandum,

"Bunk Beds: Summary of Bunk Bed-Related Recalls Before and After the Bunk Bed Final Rule"

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

Memorandum

Date: April 6, 2015

TO : Tim Smith, Bunk Bed Petition Project Manager

THROUGH : Jay Howell, Acting Assistant Executive Director, EXC

Mary Toro, Director of Regulatory Enforcement, CRE

Troy Whitfield, Mechanical Team Lead, Division of Regulatory Enforcement

FROM : Daniel Dunlap, Compliance Officer, Mechanical Team, Division of Regulatory Enforcement

SUBJECT : Bunk Beds: Summary of bunk bed-related recalls before and after the Bunk Bed final rule

PURPOSE

This memorandum responds to a request from the project manager for the bunk bed petition for information on bunk bed recalls pre- and post-1999 rulemaking. Bunk beds are subject to regulations under both the Consumer Product Safety Act (CPSA) and the Federal Hazardous Substances Act (FHSA). Under the CPSA, bunk beds are subject to 16 C.F.R. part 1213, *Safety Standard for Entrapment Hazards in Bunk Beds.* Under the FHSA, bunk beds intended for use by children are subject to 16 C.F.R. part 1513, *Requirements for Bunk Beds* (Bunk Bed Standards). A bunk bed that does not comply with the requirements of the FHSA presents a mechanical hazard and is a violation of Section 2(s) of the FHSA, 15 U.S.C. § 1261(s). Any bunk bed that presents a mechanical hazard is banned under 16 C.F.R. § 1500.18(a)(18). The Bunk Bed Standards address hazards associated with entrapment through performance requirements that concentrate on guardrails, end structures, and warning labels. This memorandum discusses recalls conducted by the Office of Compliance and Field Operations (Compliance) before and after the final rule went into effect (1990 to present).

COMPLIANCE ACTIVITIES

The Bunk Bed Standard 16 C.F.R. parts 1213 and 1513 became effective for bunk beds manufactured or imported on or after June 19, 2000. Compliance staff reviewed recalls on bunk beds from 1990 to 2014. During that period, there have been 50 consumer-level recalls involving bunk beds, 26 before the effective date and 24 after the effective date. These recalls addressed guardrail spacing, incorrect assembly, collapse/falling hazards, and structural defects.

Before the standard, there were a total of 26 recalls. There were 13 recalls for entrapment affecting 640,200 bunk beds. There were a total of 13 recalls for collapse/falling hazards, and structural defects affecting 331,830 bunk beds.

After the effective date of the standard, there have been a total of 24 recalls. There were 13 recalls for entrapment hazards affecting 96,105 bunk beds. There have been 11 recalls affecting 535,420 bunk beds for collapse/falling hazards and structural defects. In total, there were 26 entrapment, consumer-level recalls and 24 collapse/falling hazard, structural defect consumer-level recalls from 1990 to 2014. In the appendix table, recalls before the regulation and ASTM are listed as Sect. 15. The recalls after the ASTM standard came into effect are labeled ASTM/Sect. 15. When the Bunk Bed Standard came into effect, the recalls are labeled by regulation (REG) or ASTM/Sect.15, depending on whether it was a regulatory recall or an ASTM/Sect.15 recall.

Appendix (Table)
Bunk Bed Recalls
January 1, 1990 to July 22, 2014

Date	Firm	Reason	# Recalled	Sect. 15 or ASTM/Sect. 15 or REG
12/03/1993	Rosalco, Inc.	Collapse/Fall	175,000	Sect. 15
12/13/1993	Coaster	Collapse/Fall	13,000	Sect. 15
12/13/1993	Southern Enter.	Collapse/Fall	6,000	Sect. 15
03/01/1994	L. Powell	Collapse/Fall	23,400	Sect. 15
03/03/1994	Montgomery Ward	Collapse/Fall	13,000	Sect. 15
04/06/1994	Bernards, Inc.	Collapse/Fall	11,000	Sect. 15
04/06/1994	Fashion Bed	Collapse/Fall	4,800	Sect. 15
04/06/1994	S&A Imports	Collapse/Fall	2,700	Sect. 15
04/06/1994	Gold Key Entr.	Collapse/Fall	50,000	Sect. 15
06/01/1994	World Imports	Collapse/Fall	930	Sect. 15
06/01/1994	MPC Trading	Collapse/Fall	13,000	Sect. 15
06/02/1994	Int. Express	Collapse/Fall	8,000	Sect. 15
10/25/1994	AGA Warehouse	Collapse/Fall	11,000	Sect. 15
11/03/1994	El Rancho	Entrapment	10 to 14,000	Sect. 15
05/09/1995	Backwood Design	Entrapment	320,000	ASTM/Sect.15
09/28/1995	Artwood Fine	Entrapment	41,000	ASTM/Sect.15
09/28/1995	Catalina Furniture	Entrapment	5,000	ASTM/Sect.15
12/14/1995	Quality Craft Inc.	Entrapment	31400	ASTM/Sect.15
11/27/1996	Bedder Bunk Co.	Entrapment	100,000	ASTM/Sect.15
10/24/1996	Southern Entr.	Entrapment	6,000	ASTM/Sect.15
04/07/1997	Acme Trading Co.	Entrapment	3,100	ASTM/Sect.15
09/24/1997	Heartland Furn.	Entrapment	16,500	ASTM/Sect.15
08/19/1998	Lexington Furn.	Entrapment	58,000	ASTM/Sect.15
11/10/1998	Fine Pine	Entrapment	37,000	ASTM/Sect.15
03/25/1999	Newco	Entrapment	5,400	ASTM/Sect.15
12/07/1999	Northern Bedroom	Entrapment	2,800	ASTM/Sect.15
10/17/2000	Pottery Barn Kids	Collapse/Fall	200	ASTM/Sect.15
09/25/2003	Home Line	Entrapment	3,600	REG
11/21/2003	Merit Furniture	Entrapment	524	REG
04/13/2004	Ethan Allen	Collapse/Fall	2,000	ASTM/Sect.15
04/22/2004	Ashley Furniture	Entrapment	22,476	REG
05/13/2004	Coaster	Entrapment	22,000	REG
08/11/2004	PJ Sleep Shop	Entrapment	337	REG
09/04/2007	d-Scan Due	Collapse/Fall	500	ASTM/Sect.15
12/13/2007	Hooker Furniture	Entrapment	1,300	REG
02/05/2009	Land of Nod	Collapse/Fall	750	ASTM/Sect.15
05/21/2009	Gothic Cabinet	Collapse/Fall	1,500	ASTM/Sect.15
09/23/2009	Big Lots	Collapse/Fall	20,000	ASTM/Sect.15
08/03/2010	Pottery Barn Kids	Entrapment	405	REG

Date	Firm	Reason	# Recalled	Sect. 15 or ASTM/Sect. 15 or REG
10/05/2010	PBteen	Collapse/Fall	5,900	ASTM/Sect.15
05/05/2011	Dorel	Collapse/Fall	445,000	ASTM/Sect.15
06/16/2011	Big Lots	Entrapment	30,000	REG
07/12/2011	Northern Bedroom	Entrapment	2,800	REG
09/20/2011	American Wood	Collapse/Fall	180	ASTM/Sect.15
08/16/2012	PBteen	Collapse/Fall	390	ASTM/Sect.15
01/31/2013	World Import	Entrapment	8,600	REG
05/21/2013	Lea Industries	Collapse/Fall	59,000	ASTM/Sect.15
11/12/2013	Wood Castle	Entrapment	1,000	REG
03/20/2014	Bedz King	Entrapment	2,900	REG
06/04/2014	Lea Industries	Entrapment	500	REG

TAB C

EPHA Staff Memorandum,

"Bunk Bed Hazard Update"

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

Memorandum

Date: April 6, 2015

TO : Timothy Smith, Engineering Psychologist
Human Factors Division

THROUGH: Kathleen Stralka, Assistant Executive Director
Directorate for Epidemiology

Stephen Hanway, Division Director
Hazard Analysis Division

FROM : Craig O'Brien, Branch Chief[1]
Data Intake and Injury Information Branch

SUBJECT : Bunk Bed Hazard Update

I. OVERVIEW

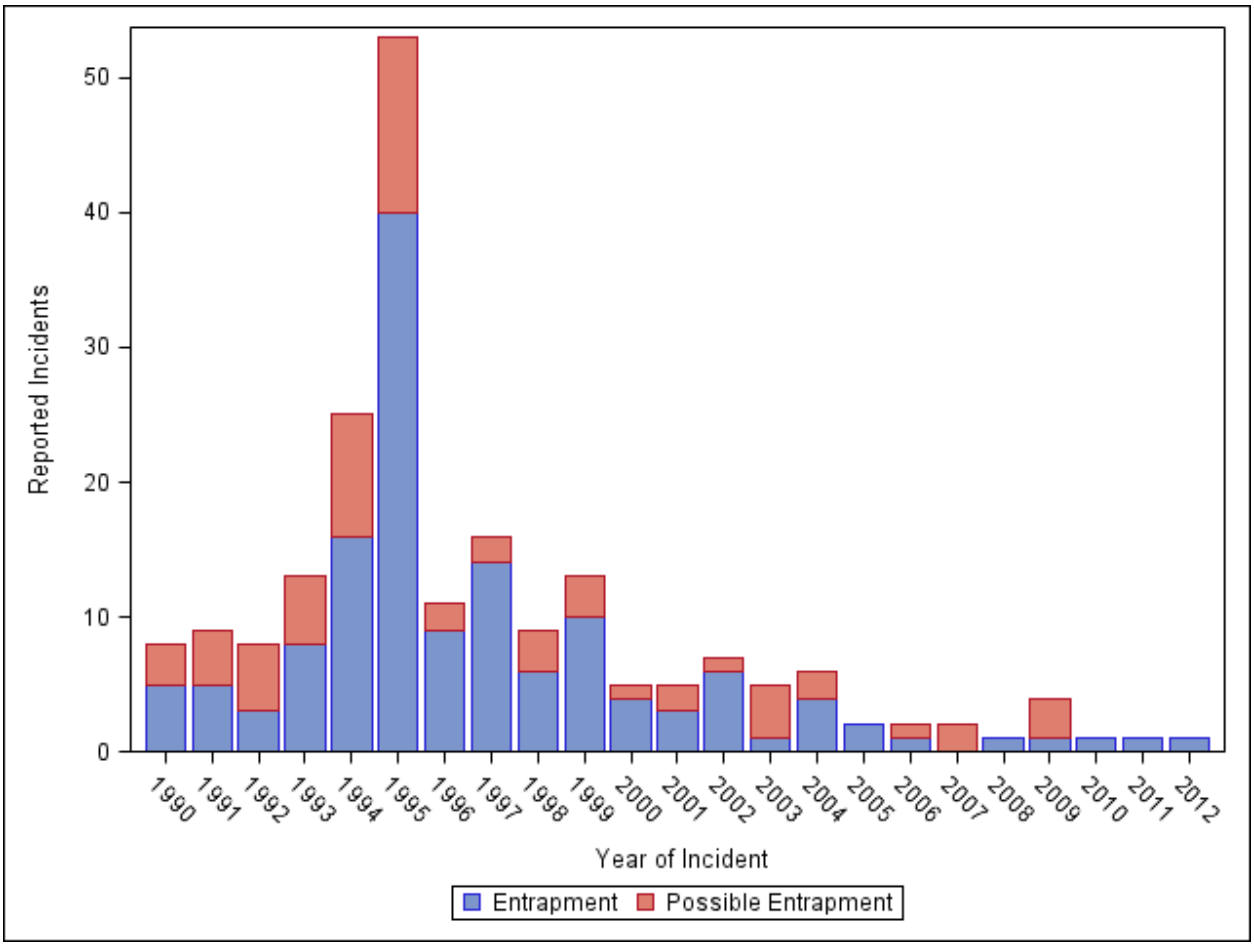
Bunk beds are regulated by the Consumer Product Safety Commission (CPSC), as codified by 16 C.F.R. parts 1213, 1500, and 1513 (Bunk Bed Standard). A portion of this standard addresses entrapment in the end structures and top guard rails of the bunk bed. This memorandum summarizes data relevant to these entrapment hazards.

II. RESULTS

CPSC staff searched for bunk bed-related incidents in CPSC data sources, as described in Section III (Methodology). These incident reports were reviewed by CPSC staff to include only incidents involving entrapments currently addressed by the Bunk Bed Standard. One hundred and forty-two incidents associated with bunk beds and involving entrapment currently addressed by the Bunk Bed Standard were reported to the CPSC from 1990 through 2012. Forty-one of the reported incidents involved a fatality. In addition, there were 65 reports that did not provide enough information to be sure that they were not currently addressable by the Bunk Bed Standard. These were included as "possible entrapments." Of the 65 possible entrapment reports, 29 involved a fatality.

[1] During this memorandum's initial writing, staff was a Mathematical Statistician in the Hazard Analysis Division.

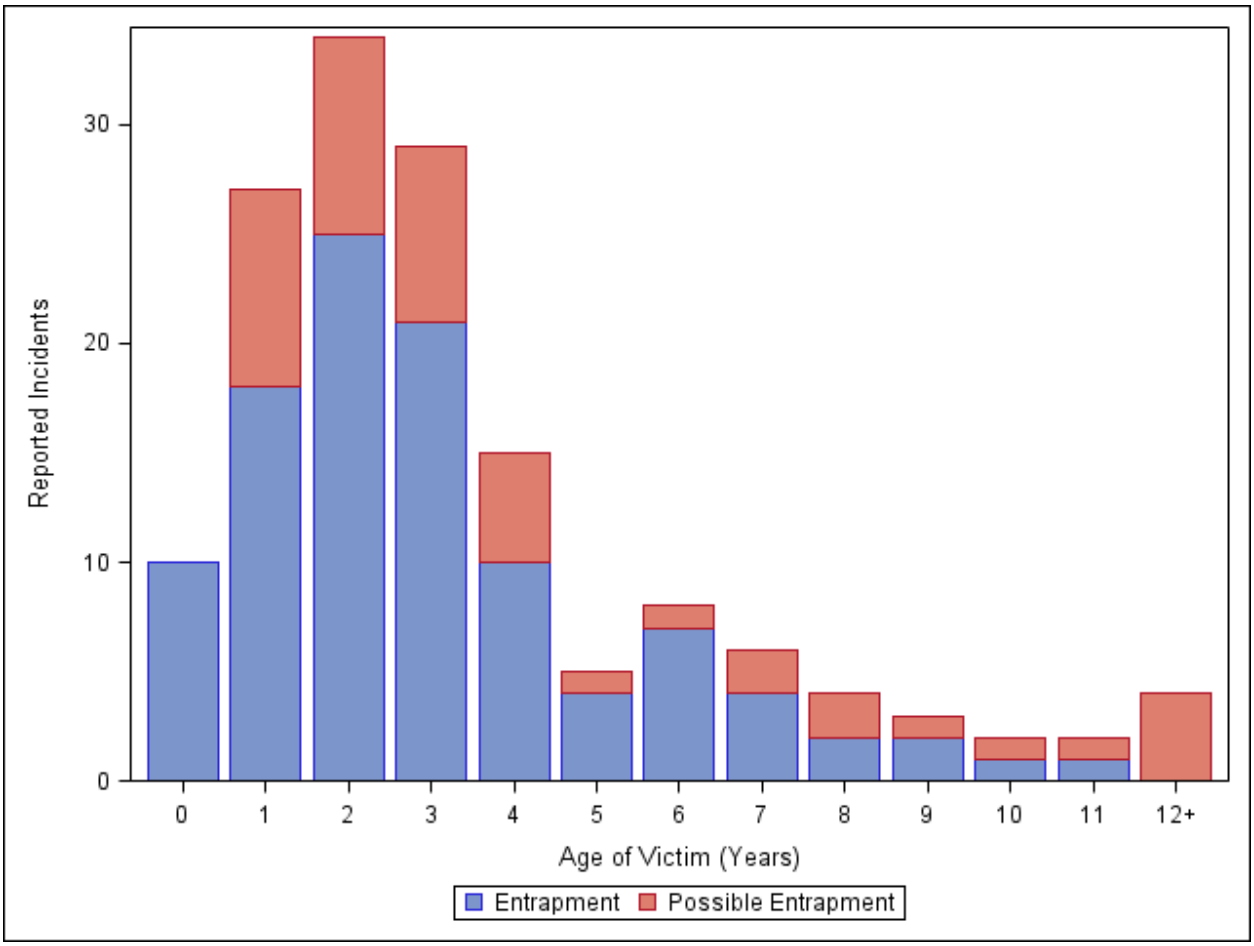
Figure 1: Standard Addressable Bunk Bed Entrapment Reports by Year, 1990 – 2012



Source: CPSRMS database, May 2014

Figure 1 shows the number of reported entrapments per year from 1990 through 2012. There is a clear spike in reporting in 1995. Reporting then drops to previous levels, eventually dropping to lower levels around 2005.

Figure 2: Standard Addressable Bunk Bed Entrapments
By Age of Victim in Years, 1990 – 2012



Source: CPSRMS database, May 2014

Figure 2 shows the ages of the victims in the reported incidents. The majority of the incidents are occurring with younger children, with 56 percent of the reported cases involving children under the age of 5 years. Note that the age of the victim is missing for 58 reports.

Figure 3: Standard Addressed Bunk Bed Entrapments by Severity of Injury, 1990 – 2012

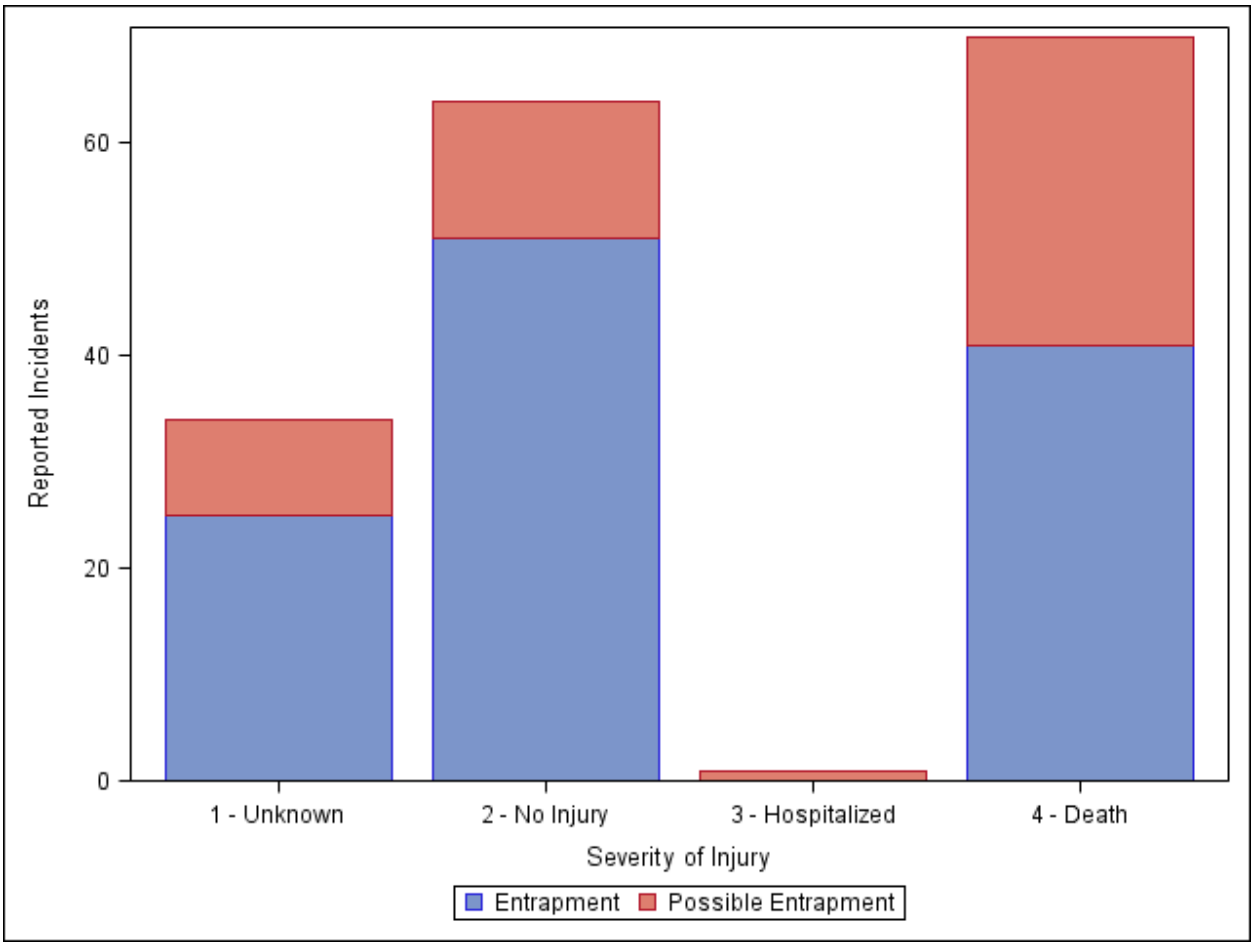


Figure 3 shows the severity of injury for the reported incidents. There is a very clear disparity within the incidents with a known severity, with the reported incidents split between no injury and death, with virtually no middle ground.

From 1990 through 2012, there were an estimated 4,600 emergency department-treated injuries involving bunk bed entrapments addressed by the Bunk Bed Standard. The 95 percent confidence interval on this estimate is 3,500–5,700 (C.V. = 12.49%). Table 1 shows the estimate before the standard took effect on June 19, 2000, and shows two estimates for after the standard took effect. Two post-standard estimates are provided so that they cover the same length of time, and therefore, can be compared to the pre-standard estimate. All of the estimates in this paragraph and in Table 1 are based on entrapments and possible entrapments. Staff could not prepare estimates excluding possible entrapments, due to small sample size.

Table 1: Estimated Emergency Department-Treated Standards-Addressable Bunk Bed Entrapments, Before and After Standard Effective Date

Time Frame	Estimate	95% C.I.	C.V.
1/1/1990 – 6/18/2000	1,200	600 – 1,800	24.70%
6/19/2000 – 12/05/2010	2,600	1,800 – 3,300	15.25%
7/16/2002 – 12/31/2012	3,000	2,300 – 3,800	12.02%

Source: U.S. Consumer Product Safety Commission National Electronic Injury Surveillance System, 2014.

III. METHODOLOGY

The incidents reported in this memorandum were derived from CPSC's Consumer Product Safety Risk Management System (CPSRMS) and CPSC's National Electronic Injury Surveillance System (NEISS).

The CPSC purchases death certificates from all 50 states, New York City, the District of Columbia, and some territories. Only those certificates in certain E-codes (based on the World Health Organization's International Classification of Diseases ICD-10 system) are purchased. These are then examined for product involvement before being entered into the CPSC's death certificate database. The result is neither a statistical sample, nor a complete count of product-related deaths; nor does the result constitute a national estimate. The database provides only counts for product-related deaths from a subset of E-codes. Therefore, these counts tend to be underestimates of the actual numbers of product-related deaths. Death certificate collection from the states also takes time. As of September 2013, the Death Certificates database was considered 94 percent complete for 2009, 87 percent complete for 2010, 65 percent complete for 2011, and 33 percent complete for 2012.

The CPSC's Injury and Potential Injury Incident File (IPII) is a database containing reports of injuries or potential injuries made to the Commission. These reports come from news clips, consumer complaints received by mail or through the CPSC's telephone hotline or website, Medical Examiners and Coroners Alert Program (MECAP) reports, letters from lawyers, and similar sources. Although the IPII database does not constitute a statistical sample, the database can provide CPSC staff with guidance or direction in investigating potential hazards.

The CPSC's CPSRMS combines the functionality of the death certificate database and IPII. CPSC implemented CPSRMS in 2011.

NEISS is a probability sample of approximately 100 U.S. hospitals having 24-hour emergency departments (EDs) and more than six beds. NEISS collects injury data from these hospitals. Coders in each hospital code the data from the ED record, and the data is then transmitted electronically to the CPSC. The NEISS sample changed in 1997. Estimates from before the sample change were adjusted to make them comparable to estimates after the sample change.

Hazard Analysis staff used SAS® version 9.4 to compute estimates and the associated coefficients of variation for the number of injuries, as well as the estimated number of injuries with particular characteristics such as age and gender. A coefficient of variation (C.V.) is the ratio of the standard error of the estimate (*i.e.*, variability) to the estimate itself. This is generally

expressed as a percent. A C.V. of 10 percent means the standard error of the estimate equals 0.1 times the estimate. Large C.V.s alert the reader that the estimate has considerable variability. This is often due to a small sample size.[2] Estimates and confidence intervals are not considered reliable unless the number of cases is 20 or more, the estimate is greater than 1,200, and the C.V. is less than 33 percent.

In February 2014, CPSRMS and NEISS were searched for incidents associated with product codes 661 (Bunk beds), occurring between 1/1/1990 and 12/31/2013, and containing one of the following keywords in the description of the incident: hang, hung, strang, chok, neck, between, caught, rail, frame, head, or end. All of the reports were reviewed by CPSC staff to include entrapments addressable by the bunk bed standard. In-scope cases were considered to be head, neck, and torso entrapments that occurred in an end structure or upper-bunk guardrail. Entrapments between the bunk bed and a wall were only considered in-scope if a guardrail was involved. Cases that were not clearly in-scope, but did not have enough information to exclude them, were included as "possible entrapments."

[2] For a more detailed discussion of measures of variation associated with NEISS estimates, see Kessler E. and Schroeder T. *The NEISS Sample (Design and Implementation).* U.S. Consumer Product Safety Commission. October 1999. Pages 70-72.

TAB D

EC Staff Memorandum,

"Bunk Bed Petition: Conformance with the Voluntary Standard, ASTM F1427-13"

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

Memorandum

Date: April 6, 2015

TO : Timothy P. Smith, Division of Human Factors,
Directorate for Engineering Sciences

THROUGH: Gregory B. Rodgers, Ph.D., Associate Executive Director,
Directorate for Economic Analysis
Deborah V. Aiken, Ph.D., Senior Staff Coordinator,
Directorate for Economic Analysis

FROM : Charles L. Smith, Economist
Directorate for Economic Analysis

SUBJECT : Bunk Bed Petition: Conformance with the Voluntary Standard, ASTM F1427-13.

On June 24, 2010, the CPSC's Office of the General Counsel docketed a petition (as CP 10-2 under the Consumer Product Safety Act and as Petition HP 10-1 under the Federal Hazardous Substances Act), requesting that the U.S. Consumer Product Safety Commission (CPSC) initiate rulemaking on bunk beds to mandate requirements for head and neck entrapment testing in spaces created by side structures, such as ladders. CPSC staff presented a briefing package responding to the petition on April 6, 2011. The Commission voted to defer its decision on the petition and directed staff to work with the ASTM F15.30 Subcommittee on Bunk Beds to develop requirements that would address head and neck entrapments in side structures as part of the ASTM safety standard for bunk beds, ASTM F1427.

On April 15, 2013, ASTM published the revised voluntary standard (ASTM F1427 – 13) containing provisions designed to address the side entrapment hazards presented in the petition.[1] This memorandum updates the information on conformance provided to the Commission in the 2011 briefing package responding to the petition.

There are no known available data describing the current level of industry conformance with the bunk bed voluntary standard. In 1999, when the CPSC Bunk Bed Standard was finalized, staff believed that 90 percent or more of bunk beds conformed to the ASTM voluntary standard. This estimate was based on staff judgments that were made after the 1992 version of the ASTM voluntary standard was published and Compliance staff had become active in monitoring for conformance to the voluntary standard (Karels, 1999). Although staff has no

[1] ASTM F1427 – 13 also contains provisions designed to address the corner post hazards presented in petition CP 03-1 & CP 03-1.

additional monitoring information on conformance since 1999, there are several reasons for believing conformance remains high.

Indicators of Conformance

According to the American Home Furnishing Association (AHFA), the trade organization that represents the home furnishings industry, all 11 of its member companies that produce or import bunk beds conform to the current voluntary standard, including the side entrapment provisions.[2] AHFA also identified an additional 46 non-member companies that may be major suppliers, because they were listed in either the Las Vegas or the High Point market resource guides as manufacturers or importers of bunk beds.[3] Of these 46 companies, AHFA attempted to contact 36 regarding their awareness of, and conformance with, the ASTM standard. Seventeen firms either reported to the AHFA that they conformed to the voluntary standard (15 firms) or made statements of conformance on their web sites (2 firms). No information was provided (either directly or on websites) by the other 19 firms. Hence, the AHFA reported that 28 of identified 57 companies (49 percent) that are believed to be major manufacturers or importers of bunk beds for the U.S. market conform to the current voluntary standard. No companies were identified that do not conform.

Since the voluntary standard was revised in 2013, EC staff attempted to contact seven bunk bed manufacturers to evaluate the impact of the side entrapment provisions of the revised voluntary standard. Five of the seven firms responded. One firm reported that the firm's bunk beds already conformed to the revised side entrapment provisions; a second firm had not conformed when originally contacted (in 2014), but said that the firm intended to conform and that the firm's bunk beds could easily be brought into conformance with only minor costs. Another firm recently reported that its bunk beds were brought into conformance with the revised standard with minor changes and minimal financial impact to the firm. Two of the five firms that responded are no longer producing bunk beds – one stopped producing bunk beds for reasons unrelated to the voluntary standard; the second ceased operations as a result of a business decision by its parent company.

According to LS staff (Massale, 2014), design changes needed to conform to the revised voluntary standard, if needed, would generally involve eliminating hazardous gaps in bunk beds with ladders attached to the bottom bunk. According to LS staff (and one of the manufacturers contacted), any design changes that would be needed would be accomplished by adjusting the

[2] Personal communication between Bill Perdue, Vice President for Regulatory Affairs, American Home Furnishing Institute, and Timothy Smith, Bunk Bed Petition Project Manager, 19 February 2015.

[3] In the communication referenced above, Mr. Perdue asserted that "[t]he vast majority of suppliers of home furnishings products for the U.S. market exhibit products at one or the other or both of these markets, so it is reasonable to assume that all major suppliers of bunk beds would exhibit at one of these two markets … assuming that retail stores are their primary channel of distribution."

gaps between the rungs of ladders and other openings. Consequently, it seems unlikely that the small marginal increase in costs associated with the side entrapment provisions would deter manufacturers from conforming to the voluntary standard. Additionally, the LS staff concluded that ". . . neither substantial extra time nor new materials would be required to perform the additional testing specified by ASTM F1427-13" (Massale, 2014, p. 3).

In addition to the small incremental costs of conforming to ASTM F1427-13, other factors should also contribute to high levels of conformance by the industry. Many major retailers require that suppliers provide only consumer products conforming to existing voluntary, as well as mandatory standards. For example, Walmart's (2015) "Regulatory Product Specific Test Protocol for Furniture, Indoor and Outdoor" for suppliers of bunk beds, as well as Walmart's (2014) "Product Safety and Regulatory Directive: Furniture (Indoor and Outdoor) and Mattresses" specify that bunk beds must conform to the ASTM F1427 voluntary standard and CPSC's mandatory bunk bed standard.

AHFA promotes conformance to voluntary standards for its members, which include foreign bunk bed manufacturers and importers and as domestic manufacturers.[4] One of the AHFA's product safety goals for 2013 was to engage in consumer education that promotes member company products that comply with voluntary safety standards.

CPSC staff has also called attention to the bunk bed voluntary standard and has said "[f]or hazards other than entrapment that are addressed in the ASTM standard, CPSC staff will consider the ASTM standard when investigating whether a bunk bed presents a substantial risk of injury to children that may require some type of corrective action under the statutes administered by the Commission" (NIST, 2013; CPSC, 2000).

Furthermore, one of the concerns raised by staff supporting mandatory rulemaking in 1999 was that smaller manufacturers were less aware of the voluntary standard for bunk beds than larger manufacturers. However, the existence and enforcement of the CPSC mandatory standard for bunk beds changes this situation. The existence of a mandatory standard to which bunk bed manufacturers must comply arguably raises small manufacturers' awareness of all bunk bed standards relative to their awareness in 1999. These factors likely have contributed to the sustained high levels of conformance with ASTM F1427.

Finally, we note that the small risk associated with side entrapment in bunk beds may also suggest a high level of conformance to the voluntary standard. Since 2009, there have been

[4] In 1999, when CPSC staff sought a mandatory rule for bunk beds, the trade association (AHFA's predecessor) limited membership to companies with manufacturing facilities in the U.S. However, AHFA dropped this requirement in 2004 and opened membership to importers and foreign manufacturers of bunk beds and other home furnishings.

no injuries reported to the CPSC that involve the side entrapment hazard. The only possible side entrapment "incident" reported to the CPSC since 2009 did not even involve an injury (O'Brien, 2013). Moreover, the details surrounding the incident suggest that the bed was used with a mattress of incorrect size. Thus, staff believes that side entrapment provisions of the voluntary standard (whether or not the bunk bed conformed to them, which is not known) would not likely have prevented the incident.

In summary, while the precise level of conformance to the voluntary standard is unknown, it was believed to amount to 90 percent or more when the mandatory standard for bunk beds was finalized in 1999. The additional information and factors discussed above suggest that conformance is likely to have remained high in recent years.

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TAB E

LSM Staff Memorandum,

"CPSC Staff's Opinion of Changes to ASTM F1427, *Standard Consumer Safety Specification for Bunk Beds*, from a Mechanical Testing Perspective"

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

Memorandum

Date: April 6, 2015

TO : Timothy Smith, Project Manager
Division of Human Factors
Directorate of Engineering Sciences

THROUGH: Andrew Stadnik, PE, Associate Executive Director
Directorate of Laboratory Sciences

Gregory K Rea, Director
Division of Mechanical Engineering
Directorate of Laboratory Sciences

FROM : John Massale, Mechanical Engineer
Division of Mechanical Engineering
Directorate of Laboratory Sciences

SUBJECT : CPSC Staff's Opinion of Changes to ASTM F1427, *Standard Consumer Safety Specification for Bunk Beds*, from a Mechanical Testing Perspective

Background and Goals of Investigation

The CPSC Division of Mechanical Engineering, Directorate for Laboratory Sciences (LSM) was asked to examine, among the many editorial and substantial changes, three specific changes to the performance requirements of ASTM F1427-07, *Standard Consumer Safety Specification for Bunk Beds*:[1]

- A new section, *Mattress Size and Fit (Lower Foundation)*, was added to address entrapment hazards between the mattress and additional components, such as a ladder or desk, attached to the lower bunk. A corresponding section also was added to the *Test Methods* portion of the standard to prescribe how to measure the gap between a mattress and an adjacent rigid structural component.
- The testing of openings in the lower bunk using the wedge block for neck entrapment was expanded from "end structures" to "the entire boundary of the lower bunk." The new version of the standard does not contain the former verbiage, thereby effecting

[1] Copyright © ASTM International, 100 Barr Harbor Dr., P.O. Box C-700 West Conshohocken, PA 19428, USA Published 2007

entrapment protection for all parts of the lower bunk structure, and not just the head and footboard areas.

- The *Ladders* section was expanded to address entrapment hazards in and around ladders. The expansion prescribes a testing procedure involving the use of the wedge block probe and the 9-inch diameter rigid sphere to gauge gaps in the bed structure. No new probes are needed to complete these tests.

The revised version of the standard was published in April 2013 and titled, ASTM F1427-13, *Standard Consumer Safety Specification for Bunk Beds.*[2]

LSM staff was asked to determine: (a) whether a significant additional burden would be placed upon a testing entity to incorporate the three changes to ASTM F1427-13 into the current test method; and (b) how much effort would be required of manufacturers to create compliant products in the future. This memorandum addresses these two issues.

Discussion

To estimate the additional testing burden associated with the new side-entrapment provisions of ASTM F1427-13, staff reexamined three samples that had been previously investigated by LSM staff under a different program. These three samples, identified here as samples A, B, and C, were selected because all had ladders incorporated into the design and did not contain serious damage or other preclusive defects for this study. Staff assembled sample A, and fully tested the sample per ASTM F1427-13. Staff evaluated samples B and C on the basis of their respective instruction manuals, previous testing reports produced by LSM, and tactile reexaminations of disassembled components.

Sample A required about 45 minutes to assemble. Then, CPSC staff completed the performance testing of ASTM F1427-07 in 25 minutes. Staff required an additional 5 minutes to conduct the new performance testing of ASTM F1427-13. ASTM F1427-13 includes all testing prescribed by ASTM F1427-07, plus additional testing for side structures. Staff delineates the time to test to each standard, even though the new version is only an expansion of the old one, because time is one of the resources that affects overall testing burden. Staff took approximately 30 minutes to disassemble sample A, which brought the total time to 105 minutes. Thus, the additional side-entrapment performance testing added about 5 percent to the total time needed to complete performance testing on the sample (5 minutes added to 100 minutes). No extra materials or probes were required to conduct this additional performance testing.

[2]

CPSC staff was able to evaluate samples B and C, despite their unassembled conditions, regarding most of the performance requirements of ASTM F1427-13. The ladders were intact and the previous LSM testing reports provided enough information to determine that both samples failed at least one of the new performance requirements. Staff required about 5 minutes to physically test the spacing of the rungs of the ladders and some of the other potential entrapment points in the frame. Testing ladder rungs did not require any new probes or fixtures.

In conclusion, staff's reexamination of Samples A, B, and C showed that neither substantial extra time, nor new materials would be required to perform the additional testing specified by ASTM F1427-13.

Concerning the amount of resources necessary for a firm to update the design of existing models, staff believes, for the reasons described below, that the new requirements would not be overly burdensome for a product that is already compliant with the 2007 version of the voluntary standard.

First, the new requirements should not be overly burdensome because changes to the product can be made to component parts. Most bunk beds are manufactured as individual parts to be assembled on location. Therefore, a retrofit part to bring a bunk bed into compliance could be applied to an individual piece, instead of revamping an entire bunk bed system. For example, a manufacturer could adjust the spacing of the rungs on a ladder to redesign the component to achieve compliance. Another example of a redesign that could bring a product into compliance might be to create a larger side rail that meets the end structure at a flush juncture to eliminate an existing gap in a side structure.

Second, new requirements in ASTM F1427-13 should not be overly burdensome because the changes do not address a new hazard pattern. Manufacturers should already be aware of the entrapment hazard because the current voluntary standard that has been in place for 7 years already addresses the entrapment hazard in other parts of the bunk bed. The biggest change involves expansion of the physical zones of applicability for the probe test. If fundamentally new hazard patterns were being addressed, new test fixtures would need to be designed, and significant amounts of additional time would probably be required by a testing entity. In this case, testing entities will perform the same probe test, using the same test fixture, on additional areas of the bunk bed product.

Finally, the changes to the voluntary standard are unlikely to create a substantial burden for manufacturers because the depth of the burden of conformity would be exercised in the design phase. Changes to a computer-aided drawing are relatively easy to turn into a new blue print. However, if a manufacturer must retool a large assembly line or uses hand-drawn templates, this

third point becomes void; the burden of meeting performance requirements would then depend on the monetary expense of production for each individual manufacturer.

TAB F

EXHR Staff Memorandum,

"Update on Hangings Associated with Bunk Beds"

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

Memorandum

Date: April 6, 2015

TO : Tim Smith, Human Factors Engineer, Division of Human Factors, Directorate for Engineering Sciences

THROUGH: Bonnie Novak, Director, Division of Human Factors, Directorate for Engineering Sciences

FROM : Susan Bathalon, Mechanical Engineer, Combustion Program Area Team Lead, Office of Hazard Identification and Reduction

SUBJECT : Update on Hangings Associated with Bunk Beds

Background

Petition CP 03-1/HP 03-1, submitted by The Danny Foundation on September 26, 2002, requested that the Commission establish a standard to address the hazard of strangulation posed by bunk bed corner posts and finials. The Danny Foundation was a nonprofit safety organization created in honor of Danny Lineweaver, a child who was caught and strangled on a crib finial.[1] The petition asserted that due to a bunk bed's height, the corner posts on the bed pose a substantial risk to children who are descending from the upper bunk and may become caught and asphyxiate by the corner post and another item, such as clothing, necklaces, or bedding.

CPSC regulations for bunk beds (16 C.F.R. parts 1213, 1500, and 1513, referred to collectively as the "Bunk Bed Standard") are intended to mitigate entrapment and fall hazards associated with the bed. The Bunk Bed Standard does not include provisions to mitigate hanging hazards. Other CPSC regulations applicable to bunk beds include sharp points or edges testing, lead and phthalate content limits, surface coating requirements, testing and certification, and tracking label requirements. The Bunk Bed Standard defines a "bunk bed" as any bed in which the underside of any foundation is raised more than 30 inches from the floor. CPSC recommends that caregivers should never allow a child younger than 6 years on the upper bunk.

Shortly after receiving Petition CP03-1 and HP 03-1, staff contacted the petitioner to clarify the component of the bed thought to be hazardous. Components of a bunk bed, such as the corner post, corner post extension, and finials, have different functions. A corner post is a functional support column of the bunk bed that extends from the floor to the top of the upper bed's guard

[1] In 2010 and after the work concerning bunk bed hangings, the Danny Foundation declared its mission completed and disbanded. See "Mission Accomplished" section of http://dannyfoundaiton.com.

rail or end panel. Any upper portion of the corner post that no longer provides support or means of horizontal attachment is called the corner post "extension." The finial is a decorative ornament that is attached to a corner post or a corner post extension. The petitioner agreed that the corner post extension and finials are the components of the bed that present the potential to act as a catch point in a child's descent from the upper bunk; therefore, the petition was intended to include only the bunk bed finials and corner post "extensions," but not the corner post.

From November 2002 to January 2003, the Commission published a notice in the *Federal Register* to solicit comments on the petition. The American Society for Testing and Materials (ASTM) Subcommittee on Bunk Beds, ASTM F15.30, began meeting in August 2003, with participation from bunk bed manufacturer representatives, participants from the industry trade group, American Home Furnishings Alliance[2] (AHFA), The Danny Foundation, and CPSC staff. ASTM formed several task groups to explore approaches to address the different scenarios where bunk bed hangings can occur. One hanging scenario occurs when a ligature item, such as a bathrobe belt, other type of belt, scarf, or jump rope is tied or firmly attached to some area of the bunk bed that ensnares and suspends a child. The second hanging scenario occurs when an item worn over the torso, or in the neck region, is caught and suspends a child descending from the top bunk.

The ASTM F15.30 Subcommittee began to develop language for a labeling requirement to address the strangulation hazard associated with attaching potential ligature items to the bed. In addition, the Subcommittee began working towards a performance requirement to mitigate the possibility of a worn item being caught on a top bunk surface, which could initiate a hanging scenario. On July 30, 2004, the Commission voted to defer action on the petition while staff continued to work with the Bunk Bed Subcommittee.

Voluntary Standard Revisions

Warning Requirements

In 2004, the initial action of the ASTM F15.30 Subcommittee was to create a warning label to mitigate the behavior of tying extraneous items to the bed because these items could act as ligatures. From the available 2004 incident death data, extraneous items that were attached to bunk beds and acted as ligatures included jump ropes, necklaces, bathrobe belts, backpack straps, shoe strings, bed clothes, and a snake stuffed animal. These items were tied onto the bed frame, the bed rail, the ladder, or the corner post. The Subcommittee revised the voluntary standard, ASTM F-1427, *Standard Consumer Safety Specification for Bunk Beds,* to include the following warning language to address the strangulation hazard associated with items tied to the bed:

> STRANGULATION HAZARD–Never attach or hang items to any part of the bunk bed that are not designed for use with the bed; for example, but not limited to, hooks, belts and jump ropes.

[2] AHFA was previously named American Furniture Manufacturers Association (AFMA).

This strangulation hazard language is listed in a warning label that is affixed to the upper bed end structure and subject to permanency requirements. In addition, the voluntary standard requires this warning language to be included among the safety warnings of the instructional literature, which are printed instructions that accompany the bunk bed. The revised ASTM F-1427 standard included this strangulation warning language when published in October 2004.

Performance Requirements

Concurrently, in 2004, the ASTM F15.30 Subcommittee began developing a performance and design requirement to prevent items being worn by a child from being caught on top bunk surfaces as the child descends. These items can be necklaces, straps, string, or other items that can be on the torso area of the child. This vertical protrusions performance requirement specifically addresses the corner post extensions, but also includes interior top surface vertical catch points. The revised ASTM F-1427 standard provision to address the vertical protrusions states:

> All vertical protrusions along the top inside surfaces of any individual component (including but not limited to bed end structures and guard rails) of the upper bunk shall not extend more than 3⁄16 in. (5 mm) above the upper edge of the adjacent surface. Ladder stiles (uprights) shall not extend more than 3⁄16 in. (5 mm) above the upper edge of the adjacent surface.

This language requires that the construction and fit of the components inside the top bunk have a height difference that is no greater than 3/16 of an inch. The 3/16-inch height is about equivalent to three stacked U.S. quarters. This height requirement includes the upper portion of a ladder attaching to the top surface of the bed and the top surface from a decorative accessory. Normally, two components on the upper bunk are attached to the corner post.

The bunk bed's top surface, primarily at the corner posts, may have an affixed cap to cover holes that are intended to allow for flexibility of features if a bunk bed is no longer in a bunked configuration and is transformed into side-by-side beds. Manufacturers of these convertible bunk beds can use finials or decorative posts when the bed is not bunked. The revised voluntary standard provision to address the caps on the upper corner posts states:

> Any cap used along the top surface of the upper bunk shall not have a vertical protrusion greater than 3⁄16 in. (5 mm) at the edge of the protrusion above the upper edge of the adjacent surface. If the cap is flush with or overhangs the edge of the corner post or other vertical protrusion, the maximum vertical protrusion shall not exceed 3⁄16 in. (5 mm). The cap shall have a maximum height of no more than 20% of the width or diameter of the cap. At no point shall the cap overhang the post more than 1⁄16 in. (2 mm). The cap shall fit flush with the top of the corner post.

This language states that the cap cannot allow for a gap, the shape of the cap should be tapered, any overhang must be no more than 1/16 inch, and the maximum height cannot exceed 3/16 inch.

The 1/16-inch overhang allows for a cap to cover the sharp edges of a metal corner post completely. The cap design is intended to prevent the cap from acting as a catch point on the upper bunk and to allow for tolerances in the manufacturing of this small component. The current market availability of convertible bunk beds that would use caps on corner posts when the bed is assembled as a bunk bed and then disassembled into side-by-side beds is unknown.

The voluntary standard provisions intended to prevent items from being caught on a top bunk surface, including the fit of the components inside the top bunk to within 3/16 inch of a height difference and the corner post cap design, were published in August 2007.

CPSC Data Findings

Staff began reviewing hangings associated with bunk beds in 2004 because of the Danny Foundation petition, CP 03-1/HP 03-1. In 2004, the petition was deferred to allow development of suitable performance requirements in ASTM F1427. The revised 2004 and 2007 publications of ASTM F1427 included new requirements for the strangulation hazard warning and performance requirements to prevent items being worn from catching on a top bunk surface when a child descends from the top bunk. Staff has continued to monitor data, with particular interest in the petitioner's concern of the corner post extension and finials acting as catch points as a child descends the bunk bed.

When possible, staff assigns In Depth Investigations (IDIs) for strangulation incidents associated with bunk beds. The information sought in these reports includes warning labels, configuration of the bed post extensions or finials, manufacturing date of the bunk bed product, and where the ligature is attached to the bed or the victim. Revisions of the ASTM F1427 Bunk Bed Standard incorporated the strangulation warning label and the dimensional corner post extension requirement in 2004 and 2007, respectively. Within the period from 2004 until the last EPI data search of bunk bed hangings in 10/31/2013, only two CPSC-reported strangulation incidents were identified as involving the corner post extension. Both occurred in 2005. In one incident, a back pack was hung on a corner post extension and the strap of the backpack acted as a ligature with the 3-year-old victim. In the first incident, it is unclear how the backpack strap suspended the 3-year-old in the torso area. In the second report, a 9-year-old child jumped off the top bunk bed when wearing a costume with an attached cape. This cape became caught in the post and the child was found hanging on the bed post.

These two incidents involving the corner post extension occurred in 2005. The incident involving the 3-year-old occurred with a new bunk bed; however, the manufacturing date of the bed is unknown. A photo of the warning label was provided in the IDI, but the label did not contain the strangulation warning. The family reportedly received the incident bunk bed in November 2004. The revised ASTM F-1427 standard, which included the strangulation warning language, was published in October 2004. Because of this timing, staff believes that it is unlikely that the 2005 incident bunk bed involving the 3-year-old and the backpack contained the strangulation warning or the top bunk vertical protrusion limitation because the bed was manufactured before publication of these voluntary standard requirements in the ASTM F1427.

The manufacturing date of the bunk bed in the 2005 incident involving the 9-year-old and the cape is also unknown; however, for reasons similar to the previous incident, it seems unlikely that the strangulation warning was included in the label on that bed. The date of the 2005 incident involving the 9-year-old sets the manufacturing date before the 2007 publication date of ASTM F1427 revision that included the top bunk dimensional vertical protrusion limitation.

The efficacy of the revised bunk bed standard in preventing hangings associated with corner post extensions and finials, from the standpoint of reduction of injuries through CPSC data, is difficult to determine for several reasons. First, the specific bunk bed component that was involved in the hanging is identified in a small portion of the available data. Second, a bunk bed product has a long useful life of approximately 2 decades. The longer life of the bunk bed creates uncertainty about whether a reported hanging incident is associated with an older bunk bed manufactured before publication of the revised voluntary standards requirements in 2004 and 2007.

International Bunk Bed Standards

Staff is aware of one international standard for bunk beds that includes top bunk vertical protrusion performance requirements. The Australian and New Zealand Standard, AS/NZS 4220 *Bunk Beds and Other Elevated Beds,* has top bunk height and tapered design performance requirements intended to reduce the hazard of ensnaring and hanging children descending from the top bunk. The 2010 revision of AS/NZS 4220 standard states:

> Protrusions and Snag Points:
> Protrusions shall not be more than 5 mm unless they are so designed that they cannot snag onto clothing. Snag points, including non-protruding features such as bounded spaces with diminishing dimensions that start wide and finish narrow shall be avoided. Garment hoods and drawstrings, necklaces and other items of apparel, jewelry, or play, may catch in a design feature with a diminishing dimension. This Clause shall apply to protrusions and snag points more than 600 mm above floor level.
> NOTE: The intention is to ensure that protrusions and snag points on a bunk bed do not present a means on which the occupant's clothing could catch and thereby present a possible strangulation hazard.

These AS/NZ 4220 requirements are similar to the ASTM F1427 requirements in both maximum height and tapered shape requirements. The AS/NZ 4220 requires that vertical protrusions are less than 5 mm. This dimension converts to approximately 3/16 inch. The 2007 revised ASTM F-1427 and AS/NZS 4220 *Bunk Beds and Other Elevated Beds* contain nearly identical performance requirements to mitigate the potential for childhood hangings by worn articles that become caught on top bunk vertical protrusions.

TAB G

EPHA Staff Memorandum,

"Bunk Bed Strangulation Hazard Update"

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

Memorandum

Date: April 6, 2015

TO : Timothy Smith, Engineering Psychologist
Division of Human Factors, Directorate for Engineering Sciences

THROUGH: Kathleen Stralka, Assistant Executive Director
Directorate for Epidemiology

Stephen Hanway, Division Director
Hazard Analysis Division

FROM : Craig O'Brien, Branch Chief[1]
Data Intake and Injury Information Branch

SUBJECT : Bunk Bed Strangulation Hazard Update

I. OVERVIEW

Bunk beds are regulated by the U.S. Consumer Product Safety Commission (CPSC), as codified by 16 CFR parts 1213, 1500, and 1513 (Bunk Bed Standard). In August 2007, ASTM International published an update to the Standard Consumer Safety Specification for Bunk Beds (ASTM F 1427 – 07). A portion of this standard addresses strangulations due to items being caught on a vertical protrusion from the top surface of the bunk bed, mainly extensions of the posts of the bunk bed or decorative finials. This hazard has been examined by CPSC staff previously, after a 2004 petition from The Danny Foundation. This memorandum provides an update to previous data analyses for bunk bed-related strangulations.

II. RESULTS

CPSC staff searched for bunk bed-related incidents in CPSC data sources, as described in Section III (Methodology). These incident reports were reviewed by a multidisciplinary team of CPSC staff to include only incidents involving strangulations associated with the corner posts of the bunk bed, and therefore, incidents that might have involved a corner post extension or finial.[2] Sixteen incidents associated with bunk beds and involving strangulations associated with the corner posts of the bunk bed were reported to the CPSC from January 1, 1990 through October 31, 2013. One of the incidents resulted in a minor injury (bruising); and 15 incidents resulted in fatalities. The ages of the children ranged from 1 year to 12 years. Table 1 (next page) provides narrative descriptions of all 16 incidents, including an indication of which incidents clearly involved a corner post extension or finial.

[1] During this memorandum's initial writing, staff was a Mathematical Statistician in the Hazard Analysis Division.
[2] Except those incidents involving a corner post for which involvement of a corner post extension or finial could be ruled out.

Table 1: Reported Unintentional Bunk Bed Strangulations, 1/1/1990–10/31/2013

Year	Document Number	Age	Verbatim Narrative	Finial or Extension
1993	N9420223A	1 yr.	A 18 MONTH OLD MALE WAS STRANGLED AFTER BECOMING ENTANGLED IN A BEADED NECKLACE HANGING ON A BED POST.	Unclear
1994	H9490075A	5 yr.	A 5 YEAR OLD FEMALE WAS BRUISED HANGING BY HER NECK WHEN HER NIGHTGOWN GOT CAUGHT ON A METAL BUNK BED POST.	Unclear
1995	9506015263	10 yr.	DECEDENT TIED SHIRT TO BUNKBED POST, PUT HIS HEAD IN THESHIRT, AND WHILE PLAYING, ACCIDENTLY HUNG HIMSELF - ASPHYXIA; HANGING - AUTOPSY YES	Unclear
1997	X9730940A	11 yr.	AN 11 YEAR OLD MALE DIED AFTER HE ACCIDENTALLY HUNG HIMSELF WITH A BEDSHEET ATTACHED TO A BUNKBED BEDPOST.	Unclear
1997	970409CNE5111	5 yr.	A 5 YEAR OLD FEMALE ACCIDENTALLY HUNG HERSELF FROM THE CORNERPOST OF AN UPPER BUNK BED WHILE SHE WAS PLAYING. A BATHROBE BELT WAS FOUND AROUND HER NECK. SHE DIED AT THE SCENE.	Extension
1999	991208CCC0171	2 yr.	A 2-1/2 YEAR OLD MALE CLIMBED ONTO AN UPPER BUNK BED AND PUT A STRAP ATTACHED TO A WATER BOTTLE AROUND HIS NECK. IN CLIMBING DOWN THE STRAP CAUGHT ON A BEDPOST AND THE CHILD WAS HUNG. HE DIED OF HIS INJURIES TWO DAYS LATER.	Extension
2000	X0030824A	9 yr.	A 9 YEAR OLD BOY HUNG HIMSELF WITH A BATHROBE TIE TIED TO A BUNK BED POST BY ACCIDENT. HE DIED OF ASPHYXIA DUE TO HANGING. CASE: 00-149.	Unclear
2001	010509CWE5010	4 yr.	A 4 YEAR-OLD MALE SUFFERED ASPHYXIA DUE TO HANGING WHEN ONE STRAP OF A CHILD'S BACKPACK PURSE CAUGHT ON THE BED POST OF A BUNK BED AND THE SECOND STRAP OF THE PURSE BECAME CAUGHT AROUND THE VICTIM'S NECK. THE PURSE BELONGED TO AN OLDER SIBLING. THE VICTIM HAD A HABIT OF PLAYING ON THE BUNK BED. THE INCIDENT WAS NOT WITNESSED. THE OLDER SIBLING OCCASIONALLY HUNG THE PURSE FROM THE BED POST. IT WAS SHE WHO FOUND THE VICTIM HANGING FROM THE BUNK BED.	Extension

Year	Document Number	Age	Verbatim Narrative	Finial or Extension
2003	030430CCN0496	4 yr.	A FOUR-YEAR-OLD MALE WAS PLAYING IN HIS BEDROOM ON THE UPPER BED OF HIS BUNK BED. HE HAD A JUMP ROPE TIED TO THE TOP POST THAT EXTENDED TO THE FLOOR. HE WRAPPED THE END OF THE JUMP ROPE AROUND HIS NECK AND DESCENDED THE LADDER. WHEN HE REACH THE BOTTOM RUNG, THE ROPE STOPPED HIM AND HE SWUNG OFF THE LADDER AND BECAME SUSPENDED IN THE AIR. HIS MOTHER FOUND HIM HANGING FROM THE ROPE WITH HIS FEET EIGHT INCHES OFF THE FLOOR. THE CHILD DIED TWO DAYS LATER AT THE HOSPITAL.	Finial
2004	0432017053	12 yr.	BELT AROUND NECK CAUGHT ON BED POST - ASPHYXIATION; ACCIDENTAL, STRANGULATION - AUTOPSY NO	Unclear
2005	050308CCC3240	3 yr.	A THREE YEAR OLD FEMALE DIED FROM ANOXIA WHEN HER NECK BECAME ENTRAPPED IN A STRAP FROM A BACKPACK THAT WAS SUSPENDED FROM THE CORNER POST OF A BUNK BED. THE EVENT WAS NOT WITNESSED. THE VICTIM WAS FOUND PARTIALLY SUSPENDED AND UNRESPONSIVE BY AN ADULT CARETAKER. EFFORTS TO REVIVE THE VICTIM WERE UNSUCCESSFUL.	Extension
2005	X0640390A	9 yr.	A BOY, AGE 9, DIED WHILE PLAYING IN HIS ROOM WHEN HE JUMPED OFF THE TOP OF BUNKBED. HE WAS WEARING A COSTUME WHICH HAD A CAPE ATTACHED. THE CAPE BECAME CAUGHT IN THE BED POST & HE WAS FOUND HANGING FROM THE BEDPOST. 05-02864	Extension
2006	0622020984	9 yr.	FOUND HANGING FROM BEDPOST. ASPHYXIATION. LIGATURE STRANGULATION. AUTOPSY-YES.	Unclear
2008	80430158	12 yr.	PARENTS FOUND HER,AT HOME, HANGING FROM THE POSTS OF HER BED, BY CLOTHBELT, WITH FEET DANGLING, PULSELESS. DX: CARDIOPULM. ARREST,ASPHYXIA	Unclear
2010	1016006960	6 yr.	ACCIDENTALLY GOT HEAD IN BELT AND BED POST DURING PLAY. ASPHYXIATION. STRANGULATION. HANGING. AUTOPSY-YES.	Unclear
2011	1121012463	10 yr.	A 10 YEAR OLD MALE WAS HANGING FROM END OF BED. ASPHYXIA. LIGATURE. HANGING. AUTOPSY-YES.	Unclear

In addition to the 16 incidents in Table 1, there were 23 reported incidents in which the strangulation involved a part of the bunk bed other than the corner post; and 52 reported incidents in which it was not possible to determine what portion of the bunk bed, if any, was involved in the strangulation.

III. METHODOLOGY

The incidents reported in this memorandum were derived from four sources: the National Electronic Injury Surveillance System (NEISS), the CPSC's death certificate database, the CPSC's Injury and Potential Injury Incident file (IPII), and the CPSC's Consumer Product Safety Risk Management System (CPSRMS). Information about each of these sources follows.

NEISS is a probability sample of approximately 100 U.S. hospitals having 24-hour emergency departments (EDs) and more than six beds. NEISS collects injury data from these hospitals. Coders in each hospital code the data from the ED record and the data is then transmitted electronically to the CPSC.

The CPSC purchases death certificates from all 50 states, New York City, the District of Columbia, and some U.S. territories. Only those certificates in certain E-codes (based on the World Health Organization's International Classification of Diseases ICD-10 system) are purchased. These are then examined for product involvement before being entered into the CPSC's death certificate database. The result is neither a statistical sample, nor a complete count of product-related deaths; nor does the result constitute a national estimate. The database provides only counts for product-related deaths from a subset of E-codes. Therefore, these counts tend to be underestimates of the actual numbers of product-related deaths. Death certificate collection from the states also takes time. As of September 2013, the Death Certificates database was considered 99 percent complete for 2009, 96 percent complete for 2010, 90 percent complete for 2011, and 55 percent complete for 2012.

The CPSC's IPII File is a database containing reports of injuries or potential injuries made to the Commission. These reports come from news clips, consumer complaints received by mail or through the CPSC's telephone hotline or website, Medical Examiners and Coroners Alert Program (MECAP) reports, letters from lawyers, and similar sources. While the IPII database does not constitute a statistical sample, the database can provide CPSC staff with guidance or direction in investigating potential hazards.

CPSRMS combines the functionality and contents of the death certificate database and IPII. CPSRMS was put into use in 2011.

In November 2013, all of the above databases were searched for incidents associated with product codes 661 (Bunk beds), 694 (Beds, not specified), and 4076 (Beds or bedframes, other or not specified); reported between 1/1/2007 and 10/31/2013; and containing one of the following keywords in the description of the incident: hang, hung, strang, chok, or neck. This data was combined with data pulled for previous memoranda in 2007 and 2004, which had searched for incidents occurring back as far as January 1, 1990. All of the reports were reviewed by CPSC staff to include unintentional strangling on an item tied to or attached to the bunk bed. Specifically excluded from the baseline data were cases clearly not involving a bunk bed, cases involving homemade bunk beds, suffocations involving bedding used in a normal manner, suffocations involving products near the bunk bed (but not attached to the bunk bed or worn), entrapment suffocations, and intentional cases. Entrapment suffocations involve being stuck between the bed and another object, usually the bed frame, a bed rail, or a wall. If no second product involvement was indicated in the report, the incident was assumed to be an entrapment

suffocation. Intentional cases involve the victim intentionally attaching something to their neck and to the bunk bed. This includes suicides and auto-erotic asphyxiations, as well as pranks and other play behavior. Suicides are often classified as accidental deaths by medical examiners to spare the family, especially in the case of children. Unspecified ligature hangings for children 13 years of age and older were assumed to be intentional cases, as were hangings involving rope for children 10 years of age and older. Although incidents involving victims of all ages were reviewed, the assumptions about intentionality meant the oldest victim in the data was 13 years of age.