

# **TAB E**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

## Memorandum

Date: October 22, 2003

TO : Debra Sweet  
Project Manager, Bunk Bed Cornerposts Petition  
Directorate for Epidemiology

THROUGH: Hugh M. McLaurin *HMM*  
Associate Executive Director, Directorate for Engineering Sciences

Robert B. Ochsman, Ph.D. *RBO*  
Director, Division of Human Factors

FROM : Michele R. Marut, Engineering Psychologist *MRM*  
Division of Human Factors

SUBJECT : Human Factors Assessment for Petition CP03-1/HP03-1  
Petition to Establish Mandatory Safety Standards for Bunk Bed Cornerposts

## Introduction

The U.S. Consumer Product Safety Commission (CPSC) received petition CP03-1/HP03-1 from The Danny Foundation requesting that the Commission establish a mandatory safety standard banning bunk bed corner post extensions and finials to prevent hanging deaths and injuries to children.

Federal Regulations 16 CFR Parts 1213 and 1513 define a bunk bed as a bed in which the bottom of any mattress support is more than 30 inches off the ground. Bunk beds are commonly made of metal or wood and their designs often use corner posts as a means of support. A corner post extension is the upper segment of the corner post that does not provide structural support or a means of attachment for end panels or guardrails of the bunk bed. Sometimes a finial (a decorative knob or ornament) is placed on the corner post or the corner post extension by the manufacturer. There are no voluntary or mandatory U.S. standards with performance requirements for bunk bed corner post extensions or finials. However, the height of corner post extensions on cribs and play yards, with and without finials, is subject to voluntary standards.

CPSC staff is aware of 47 bunk bed related hanging incidents (39 deaths, 8 injuries) that occurred between January 1, 1990 and December 31, 2002. Staff from Health Sciences defines a hanging as "the constriction of the neck by a ligature (an object that can constrict the material around which it is placed) wherein the pressure applied to the neck is due to all, or part of, the weight of the individual's body bearing upon the ligature." The majority of the 47 incidents were caused by a child's clothing, accessory, or bedding catching on the bunk bed or a child

becoming entangled in an item (i.e., belt, scarf, purse) attached to the bunk bed and involved children ranging in age from 11 months to 16 years.

Of the 47 incidents, four fatal incidents specifically indicate that a corner post extension and/or finial was involved.

- A two-year-old male climbed onto an upper bunk bed and put a strap attached to a water cup around his neck. In climbing down, the strap caught on the corner post extension and the child was fatally hung (991208CCC0171).
- A seven-year-old female looped a belt over the corner post extension and/or finial, put the belt around her neck and swung back and forth before being fatally hung (9549003956).
- A four-year-old male became fatally entangled in a purse already hanging from the corner post extension (010509CWE5010).
- A five-year-old female was found hanging from the corner post with a bathrobe belt around her neck. The child was known to have been jumping off the bed before the incident. Whether the belt was caught on the corner post extension when she jumped or if the belt was intentionally attached to the extension before she jumped is unknown (970409CNE5111).

In this memorandum, staff from the Division of Human Factors (HF) comments on the extent to which hangings from corner post extensions and finials may be prevented by eliminating corner post extensions and finials. This analysis focuses on human factors issues related to bunk bed hangings, most specifically hangings from corner post extensions and/or finials. Hazards that are not related to hangings from corner post extensions and/or finials, such as falls from bunk beds or guardrail entrapments, are not addressed in this memorandum.

## **Discussion**

### ***User Characteristics***

Several characteristics of children are likely to contribute to hanging scenarios. A child may lack the cognitive skills and/or the coordination to anticipate and/or move to avoid a hanging scenario or to reverse the sequence of events that might cause him to become hung. The size of a child, (i.e., stature, length of arms and legs, etc.) may also contribute to hanging scenarios. While in a hanging position, a child's small size may make it difficult for him to reach a place to balance or stand (i.e., the floor, a ladder rung, and the lower bunk). The ability to balance or stand will affect his ability to disentangle himself from the bunk bed and the secondary item involved in the hanging. Similarly, a child may lack the strength required to perform any of these actions.

Children may have some of these characteristics because they are very young. Three of the four corner post extension and/or finial incidents involved children under six years. According to Federal Regulations 16 CFR Parts 1213.5 and 1513.5, six years is the minimum recommended age for use of the upper bunk of a bunk bed. However, as shown by the incidents, children under six are likely to climb on bunk beds and interact with items attached to upper bunks such as corner post extensions and/or finials.

Children six and over may still be involved in hanging scenarios if they lack the cognition, coordination, size, and/or strength to help them avoid or reverse a hanging scenario. HF notes that one of the corner post extension and/or finial incidents involved a seven-year-old child.

Additionally, a child may end up in a hanging position that requires another person to rescue him. However, children of all ages often use bunk beds without adult supervision (i.e., sleeping, waking up, bedtime, when playing alone or with other children) and parents often expect to hear a child in danger, since a common behavior of children in danger is to cry out. However, staff from Health Sciences has indicated that a child would most likely be unable to cry out if his airway was already blocked and that if help is not received within 3-5 minutes, it may be too late for him to be revived. Therefore, children are unlikely to receive immediate help if they hang from a bunk bed.

Any of the above characteristics (cognition, coordination, small size, little strength, and unsupervised activity) may have played a role in the four fatal corner post extension and/or finial incidents.

### ***Causes of Corner Post Extension and/or Finial Hangings***

Two causative scenarios emerged from an analysis of the four fatal corner post extension and/or finial incidents: (1) clothing, accessory, or bedding catches on the corner post extension and/or finial (991208CCC0171) and (2) entanglement in previously attached items (9549003956 and 010509CWE5010). Methods of attaching an item to a corner post extension or finial include tying, hooking or looping it over the extension or finial. HF cannot confidently determine whether incident 970409CNE5111 is the result of scenario one or two.

Some items a child may wear or hold can catch on the corner post extension and/or finial while the child climbs on or off the bunk bed thus creating a potential hanging scenario. The likelihood of this scenario occurring while the child is climbing increases if the ladder is close to corner post extensions and/or finials. The ladder is likely to be close to corner post extensions and/or finials because ladders are often located adjacent to bunk bed end structures. In order to accommodate the ladder access to an upper bunk, CFR Parts 1513.3(a) allows a gap of no more than 15 inches between the guardrail end and end structure. Similarly, some ladders are close to corner post extensions and/or finials because they are integrated into the end sections of the bunk beds.

Since bunk bed ladders are often close to corner post extensions and/or finials, and children sometimes lean over a corner post extension and/or finial while ascending or descending bunk bed ladders, it is possible that a child's clothing or an accessory a child is wearing may become caught on the corner post extension and/or finial. Incident 991208CCC0171 involved such a scenario. The incident report describes a two-year-old, with a water cup strap around his neck, descending a bunk bed with a ladder integrated into the end structure, when the strap caught on the 6 inch corner post extension.

HF is aware of several incidents involving children who became caught on bunk beds after jumping off the bunk bed. None of these incidents can be confidently linked to corner post extensions or finials. However, since ladders are often close to corner post extensions and/or finials, the clothing or accessory on a jumping child may potentially catch on the corner post extension and/or finial.

Eliminating corner post extensions and finials removes the opportunity for a child's clothing or accessory to catch on these features and thus prevents related hangings.

Hanging incidents can also occur when children become entangled in an item attached to the corner post extension and/or finial. Items such as belts, sheets, and t-shirts are widely available in the home and can easily be tied, hooked or looped to the corner post extension and/or finial. Sometimes children may tie sheets to one or more corner post extensions and/or finials while making a fort, a swing, or a hammock. They may hook belts or scarves around the corner post extension and/or finial while playing Tarzan or super hero and then rappel down the bunk bed. Children can swing from T-shirts hooked on the cornerpost extension and/or finial. Similarly, they may jump off the bed while holding one of these items or tie the item around their themselves before swinging. Incident 9549003956 involved a seven-year-old child attaching a belt to a corner post extension and/or finial before putting it around her neck and swinging. Children may also handle and become entangled in items (i.e., backpacks, toy hammocks, etc.) previously attached to the bed. In incident 010509CWE5010, a four-year old child became fatally entangled in the straps of a purse hanging on the corner post extension and/or finial. Although the report states he liked to climb on the nearby ladder, it is unknown how he became entangled in the purse straps.

Eliminating corner post extensions and finials precludes a child or someone else from attaching (tying, hooking, looping, etc.) items there. This will prevent hangings associated with items deliberately attached to corner post extensions and finials.

## **Other Concerns**

HF notes that there were 24 bunk bed hanging incidents not associated with a specific part of the bunk bed and 19 incidents involving specific parts of the bunk bed that are not identified as corner post extensions and/or finials (i.e., ladders, guard rails, etc.). The causative scenarios in these incidents were similar to those involving corner post extensions and/or finials: 1) clothing, accessory, or bedding catches on some part of the bed (i.e., edge of ladder, between mattress and end panel, etc.) and 2) entanglement in previously attached items.

These incidents involving clothing or accessories getting caught on the bunk bed are similar to the incidents involving clothing or accessories getting caught on the corner post extension and/or finial because the likelihood of catching on a part of the bunk bed also depends on what the child is wearing or carrying, and whether the clothing or accessory catches on some part of the bunk bed. Again, this scenario is potentially dangerous if it occurs while the child is climbing on or off or jumping off the bunk bed because the child may hang if clothing or an accessory catches during those activities. Eliminating corner post extensions and finials will not eliminate protrusions such as ladder edges or rails, which may catch a child's clothing or accessory.

Similarly, children may tie, hook, or loop objects around any part (i.e., ladder rung, guard rail, mattress platform, etc.) of the bunk bed in addition to corner post extensions and/or finials. They also may play with items attached by someone else to the bunk bed. Thus, if corner post extensions and finials are eliminated the child may still become entangled in an item he or someone else deliberately attached to another part of the bunk bed.

## **Conclusion**

HF believes that eliminating corner post extensions and finials would eliminate the opportunity for a child's clothing or an accessory to become caught on such features and precludes a child or someone else from attaching (tying, hooking, looping, etc.) items there. This will prevent hangings caused by such events. However, eliminating corner post extensions and finials will not eliminate all bunk bed hanging incidents.

**TAB F**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: October 23, 2003

TO : Debra Sweet  
Project Manager, Petition CP 03-1 / HP 03-1  
Directorate for Epidemiology

THROUGH: Mary Ann Danello, Ph.D., Associate Executive Director,  
Directorate for Health Sciences *md*  
Lori E. Saltzman, M.S., Director, *l*  
Division of Health Sciences

FROM : Jason R. Goldsmith, Ph.D., Physiologist, *JRG*  
Division of Health Sciences

SUBJECT : Petition CP 03-1 / HP 03-1

This memorandum has been prepared in response to Petition CP 03-1 / HP 03-1, which petitions the Commission to address hanging deaths that have resulted from bunk bed corner posts or finials by instituting a mandatory safety standard that would ban such elements on bunk beds.

**BACKGROUND:**

The petition was brought by the Danny Foundation, a nonprofit organization, whose mission is to secure safety standards for baby cribs and other children's products. The Foundation characterizes corner posts or finials<sup>1</sup> as unnecessary embellishments that can injure or kill children. In support of that claim, the petitioner submitted an appendix containing descriptions for twenty hanging incidents believed to have involved bunk bed corner post extensions (the structurally nonessential terminal portion of the corner post) or finials, at least 14 of which are purported to be fatalities. The incidents, compiled from CPSC databases and a newspaper article, occurred between July 1993 and February 2002 and involved children ranging in age from 19-months-old to 12-years-old.

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<sup>1</sup> Whereas, the petitioner has equated corner posts (a required structural element) with finials and requested that either be banned, for purposes of this memorandum it is assumed that the petitioner's intention was to request a ban of corner post *extensions* as well as the finials that may adorn corner posts or corner post extensions.



The Division of Hazard Analysis (HA) staff (D. Sweet, June 24, 2003 Hazard Analysis memorandum) examined CPSC incident databases for hanging incidents involving bunk beds that occurred during the period of January 1, 1990 through December 31, 2002. Thirty-nine deaths and eight injuries were found. A subset of these incidents involve children who were either 1) caught on the corner post extension or finial, or other feature of the bunk bed (e.g., ladder or support member) by articles of clothing, clothing accessories or other products that were already in contact with their necks, or 2) were hung by items that previously had been placed over, or tied to, a corner post extension or finial, or tied to another feature of the bunk bed (e.g., guardrail or support member). However, in the majority of incidents, it is not clear which, if either, of these two scenarios may apply. Ten of the 47 incidents mention the child hanging from or becoming caught on the “post”, “bed post”, “bunk bed post”, or “corner post”, some of which may refer to the design element(s) that is of concern to the petitioner (i.e., corner post extension or finial).

Based on a review of the materials provided by the petitioner, the HA analysis, and the medical literature involving hanging deaths, Health Sciences (HS) staff has provided a discussion on hanging and the injury potential associated with a child becoming suspended about the neck by an object that is caught on, placed over, or tied to the corner post extension or finial of a bunk bed.

## **DISCUSSION:**

Hanging is defined as the constriction of the neck by a ligature (an object that can constrict the material around which it is placed) wherein the pressure applied to the neck is due to all, or part of, the weight of the individual’s body bearing upon the ligature. Hanging can occur without the body being fully suspended (Iserson, 1984). A variety of items can serve as ligatures; examples include ropes and cords, articles of clothing (e.g., a shirt or nightgown), and clothing accessories (e.g., a belt or tie).

When an individual is suspended by an object that is either tied or wrapped around the neck such that it fully encircles the neck, or otherwise becomes caught by an object about the neck (i.e., less than the full circumference of the neck is in contact with the article), it can constrict the neck and affect the tissues that lie within it. It is important to note that it is not necessary for the ligature to surround the neck for hanging to occur (Polson, 1973). The tissues within the neck that may be affected in hanging incidents are the bilateral blood vessels that course through the neck (i.e., the common carotid arteries and jugular veins), the vagus nerve that is closely associated with these vascular elements, and the centrally-located upper respiratory tract. The common carotid artery, jugular vein and vagus nerve are all located in the soft tissues of the neck, very superficial to the skin, and are therefore vulnerable to external injury. The common carotid arteries and jugular veins are vital cardiovascular elements in the maintenance of brain function; the common carotid arteries carry oxygenated blood to the brain and the jugular veins provide a return path to the heart for deoxygenated blood from the brain. The vagus nerve is involved in the regulation of cardiac function. The upper respiratory tract, consisting of the larynx and trachea, is the conduit through which the lungs receive inspired air containing oxygen. The involvement of these structures in hangings will be discussed in greater detail below.

Experiments in adult cadavers have revealed that very little tension on the ligature is needed to occlude the structures within the neck. In an adult, the tension on the ligature (a rope) that is necessary to occlude the jugular veins, the common carotid arteries, and trachea was determined to be 2 kg (4 pounds) (Brouardel, 1897), 3-5 kg (7-11 pounds) (Brouardel, 1897; Polson, 1973) and 15 kg (33 pounds) (Brouardel, 1897), respectively. Using a 64 kg (140 pound) human volunteer, Polson (1973) determined that only a small proportion of an individual's full body weight<sup>2</sup> was capable of exerting 14 kg (30 pounds) of tension on a rope placed around the neck. Assuming that these determinations approximate those for children, since no such values exist for children, the full body weight of a child would be expected to exert tension on a ligature sufficient to occlude one or all of these structures (i.e., the jugular veins, common carotid arteries, and trachea).

As stated by Polson (1973), the effects of applying the weight of one's body to a ligature placed around the neck are complex; all or some of the effects described in the following discussion may apply in a given hanging incident. Typically, hanging injuries and deaths result from the cerebral hypoxia (reduction of oxygen supply to tissues) and/or ischemia (deficient blood supply) that occurs in the brain subsequent to the occlusion of the blood vessels in the neck. Given the low force required to occlude the jugular veins, compression of these vessels is a likely factor in all cases of hanging (Iserson, 1984). In the case of incomplete hanging, where part of the weight of the individual's body is supported by the ground or some other structure (i.e., rather than by the ligature), the pressure on the neck may initially compromise only the jugular veins (Hoff, 1978; Iserson, 1984; Polson, 1973). Occlusion of only these vessels will result in engorgement of the head and neck (due to the continuing arterial blood flow into this region), cerebral edema (swelling of tissue due to an accumulation of fluids), and cerebral hypoxia, eventuating in a loss of consciousness (Hoff, 1978; Iserson, 1984; Polson, 1973). The edema and hypoxia will result in irreversible neuronal damage (Digeronimo and Mayes, 1994; Feldman and Simms, 1980; Hoff, 1978). The loss of consciousness, in turn, will lead to decreased muscle tone in the neck, which may then permit compression by the ligature of the carotid arteries and/or occlusion of the airway (Iserson, 1984) (see below for a discussion of these events). Gresham (1993) states that in the absence of intense constriction of the neck, as may occur in incomplete hangings, death may occur more slowly, with a period of coma developing beforehand. In incomplete hangings, or those hangings where occlusion of the venous return predominated, the hypertension that results in the head and neck often leads to the hemorrhaging of capillaries in the conjunctivae (the delicate membrane that lines the exposed anterior surface of the eyeball and posterior surface of the eyelids) and face; the pinpoint purplish red marks, known as petechial hemorrhages, are visible at autopsy (Ely and Hirsch, 2000; Luke et al., 1985; Polson, 1973).

In complete hangings, where the full weight of the body bears upon the ligature, or in those circumstances where the pressure to the neck is otherwise sufficiently strong, occlusion of both the jugular veins and common carotid arteries may occur, resulting in cerebral ischemia (Digeronimo and Mayes, 1994; Hoff, 1978; Polson, 1973). Without restoration of the cerebral circulation, all the oxygen that is available to the brain will be consumed within approximately 15 seconds (Digeronimo and Mayes, 1994); this will result in a loss of consciousness and rapid

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<sup>2</sup> In this experiment, a rope was placed around the neck of a subject who assumed a semi-reclined position. The pull on the ligature exerted by the weight of the subject's head and shoulders alone (i.e., only partial body weight) was then determined.

irreversible neurological damage, with death occurring within four to five minutes (Iserson, 1984). In addition to the mechanical closure of the vasculature, compromise of the respiratory tract may also occur. Occlusion of the airway may occur as the hyoid bone (the U-shaped bone lying between the jaw and larynx) is displaced posteriorly, causing the tongue to move posteriorly and rest against the back wall of the pharynx (throat) and the epiglottis (the elastic cartilage located at the root of the tongue, which folds over and thereby protects the larynx during swallowing) to fold over the larynx (Iserson, 1984). Such compromise will affect the oxygen supply to the lungs and ultimately produce hypoxia in the brain and elsewhere; this will result in greater injury in less time than would compromise of the vascular structures alone (Digeronimo and Mayes, 1994). Hangings in which the initial pressure is sufficient to occlude both the common carotid arteries and jugular veins are likely to have a complete or near absence of petechial hemorrhages of the conjunctivae and face (Ely and Hirsch, 2000; Luke et al., 1985; Polson, 1973); this is owing to the obstruction of the carotid arteries and consequent absence of a significant increase in intracapillary pressure in the head (Luke et al., 1985).

A more rapid death, from cardiac arrest, may also occur in some hanging deaths, due to the activation of neural pathways that regulate cardiac output. Compression of the neck may activate baroreceptors (pressure sensors) within the carotid sinus (an enlarged area within the carotid arteries) and initiate a dramatic bradycardia (slowing of heart rate) and loss of consciousness, eventuating in cardiac arrest (Gresham, 1993; Hoff, 1978; Iserson, 1984; Polson, 1973; Shepherd, 1990). Polson (1973) has remarked that in hanging, death from this mechanism may be the exception rather than the rule, whereas others have commented that this mechanism theoretically may occur in older individuals with atherosclerosis and carotid artery disease (Digeronimo and Mayes, 1994; Iserson, 1984), but is unlikely to occur in children (Digeronimo and Mayes, 1994). Rapid cardiac arrest may also result from reflex activation of the vagus nerve by external pressure applied to the carotid bodies (chemical sensors associated with the carotid arteries) (Feldman and Simms, 1980; Hoff, 1978; Iserson, 1984; Shepherd, 1990) or vagal sheath (a fibrous envelope that surrounds the carotid artery, jugular vein and the vagus nerve) (McHugh, 1983; Polson, 1973).

### Bunk Bed Hangings

The severity of injury that will result from a child hanging from a bunk bed may range from minor abrasions, contusions, and lacerations produced by the ligature, to the death of the child. This is dependent on a number of factors, including the manner of the suspension, the ligature involved, and the duration of time that the child hangs before rescue and resuscitation are initiated. In turn, the manner of suspension is dependent on the height of the child, the height of the bunk bed, the ligature attachment point or point where an article becomes caught, and the length of the ligature. In such cases where one or more of these factors allow the child's weight to be partially supported (e.g., in a sitting or kneeling position), an incomplete hanging may occur. In contrast, when a child's body is fully suspended (i.e., at most, only the toes touching a surface), a complete hanging occurs. A complete hanging is likely to produce intense constriction of the neck, and lead to rapid loss of consciousness and death, whereas partial suspension (i.e., an incomplete hanging) may produce less pressure on the neck, with death possibly occurring more slowly. Corner post extensions and finials may facilitate objects being hung from bunk beds and also serve as a catch point for objects associated with the neck of a child (e.g., clothing or clothing accessories), which potentially could become ligatures.

Children that are rescued soon after the onset of a hanging incident require immediate resuscitation in order to reestablish cerebral blood flow. If cardiopulmonary resuscitation attempts are not initiated immediately and/or the child responds poorly to such efforts (i.e., don't develop spontaneous pulse and respiration), the medical outcome is generally unfavorable (Digeronimo and Mayes, 1994; Feldman and Simms, 1980; Hoff, 1978). In such cases, there are often respiratory complications or failure and significant insult to the brain that may result in coma, survival with severe neurological sequelae (ranging from amnesia to a long-term or permanent vegetative state), or continuing deterioration of the nervous system, ending in death (Digeronimo and Mayes, 1994; Feldman and Simms, 1980; Hoff, 1978; Iserson, 1984). Children who respond positively to resuscitation attempts and are provided with the necessary hospital care, such as treatments to minimize the development of cerebral edema, stand a good chance to recover fully, many doing so within only days of their hanging incident (Digeronimo and Mayes, 1994; Feldman and Simms, 1980; Iserson, 1984).

### Bunk Bed Incident Data

In four of the incidents found in the CPSC databases, staff was able to reasonably conclude that a corner post extension or finial was involved in the hanging. All four of these incidents had fatal outcomes. Three of the incidents involved children younger than 6-years-old, the minimum age CPSC has recommended for use of the upper bunk of a bunk bed.

- IDI #991208CCC0171: In this incident, a 2-year-old male was caught on and hanged from the corner post extension (reported to be approximately 6 inches in height) by the strap of the water bottle he was wearing around his neck as he descended the bed. It is unknown whether the child was completely suspended by the strap. The mother of the child believes that he was left unattended for only three minutes and relieved his suspension immediately upon discovering him. Pulses were not regained until after the child's arrival in the emergency room, at which time there was evidence of anoxic (total lack of oxygen) brain injury and pulmonary hemorrhage. The child was kept alive on life support for two days, until such support was terminated due to the absence of brain function. Although the rescue of this child may have been within three minutes of the initiation of hanging and the response to resuscitation efforts was somewhat positive, the anoxia that occurred during the hanging resulted in a severe insult to the brain from which the boy could not recover.
- IDI #010509CWE5010: In this incident, a 4-year-old male was entangled in and hung from one of the straps of a backpack, the other strap of which previously had been placed on the bunk bed's corner post extension (reported to be approximately 3 inches in height). The child could not be resuscitated. The coroner noted the cause of death as asphyxia due to hanging. The duration of time that the child was hanging prior to his being discovered is unknown and the documentation of this case did not specify whether he was completely suspended. The petechial hemorrhages of the face and eyes and cerebral edema noted by the coroner may suggest that venous occlusion alone occurred for some period of time and possibly that the hanging may have been incomplete.
- Death certificate #9549003956: In this incident, a 7-year-old female hanged from a belt that was looped over the corner post extension or finial and around her neck. The brief description provided on the death certificate suggests that the belt had been purposefully placed over the corner post extension or finial and then around the girl's neck after which she swung back and forth. The certifying physician stated that the girl died of cardiac arrest as a

result of accidental strangulation. Additional details are not available for this incident. Therefore, it is unknown to staff whether the belt was originally placed around her neck or if it moved to that position during the act of swinging. It is also unknown whether the child was completely suspended and the duration of time the child was hanging prior to her being discovered.

- IDI #970409CNE5111: In this incident, a 5-year-old female was hung by a bathrobe belt that formed a continuous loop around the child's neck and the corner post extension (approximate height is unknown) of the bunk bed. The child may have been unattended for anywhere from 20 minutes to 3 hours before being discovered by her grandmother, and could not be resuscitated once rescued. Whereas, the medical examiner noted that the free ends of the belt had been tied together in a knot, it is not clear whether the belt was initially placed over the corner post extension or finial of the bunk bed or whether it had been caught there. This is the only incident for which it is possible to determine whether the hanging was complete or incomplete, as one of the first persons to observe the child hanging noted that her toes were barely touching the floor (i.e., a complete hanging). The few scattered petechial hemorrhages found on the conjunctivae and absence of any on the face are consistent with a complete hanging.

In a review of the medical literature on hangings possessed by HS, three case reports were found in which a child (6-, 7- and 11-years-old) was hung from or became caught on the "corner post" or "upper post" of a bunk bed<sup>3</sup>. One of these incidents occurred between 1985 and 1990 and resulted in the death of the child (Clark et al., 1993, Case 9). The two other incidents occurred between June 1989 and April 1991 and resulted in the injury of the child (Digeronimo and Mayes, 1994, Case 1 and Case 2). None of these incidents is a duplicate of an incident analyzed by HA. In one of these cases (Digeronimo and Mayes, 1994, Case 1), HS staff was able to reasonably conclude that a corner post extension and/or finial was involved in the hanging.

In this hanging incident (incident date of February 21, 1990 or 1991), a 7-year-old male unintentionally hanged himself by his headband from the corner post of a bunk bed located in his bedroom. The incident occurred while he was pretending to be a "Ninja Turtle", at which time his headband inadvertently slipped down around his neck and became caught on the corner post. His mother found him completely suspended from the bedpost and immediately freed him (duration of suspension is unknown). The boy was limp, cyanotic (blue in color) and was without spontaneous movements. Although he had a palpable pulse, he was not breathing. After several minutes of mouth-to-mouth resuscitation by the mother, spontaneous breathing was restored. At the time the paramedics arrived, the boy was found to be unresponsive and had irregular breathing. He was comatose upon arrival at the hospital, treated for four days with ventilation therapy, kept sedated, and given frequent neurological assessments to observe for signs of increased intracranial pressure. After seven days of hospitalization, the boy was discharged with normal mental status, except for amnesia surrounding the hanging incident.

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<sup>3</sup> Given that the medical literature devoted to hangings is extensive and the fact that relevant discussions can be found under many subject headings (e.g., strangulations, asphyxiations, anoxial deaths), HS did not attempt to determine the total number of hanging deaths or injuries due to bunk bed corner post extensions and/or finials that have been reported in the medical literature. Instead, only the pertinent medical literature already in-house was reviewed.

## CONCLUSION:

Hanging injuries can be severe, with permanent debilitation or death likely outcomes. Hanging injuries and deaths may occur as a result of entanglement in, or playing with, objects that have been attached to and retained by bunk bed corner post extensions or finials, or the capture and retention of items previously associated with the neck of the child (e.g., clothing or clothing accessories) by corner post extensions or finials.

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**TAB G**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: March 25, 2004

TO : Debra Sweet, Project Manager  
Division of Hazard Analysis

THROUGH: Hugh McLaurin *Hugh McLaurin*  
Associate Executive Director, Directorate for Engineering Sciences

Mark Kumagai *M. Kumagai*  
Division Director, Division of Mechanical Engineering

FROM : Susan Bathalon *S. Bathalon*  
Mechanical Engineer, Division of Mechanical Engineering

SUBJECT : Engineering Analysis Memorandum, Petition CP 03-1/HP 03-1

Petition CP 03-1/HP 03-1, submitted by the Danny Foundation, requests that the U.S. Consumer Product Safety Commission (CPSC) develop a mandatory standard to address hangings associated with bunk bed corner posts and finials. This memorandum presents a review of current bunk bed and corner posts standards, including Federal regulations, voluntary and international standards, to determine how they address hazards associated with corner post extensions and finials.

The components of the bunk bed, the corner posts, the corner post extensions, and the finials, have functional differences. Corner posts are support columns that act as the backbone structure for a bunk bed. The corner posts transfer the weight of the bunk bed structure, plus the occupant, through to the floor. The corner posts also serve a structural purpose in providing a means of attachment for the guardrails, end panels, and mattress support system. Therefore, the corner post is a functional support column for the bunk bed, which extends from the floor to the top of the upper bed's guard rail or end panel. The height above which the corner post discontinues to provide a means of attachment for the end panel or guardrail is called the corner post extension. Thus, corner post extensions do not provide structural support to the bunk bed. Likewise finials, which are crowning ornaments such as decorative knobs, do not provide structural support to the bunk bed. Because the finials and corner post extensions are the parts of the bunk bed that present the stated hazard, staff confirmed with the petitioner that the request was a ban of finials and corner post extensions rather than corner posts.



## REVIEW OF STANDARDS

### 1) Review of Federal Regulations for Bunk Beds 16 CFR Parts 1213 and 1513

In December 1999, 16 CFR Parts 1213 and 1513, consumer product safety standards for bunk beds, were published in the Federal Register. 16 CFR Part 1213 addresses risks associated with bunk beds. 16 CFR Part 1513 specifies identical performance requirements as 16 CFR Part 1213, but addresses the unreasonable risks of injury associated with bunk beds intended for use by children. 16 CFR Parts 1213 and 1513 prescribe performance requirements for bunk beds to reduce risks to children from being trapped between the upper bunk and the wall, in openings below guardrails, or in other structures in the bed. A review of 16 CFR Parts 1213 and 1513 is presented below. The performance requirements are categorized as those addressing entrapment hazards and fall hazards. Marking and labeling requirements are also reviewed.

#### a) Performance Requirements for Entrapment Hazards

##### i) Guardrails

For a bed where the underside of the mattress foundation is over 30 inches from the floor, guardrails are required on each side of the bed. The wall side guardrail must be continuous between the bunk bed's end structures, which is defined as a gap less than 0.22 inches between the guardrail and end structure. This gap dimension was defined to prevent finger entrapment. The second guardrail must also be continuous between the guardrail and end structure with the exception that a ladder may be used. A maximum gap of 15 inches between the ends of the guardrail and corresponding bed end structures is allowed, thus allotting space for the ladder.

Without a mattress on the bed, openings between the underside of the upper bunk's foundation and the lower edge of the guardrail's uppermost portion cannot permit passage of a wedge block, as defined in the regulation. The size of the wedge block is defined by the small torso template, in which the dimensions are based on the anthropometric data of a 5<sup>th</sup> percentile 2-year-old child. A 5<sup>th</sup> percentile 2-year-old child is considered to be the smallest user at risk. This wedge block has a base that measures 3.5 inches by 6.2 inches. This requirement is intended to minimize the risk of entrapment due to feet-first entry by a child.

##### ii) Bed end structures

Without a mattress on the upper bunk, openings in the end structures above the foundation of the upper bunk cannot permit passage of the wedge block. Without a mattress on the lower bunk, end structure openings between the underside of the upper bunk foundation and the upper-side of the lower bunk foundation that permit passage of the wedge block must also allow passage of a 9-inch diameter rigid sphere probe. This sphere probe is based on the large head template, which is based on the chin-to-back-of-head of a 95<sup>th</sup> percentile 5-year-old. This requirement is intended to prevent openings that are potential strangulation hazards due to feet-first entry of the child. The rationale

behind the dimension is that if the opening is large enough to permit free passage of the sphere probe, then the opening shall be large enough to allow passage of the child's head.

Without a mattress on the lower bunk, any end structure openings between the underside of the upper bunk foundation and the upper-side of the lower bunk foundation that permits passage of the wedge block and 9-inch diameter sphere probe must also be tested with the neck entrapment probe, as defined in the regulation. Additionally, with the manufacturer's recommended maximum thickness mattress, all portions of bounded openings on the lower bunk end structure that permit passage of the wedge block and 9-inch diameter sphere must conform to neck entrapment tests. The neck entrapment performance test prevents entrapment of a child's head and neck in a bounded opening.

## **b) Performance Requirements for Fall Hazards**

### **i) Guardrails**

To prevent falls, guardrails are required on each side of bunk bed foundations that are over 30 inches from the floor. Guardrail attachment must prevent unintentional removal. The removal of attached guardrails may occur by either applying forces sequentially in different directions or by intentionally disconnecting a fastening device. When a mattress of the maximum thickness (as specified by the bed manufacturer's instructions) is on the bed, the upper edge of the guardrail shall be no less than 5 inches above the top surface of the mattress.

### **ii) Bed end structures**

When a mattress of the maximum thickness (as specified by the bed manufacturer's instructions) is on the upper bunk, the upper edge of the end structures must be at least 5 inches above the top surface of the mattress. This 5-inch height is required for at least 50 percent of the end structure between the corner posts.

## **c) Marking and Labeling Requirements**

Identification of manufacturer information is required on all bunk beds. The bed must have a label identifying the manufacturer, distributor or seller, the model number, and the date of manufacture. In addition, a warning label is required on the inner surface of the bunk bed structure. The warning label states, "To help prevent serious or fatal injuries due to entrapment or falls: Never allows a child under 6 years old on the upper bunk". The label is also required to provide dimensional requirements for the mattress.

## **2) Review of ASTM F1427-01 Voluntary Standard for Bunk Beds**

The ASTM F1427 Standard Consumer Safety Specification for Bunk Beds contains performance tests to determine if a newly manufactured bunk bed is in compliance with the test specifications, thus minimizing the risk of identified hazards associated with the product. The 1996 version of ASTM F1427 contained performance requirements to address hazards associated with falls from the upper bunk, entrapment in the end structures, and structural integrity of the foundation support system. The standard also contained requirements for a warning label, manufacturing identification and consumer information regarding intended use of the bed. The 2001 version of

ASTM F1427 adopted the performance requirements in 16 CFR Parts 1213 and 1513 for guardrails and bed end structure entrapment hazards.

ASTM F1427-01 has performance requirements for mattress foundation cross member supports that is not contained in 16 CFR Parts 1213 and 1513<sup>1</sup>. This mattress foundation performance requirement tests cross member supports. The ASTM standard requires that if more than two cross member supports are used to bolster the mattress foundation, the openings between the supports must prevent passage of the wedge block or allow passage of both the wedge probe (to prevent torso entrapment) and the sphere probe (to prevent head entrapment). ASTM F1427-01 and 16 CFR Parts 1213 and 1513 have identical performance requirements to address fall hazards<sup>2</sup> and for marking and labeling requirements<sup>3</sup>.

On August 7, 2003, the ASTM Subcommittee on Bunk Beds, met to discuss a draft standard, submitted by the F15 Committee Chairman, and review CPSC incident data. Representatives from industry, CPSC, and the Danny Foundation participated in this meeting. During the meeting, the subcommittee committed to develop a voluntary standard to address the concerns raised by the petitioner. The chairman of the bunk bed subcommittee sent a letter to CPSC as "a formal offer to develop a voluntary standard" and detailing task groups set up during the meeting.

Three task groups were established to address hazards associated with bunk bed corner post extensions. The first task group was set up to develop language for the existing warning label to address the hazards associated with corner post extensions and finials and the general hazard of attaching items to bunk beds. This effort is an interim safety measure to address the hazards while performance requirements are developed. The labeling requirement will stay in place once corner post extension performance requirements have been developed. Two other task groups were formed to evaluate CPSC data and to work on developing design and performance criteria to address the hazards of hanging associated with bunk bed corner post extensions and finials. To expedite the process, the subcommittee will first address extensions and finials and then work on requirements to address catch points in general. CPSC staff will participate in all of the task groups.

The ASTM Subcommittee on Bunk Beds met again on February 18, 2004, where wording for the labeling requirements was drafted. Language was developed to warn against the strangulation hazard associated with parents or children attaching an item to the bunk bed and the child then becoming hung by the item. The new language, to be added at the bottom of the existing warning label, reads:

**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.

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<sup>1</sup> For entrapment hazard requirements, refer to sections 1) a) i) and 1) a) ii) of this memorandum.

<sup>2</sup> For fall hazard requirements, refer to sections 1) b) i) and 1) b) ii) of this memorandum.

<sup>3</sup> For marking and labeling requirements, refer to section 1) c) of this memorandum.

Since corner post extensions and finials are to be addressed through performance criteria in the future, the phrase “any part of the bed” is intended to include corner post extensions as well as other parts including ladders, guard rails and beams. The language does not warn against becoming caught on the extension as warning labels are intended to prohibit deliberate action. Accidentally becoming hung is not an action that can be warned against. This hazard will be addressed through the performance requirements. The new warning label language is expected to go to ballot in March.

At this February meeting the subcommittee discussed potential performance requirements to prevent hangings on corner post extensions and finials. A group of subcommittee members will gather in April to experiment with four potential performance requirements and results will be discussed at the June 2004 subcommittee meeting.

### **3) Review of Australian/New Zealand Voluntary Standard AS/NZS 4220:1994 Bunk Beds Standard**

A review of international bunk bed standards was conducted to determine if performance requirements for corner post extensions existed. One such standard was found; AS/NZS 4220:1994 Bunk Beds Standard published in June 1994. The development of AS/NZS 4220 was based on a British Standard, a draft International Standard, and other Australian Standards related to child safety. The performance requirements included in AS/NZS 4220 address hazards from falls off the top bunk, head entrapment, and strangulation hazards.

#### **a) Performance Requirements for Entrapment Hazards**

At 600 mm (23.6 inches) or more from the floor, openings must not have dimensions between 5-12 mm (0.2-0.5 inches) to prevent finger entrapment, 30-60 mm (1.2-2.4 inches) to protect against limb entrapment and 75-230 mm (3.0-9.0 inches) to prevent head entrapment.

#### **b) Performance Requirements for Fall Hazards**

The upper bunk bed must have guardrails that are at least 160 mm (6.3 inches) above the top surface of the maximum recommended mattress thickness on all 4 sides of the bed.

#### **c) Performance Requirements for Hanging Hazards**

There should be no protrusions more than 8 mm (0.31 inches) anywhere on the bed structure. The intention of this provision is to ensure that protrusions on a bunk bed do not create a situation where the child’s clothing could snag and present a possible strangulation hazard. This protrusion requirement is listed in the *Design* section (6.8(b)) of the standard. This section neither includes nor excludes any specific portion of the bunk bed.

Since this protrusion requirement neither specifically includes nor excludes corner post extensions, ES staff researched articles to determine the scope of the 8-mm (0.31-inch) protrusion requirement. An article, Regulation Impact Statement: Bunk Bed Safety Requirements, written by the Australian Consumer Affairs Division of the Treasury Department, reviewed the impact of adopting the voluntary requirements of AS/NZS 4220:1994 as a mandatory consumer product safety standard. The article included a review of bunk beds in the

market place for conformance to the performance requirements in the voluntary bunk bed standard. One major conclusion of this marketplace survey was that some bunk beds were designed with four extended corner posts on the upper bunk that violate the 8 mm (0.31 inch) protrusions requirement. Based on this conclusion, ES staff believes that the 0.31-inch or less protrusion requirement in AS/NZS 4220 applies directly to corner post extensions.

#### **4) Review of Voluntary Standard ASTM F966-00 Crib Corner Post Extensions**

ASTM standards for Non-Full Size Baby Cribs/Play Yards (ASTM F406-02) and Full-Size Baby Cribs (ASTM F1169-99) require that corner post extensions conform to the dimensional specifications of ASTM F966-00 Full-Size and Non-Full-Size Baby Crib Corner Post Extensions. ASTM F966-00 establishes an acceptable dimensional range for corner post assemblies, which include corner post extensions and finials. Corner post assemblies cannot be more than 0.06 inches above the upper edge of an end or side panel, whichever is higher, when measured from the lowest point on the upper edge of the end or side panel. The 0.06-inch limitation does not apply if the corner post assembly exceeds 16 inches above the uppermost surface of the side panel when it is in its uppermost position. In addition, ASTM F966-00 requires that any removable vertical extension on the corner post (including finials) shall not violate the established corner post assembly dimensional requirements when installed or removed.

The introduction contained in ASTM F966-00 explains that two incident scenarios were used to create this range of heights for the corner post assembly. The first scenario involved young children standing in the crib or play yard with cords or necklaces around their necks that become caught on the corner post assembly. This data resulted in the lower acceptable limit of 0.06 inches. The second group of incidents involved older children, who attempted to climb out and whose clothing became caught on the corner post assembly. This data resulted in the higher acceptable range of 16 inches.

### **REVIEW OF INCIDENT DATA**

CPSC incident data associated with bunk beds was reviewed for involvement of corner post extensions and finials. Many of CPSC's database reports provide limited information with regard to the portion of the bunk bed involved in hanging incidents and the dimensions of the involved corner post extension and finials. However, there were four reports that referenced hangings and involved the corner post extension and finials. Incident report 9549003956 involves a 7-year-old female who died when she looped a belt over the bunk bed corner post extension, put it around her neck and was swinging back and forth. The second report, 970409CNE5111, states that a 5-year-old female was found in her bedroom with a bathrobe belt around her neck and around the corner post extension of the bunk bed. This bathrobe belt was in a continuous loop with the ends tied together.

The remaining two reports provided information about the corner post extension dimensions. Incident report 991208CCC0171 describes that a 2.5-year-old victim climbed onto the top bunk. After retrieving a water bottle with an attached carrying strap, the victim placed the carrying strap around his neck area. When attempting to climb down, the carrying strap became looped over one of the corner post extensions and the victim hung himself. The information contained

in the report included a Medical Examiner's sketch of the bunk bed. ES interpreted this sketch to identify the subject corner post extension at 6 inches. Incident report 010509CWE5010 states that a backpack-purse with straps was hung from one of the corner post extensions on the bunk bed. The 4-year-old victim became entangled in the straps of the backpack-purse. One of the straps was caught around the victim's neck and the other strap was hooked onto the corner post extension. The information in the report states that the bunk bed's corner post extensions were approximately 3 inches high on each corner.

## CONCLUSIONS

16 CFR Parts 1213 and 1513 prescribe performance requirements for bunk beds to reduce or eliminate risks to children from entrapment hazards and fall hazards, and additional requirements for warning labels. Voluntary standard ASTM F1427-01 also addresses fall hazards, entrapment hazards, warning label requirements, and structural integrity of the foundation support system.

The provisions of ASTM F966-00 Full-Size and Non-Full-Size Cribs Corner Post Extensions and AS/NZS 4220:1994 Bunk Beds contain performance requirements to prevent entanglement and strangulation incidents. ASTM F966-00 and AS/NZS 4220:1994 assert that acceptable heights for corner post projections are less than 0.06 inches and 0.31 inches, respectively. ASTM F966-00 establishes dimensional requirements for corner post extensions and finials to minimize risk of entanglement associated with children who are either standing inside the product or attempting to climb out of the product. ASTM F966-00 asserts that corner post extensions and finials must be less than 0.06 inch or greater than 16 inches above either the side or end panels. A requirement to exceed 16 inches may not be practical for bunk bed corner post assemblies because of spatial constraints with the ceiling. Bunk beds conforming to AS/NZS 4220:1994 do not have protruding extensions with dimensions greater than 0.31 inch. This protrusion requirement includes protrusions created by corner post extensions. This requirement is intended to prevent a child's clothing from becoming caught and causing hanging. CPSC staff is unaware of the rationale for this 0.31-inch dimension.

ASTM F966, which includes a performance requirement for non-full size and full-size baby crib corner post extensions to be less than 0.06 inch, was published in 1990. A recent CPSC hazard analysis report, entitled *Hazard Analysis: Crib-Related Deaths*, dated August 2002, found that there were no hanging incidents on crib corner post extensions between January 1997 and July 2002. Further comparison of the crib hanging incidents versus the bunk bed hanging incidents is needed to determine if the 0.06-inch dimension would address hangings associated with bunk bed corner post extensions and finials.

ES staff recommends participating with the ASTM F1427 Bunk Bed Subcommittee and its three task groups to determine design and performance criteria to address hanging incidents associated with bunk bed corner post extensions and finials. These performance requirements shall address hanging hazards associated with corner post extensions and finials, as well as potential catch points on the top bunk bed surface. While work on the performance requirements was projected to be completed in the third quarter of 2004 as stated in the subcommittee chairman's letter, the subcommittee chairman stressed at the February 2004 meeting the difficulty of the task and likelihood that this would be a long

process. The 2004 completion date is no longer expected and no new completion date has been set.

**TAB H**





U.S. CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

Debra Sweet  
Statistician  
Division of Hazard Analysis

Tel: (301) 504-7403  
Fax: (301) 504-0081  
Email: dsweet@cpsc.gov

July 28, 2003

Mr. Bill Perdue  
ASTM Subcommittee F15.30 on Bunk Beds  
American Furniture Manufacturers Association  
317 W. High Ave.  
High Point, NC 27261

Dear Mr. Perdue:

On September 26, 2002, The Danny Foundation petitioned the U.S. Consumer Product Safety Commission (CPSC) to "institute mandatory safety standards banning finials and corner post [extensions] from bunk beds."<sup>1</sup> The petitioner is concerned that protruding corner post extensions and finials are hazardous catchpoints upon which children can become hung.

The CPSC staff is in the process of preparing a briefing package that will form the basis of a Commission decision on whether to grant the petition and initiate a rulemaking proceeding or to take some other action. The package is scheduled to go to the Commission soon. We understand that a draft voluntary standard for bunk bed corner post extensions has been proposed and will be discussed at the August 7<sup>th</sup> meeting for ASTM Subcommittee F15.30 on Bunk Beds. We invite you to provide us with a letter of commitment that work on performance requirements will begin. We would like to forward that letter with the briefing package for Commission consideration. It would also be helpful if you provide a preliminary timeline for developing a new standard specifically for corner post extensions or for incorporating new requirements into the existing voluntary standard for bunk beds. CPSC staff plans to attend the August 7<sup>th</sup> meeting and we can discuss this request with you at that time.

CPSC staff has reviewed the incident data associated with bunk bed corner post extensions and finials as well as bunk bed-related hanging incidents in general. Children have strangled after they became caught on the bunk bed corner post extension by an item around their necks and when they became entangled in a product that was placed over the corner post extension. However, corner post extensions and/or finials are not the only catchpoints upon which children have become hung. The CPSC incident data show cases involving the tops of ladders and other parts of the bed. Summaries of the epidemiological data are enclosed.

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<sup>1</sup> The petitioner has requested a ban of corner posts and finials; it is assumed that the petitioner's intention was a request to ban corner post *extensions* and finials.

Mr. Bill Perdue

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We believe that the expertise of the members of the bunk bed subcommittee would contribute substantially to the development of effective and practical performance criteria to address corner post extensions, finials and other potentially hazardous catchpoints on bunk beds. CPSC staff would like to attend future meetings and to participate in the development of voluntary performance requirements to address strangulation hazards on bunk beds. This letter conveys the views of the CPSC staff, and has not been reviewed or considered by the Commission.

Sincerely,



Debra Sweet  
Project Manager

Enclosure(s)

CPSC Incident Data

cc:

John Blair, Chairman  
ASTM Committee F15 on Consumer Products  
Lee Baxter, Chairman  
The Danny Foundation

The following table contains incident information for the 47 bunk bed-related hanging incidents discussed in the Hazards Analysis Memorandum.

Document Number	Death/ Injury	Incident Date	Date of Death	Age/Sex	Part of Bed Child Became Hung From	Product Involved	Manner by Which Child was Hung	Summary
910205CCC2231 9039048835	death	7/22/90	7/22/90	9/F	Corner post	Sheet	Unknown	The victim and her 6-year-old sister were making tents over their bunk beds and the victim allegedly wrapped a sheet around herself as an evening gown when she either jumped or fell from the top of the bunk bed. The sheet got caught on a corner post and she accidentally hung herself.
910204CCC2230 9039060596	death	8/1/90	8/1/90	13/M	Corner post	Rope	Intentionally attached product	The victim was found hanging from the upper corner post of the bunk bed from a rope which appeared to have been tied by the victim. Coroner feels death was self-inflicted but accidental.
9148017226	death	1/19/91	1/19/91	8/M	Other	bathrobe belt	Intentionally attached product	The victim tied a bathrobe belt around his bunk bed rail and around his throat. Pressure on his throat rendered him unconscious and he slumped over in bed, feet still on floor.
9106181180	death	11/18/91	11/21/91	12/M	Unknown	Rope	Unknown	The victim was hanged with a rope attached to the upper bunk bed.
X9312640A	death	9/13/92	9/13/92	11 mos/M	Unknown	T-shirt	Caught on bed	The victim was found hanging from his t-shirt from the top of the bunk bed frame. The part of the frame is unknown.
930209CWE5004 9349001036	death	1/21/93	1/22/93	6/M	Other	Webbed belt	Intentionally attached product	The victim's mother entered the bedroom and found the victim hanging from the top bunk bed. A noose, using a webbed belt, had been fashioned and tied to the middle bar of the side guardrail and the belt came up over the top rail.
940204HCC1138 9342036315	death	4/10/93	4/10/93	9/F	Unknown	Stuffed animal display	Intentionally attached product	The victim was playing in her bedroom with a friend and accidentally hung herself by getting a plastic mesh hammock looped around her neck. The friend was scared and didn't say anything for a while.
9329011033	death	5/1/93	5/1/93	12/M	Unknown	Belt	Unknown	The victim accidentally hung himself with a belt that was attached to a bunk bed.
9306071743	death	5/26/93	5/26/93	16/M	Other	Rope	Unknown	The victim hanged himself with a rope that was attached to upper bunk bed rail.
9320013318	death	7/31/93	7/31/93	12/M	Unknown	Karate Belt	Unknown	The victim was found with a karate belt around his neck and attached to the bunk bed.
9318049323	death	11/9/93	11/11/93	13/M	Unknown	Rope	Unknown	The victim was found in the bedroom with a rope around the upper bunk bed and then around his neck.

Document Number	Death/ Injury	Incident Date	Date of Death	Age/Sex	Part of Bed Child Became Hung From	Product Involved	Manner by Which Child was Hung	Summary
H9490075A	injury	7/1/94		5/F	Other	Nightgown	Caught on bed	The victim was bruised after a hanging by her neck when her nightgown got caught on the top of the ladder on her metal bed.
9453022004	death	8/22/94	8/22/94	2/M	Corner post	Unknown	Unknown	The victim hung himself from the foot of double bunk bed post.
G9490127A	death	9/8/94	9/8/94	7/F	Other	Jump rope	Unknown	The victim fatally hanged herself with a jump rope caught on an upper bunk bed rail in her bedroom.
9453431525	death	11/5/94	11/5/94	12/M	Corner post	Unknown	Unknown	The victim was found suspended from the corner post of the upper bunk - hanging by ligature around neck.
9505000902	death	1/17/95	1/17/95	12/M	Unknown	Bedding	Unknown	Accidentally hung with bedding from a bunk bed.
9506015263	death	2/21/95	2/23/95	10/M	Corner post	Shirt	Intentionally attached product	The victim tied a shirt to a bunk bed post, put his head in the shirt and while playing, accidentally hung himself.
9549003956	death	4/22/95	4/22/95	7/F	Corner post extension	Belt	Intentionally attached product	The child had looped a belt over the bunk corner post extension, put it around her neck and was swinging back and forth.
F9580142A	death	8/8/95	8/8/95	4/M	Unknown	bathrobe belt	Unknown	Victim accidentally hung himself from the top of a bunk bed frame with a cloth belt from his bathrobe. The cloth belt was wrapped, not tied, around boy's neck and top of bunk bed frame. The part of the frame is unknown.
NEISS - 92480999	injury	9/7/95		9/M	Unknown	Belt	Unknown	The victim accidentally hung himself with a belt from a bunk bed while playing with his younger brother; asphyxiation by hanging. Patient was treated and admitted for hospitalization.
X95B0791A	injury	11/14/95		5/M	Unknown	Head band	Unknown	The victim hanged when he accidentally hung himself with a headband that was around his neck on his bunk bed.
H96B0296A	injury	11/22/96		4/M	Other	Shirt	Caught on bed	The bottom of the back of a boy's shirt got caught on the ladder of the bunk bed. This caused him to hang by his shirt. He received a small laceration to his nose.
F9720006A	death	12/28/96	12/28/96	8/M	Unknown	Cloth belt	Unknown	The victim was playing on his bunk bed when he became entangled in a cloth belt that he was also playing with. He was found hanging from the belt from a bunk bed.
X9730940A	death	3/5/97	3/5/97	11/M	Corner post	Bedding	Unknown	The victim was found unresponsive and hanging with bedding around his neck and around a bunk bed post at his home.

Document Number	Death/ Injury	Incident Date	Date of Death	Age/Sex	Part of Bed Child Became Hung From	Product Involved	Manner by Which Child was Hung	Summary
970409CNE5111 N9740159A N9740248A X9822142C	death	4.8/97	4/8/97	5/F	Corner post extension	bathrobe belt	Unknown	Victim's grandmother found the victim in her bedroom with a bathrobe belt around her neck and around the corner post extension of the bunk bed. The girl was hanging with her toes barely touching the floor. The bathrobe belt was in a continuous loop, tied together at both ends.
970903HWE4144	injury	8/4/97		4/M	Other	Neck tie	Unknown	A boy got his father's neck tie and wrapped it around his neck, but did not put a knot in the tie. At some point the tie got wrapped around the guardrail and the child fell off the upper bed. He was found hanging from the bunk bed with the tie around his neck. Both end of the tie were wrapped around the boy's neck.
9717065641	death	11/12/97	11/12/97	11/M	Other	Belt	Intentionally attached product	The victim was playing in the top bunk and fell. He was hanging by the neck; a belt was placed around the neck and secured to the top rail of the bunk bed.
980625HCC6878 X9863924A 9806090211	death	5/1/98	5/2/98	18 mos/M	Unknown	Mesh-type man's tie	Intentionally attached product	A stretchable mesh man's necktie was attached to a support bar rising up from the floor which continued to the top bunk. The victim was found hanging by his neck in the looped necktie.
NEISS - 854688	injury	10/21/98		2/M	Unknown	Sheet	Unknown	The patient was found hanging from the bunk bed with a sheet wrapped around his neck. The patient was treated and admitted for hospitalization.
9910000258	death	1/10/99	1/12/99	12/F	Unknown	Scarf	Intentionally attached product	The victim was found hanging by a scarf which was tied to the top bunk bed.
010119CCC0239 9913005340	death	1/16/99	1/16/99	5/M	Other	Stuffed animal display	Intentionally attached product	The victim is believed to have been attempting to dive into the lower bunk bed from the end and caught his head in the product. The stuffed animal display was hung from a horizontal member of footboard.
9918011256	death	3/24/99	3/24/99	12/M	Other	Unknown	Unknown	A ligature was attached to the top rail of bunk bed then to the victim's throat.
01022HCC0314 9913029141	death	5/15/99	5/15/99	2/F	Unknown	Stuffed animal display	Intentionally attached product	The victim was playing in her room for a while. Her father found her hanging from the end of the upper bunk bed by the piece of cloth twisted around her neck.
9919013407	death	6/21/99	6/21/99	11/M	Unknown	Belt	Unknown	The victim's father found the victim hanging by a belt from the top of his bunk bed.
00725HCC3346 9906095361	death	6/23/99	6/23/99	10/M	Other	Bedding	Caught on bed	The boy was asphyxiated by a blanket wrapped around his neck when he fell or jumped from a bunk bed. The blanket stayed tucked under the mattress and also caught in between to bars on the bed.

Document Number	Death/ Injury	Incident Date	Date of Death	Age/Sex	Part of Bed Child Became Hung From	Product Involved	Manner by Which Child was Hung	Summary
990728HWE5020 F9975019A	death	7/12/99	7/12/99	7/F	Other	Purse strap	Intentionally attached product	The girl was pretending to be a dog when she wrapped a purse strap around her neck as a collar/leash and tied the other end around an upper bunk bed.
C0030007B 991208CCC0171	death	8/16/99	8/18/99	2/M	Corner post extension	Water bottle	Caught on bed	The victim 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 corner post extension and the child was hung.
9995333284	death	9/29/99	9/29/99	8/M	Unknown	Robe belt	Unknown	The victim was playing in his room with a robe sash and hung himself on the bunk bed.
X0030824A	death	1/23/00	1/23/00	9/M	Unknown	Bathrobe belt	Intentionally attached product	The victim hung himself by a bathrobe tie tied to a bunk bed part by accident. The mother found the boy with the tie around his neck.
000215HCC3160 H0020124A	injury	2-1/00		7/M	Other	Walkie talkie strap	Caught on bed	The victim and his brother were playing on the bunk bed with walkie-talkies that had two straps. The victim had put one strap around his head as a bandana and tried to step off of the top bunk onto the bottom bunk. The free end of the strap got caught on the railing and the loop around the boy's head slipped to his neck. He fell and the strap tightened and the boy's feet couldn't touch the floor. He lost consciousness and was taken to the hospital.
NEISS - 1209931	injury	4/29/00		13/M	Unknown	Belt	Unknown	The victim was accidentally hanged with a belt when he fell off of a bunk bed. He was treated and admitted for hospitalization.
0121016825	death	2/14/01	2/14/01	11/M	Unknown	Belt	Unknown	The victim was found with a belt around his neck hung from the upper bunk bed.
010509CWE5010 F0155009A	death	5-3/01	5/3/01	4/M	Corner post extension	Purse strap	Intentionally attached product	One child in the family hangs a backpack purse on the corner post extension of the bunk bed. The victim, who liked to climb on the ladder of the bed, became entangled in the straps of the backpack purse. One strap was around the child's neck and the other strap was hooked on the bunk bed corner post.
X0210028A	death	10/9/01	10/9/01	17 mos/M	Unknown	Shoestring	Intentionally attached product	The victim was found by his siblings from a shoestring that had been tied to form a loop. The shoestring was under the top bunk and the deceased's siblings presumably would use this to reach the top bunk as a step.
G01B0173A	death	11/26/01	11/26/01	7/F	Unknown	Purse strap	Intentionally attached product	The victim accidentally hung herself at home. Police reports show that victim tied a purse strap to the top of a bunk bed.

Document Number	Death/ Injury	Incident Date	Date of Death	Age/Sex	Part of Bed Child Became Hung From	Product Involved	Manner by Which Child was Hung	Summary
0206003670	death	2/23/02	2/23/02	7/M	Unknown	Electrical cord	Unknown	The victim was found hanging from a bunk bed by an electrical cord.
X0294587A	death	4/20/02	4/20/02	11/M	Unknown	Plastic covered bike chain	Intentionally attached product	A father sent son to his room and went to check on him 15 minutes later. The father found the victim hanging in a sitting position on the lower bunk of a metal frame bunk bed. The ligature was the bike chain.

# TAB I





Ms. Debra Sweet  
Division of Hazard Analysis  
U.S. Consumer Product Safety Commission  
Washington, DC 20207

Ms. Sweet:

Thank you for participating in the August 7 meeting of the ASTM Subcommittee on Bunk Beds (F15.30). As I expressed at the meeting, AFMA is committed to working through the ASTM Subcommittee F15.30 to address the concerns raised by the Danny Foundation.

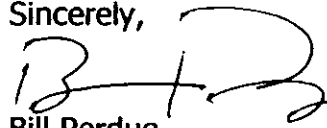
AFMA staff believes a balanced and practical performance standard can be developed that adequately reduces the risk posed by finials and corner post extensions. It is intended that the work and outcome of this committee be incorporated into the existing bunk bed standard following the prescribed ASTM protocol. Please consider this letter as a formal offer to develop a voluntary standard under the provisions of the Consumer Product Safety Act, 15 U.S.C. 2051, et seq.

As you recall, the members of the committee divided the standard development tasks among three work groups. One group will focus on adding appropriate language to the existing warning label to draw attention to the potential risk associated with "corner post extensions" and the general risk of "hanging items from the bed that could cause injury," a task we expect can be completed during the last quarter of 2003. This "hazard labeling" is intended to be **an interim safety measure**. It is intended that the labeling requirements continue to be enforced once the prescribed corner post extension performance standard has been developed and incorporated into the existing ASTM standard. It should be noted, that potential "catch points" will be addressed during the standard development, remedies prescribed and incorporated into the existing standard.

The other two work groups will evaluate the CPSC data and work on developing design and performance criteria to address the associated risk. That work will hopefully be completed in the second or third quarter of 2004.

We hope that you will remain involved in the standard development process. Please contact me with any questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read 'Bill Perdue', with a long horizontal line extending to the right.

Bill Perdue  
Chairman, ASTM F15.30

cc: John Blair, Chairman  
ASTM F15 on Consumer Products

**TAB J**

**U.S. Consumer Product Safety Commission  
LOG OF MEETING**

**SUBJECT: ASTM Bunk Bed Subcommittee: Bunk Bed Corner Post Extension  
Standard Discussion**

**DATE OF MEETING: February 18, 2004**

**LOG ENTRY SOURCE: Debra Sweet**

**DATE OF LOG ENTRY: March 25, 2004**

**LOCATION: ASTM Headquarters, West Conshohocken, PA**

**CPSC ATTENDEE(S): Susan Bathalon, Engineering Sciences  
Jonathan Midgett, Human Factors  
Debra Sweet, Hazard Analysis**

**NON-CPSC ATTENDEE(S): ASTM Bunk Bed Subcommittee Members (at this time,  
I do not have a list of the attendees)**

**SUMMARY OF MEETING:**

**Discussion of CPSC actions and status:**

**Debra Sweet discussed the status of the briefing package and discussed the importance of demonstrating progress on developing voluntary standard requirements to address strangulation hazards associated with bunk beds.**

#### **Follow-up of action items:**

After discussion of intent and verbiage, Jonathan Midgett presented a draft warning label to the group. Revisions were made and new language was created to add to the existing warning label that appears on the upper bunk.

Warning reads: **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.**

This label warns against the most commonly seen strangulation hazard of parents or children attaching or hanging items on the bed. Corner post extensions are not explicitly included in this statement because the performance/design requirements should eliminate (or reduce) the hazard with that part of the bed. So the phrase “any part of the bunk bed” is intended to include corner posts, ladders, beams, etc.

This label does not warn against becoming caught on the corner post extensions or vertical protrusions of the bed. Jonathan explained that the warning label is intended to prohibit deliberate actions and accidentally becoming caught is not an action that can be warned against. The prevention of this action will have to be addressed through performance/design requirements.

The language has been added to the standard and will go out for ballot. Originally, the ballot was expected in March, but now is expected for April.

In addition to the language for the warning label, the subcommittee agreed to include provisions for permanency of the warning label through tests already established. These provisions will be balloted along with the label.

#### **Design and performance issues:**

##### **Corner posts**

There were preliminary discussions about this task being difficult and that it would take multiple meetings and full commitment of members. Bill Perdue asked CPSC staff to visit a bed factory to see how the beds are made in hopes to help in the development of the standard.

The manufacturers and Bill Perdue stated that they would prefer a performance requirement rather than a design requirement.

In response to Bill asking CPSC staff what we wanted to come out of the meeting, CPSC staff requested that the subcommittee brainstorm about potential tests that could be used. Four tests were proposed: the test used in the European crib standard (hanging a weighted ball from a string looped around the corner post); the “toggle test” (pull a string over the corner post with a toggle shape at the end); the “break away finial test” (try to create a finial that came off with pressure); and the “dowel test” (creating a finial dowel that would release with pressure).

The subcommittee members also discussed more passive actions to eliminate or reduce the hazard. One leading manufacturer showed pictures of a safety bar that would eliminate the finials and corner post extensions on the bed, creating a decorative arch over the headboard/footboard, to be used while the bed was used as the upper bunk. These passive products would allow parents to unstack the bunk bed, detach the decorative arch, attach finials and have two

matching twin beds.

**Other vertical protrusions**

Vertical protrusions will be worked on after the subcommittee has developed design/performance criteria for corner post extensions and finials.

**Action plan for moving forward:**

In April of 2004, Bill Perdue, and other members of the subcommittee will meet at a testing laboratory in North Carolina. During this meeting, they will experiment with the different test methods to find out how they might work, what produces reliable and repeatable measures, and which seem to simulate the hazard.

**Next Meeting –** The next subcommittee meeting is scheduled to take place over two days in June 2004 in North Carolina. On day 1, CPSC staff will be taken to the Stanley Furniture Lab in Lexington, NC for an illustration of an audit of the bunk bed (demonstration of assembly and testing). Day 2 of the meeting will be in Greensboro, NC with the remainder of the subcommittee to discuss the results of the testing in April and to proceed with the development of performance requirements for extensions and finials.