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## BRIEFING PACKAGE FOR BUNK BED FINAL RULE

November 1999

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Excepted by *[Signature]*

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Initial *rch* Date *11/3/99*

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## EXECUTIVE SUMMARY

An advance notice of proposed rulemaking (ANPR), published in the Federal Register on January 22, 1998, requested comments on a rulemaking proceeding that, if finalized, would promulgate a mandatory rule addressing entrapment of children in bunk beds. In response to the ANPR, 420 comments were received, and 398 of these favored a mandatory rule.

A notice of proposed rulemaking (NPR) was published in the Federal Register on March 3, 1999, proposing rules under both the Consumer Product Safety Act (CPSA) and Federal Hazardous Substances Act (FHSA) respectively addressing entrapment hazards to children associated with adult bunk beds and bunk beds intended for use by children. The entrapment requirements in the two rules are identical. In response to the NPR, 21 written comments were received and, at a public hearing held on May 6, 1999, five persons gave oral testimony before the Commission on the pros and cons of the proposed mandatory rules for bunk beds. In total, nine persons expressed support for the proposed rules.

Since the publication of the NPR, staff has attended three meetings of the ASTM bunk bed subcommittee to discuss revisions to the ASTM standard for bunk beds in an effort to make its entrapment requirements the same as those in the CPSC's proposed rules. At one of those meetings, it became evident that the requirement addressing entrapment in bunk bed end structures in the proposed rules was not sufficient to address the entrapment fatality it was intended to address. Therefore, a revised NPR containing an additional requirement addressing neck entrapment was published in the Federal Register on July 9, 1999. Five comments were received in response to the revised NPR, two of which supported the additional requirement.

From January 1990 through August 9, 1999, CPSC received 57 reports of fatal entrapments in bunk beds. A national estimate of the annual entrapment fatalities associated with bunk beds is about ten.

Since November 1994, there have been nine recalls of bunk beds that did not conform to the entrapment requirements in the ASTM voluntary standard. These recalls involved 42 manufacturers and affected approximately 536,000 bunk beds.

At the present time, staff is aware of 167 bunk bed manufacturers who produce about 500,000 bunk beds annually. Staff estimates that conformance to the entrapment requirements in the existing voluntary standard may be more than 90 percent. However, staff believes that a mandatory rule for bunk beds would have greater visibility and would reduce the number of bunk beds currently being produced that do not conform to the entrapment requirements in the voluntary standard and consequently present a risk of entrapment to children.

The cost of conforming to the entrapment requirements in the two proposed rules is significantly less than the societal cost of the deaths addressed by the rule. Even though there are a substantial number of small firms producing bunk beds, staff does not expect that the

proposed rules will have a significant effect on these firms. Staff has also determined that there will be no significant environmental effect resulting from the proposed mandatory rules for bunk beds.

The staff recommends that the Commission publish a final rule addressing entrapment in bunk beds under both the CPSA (for adult beds) and FHSA (for children's beds) with an effective date that is 180 days after the date of publication of the rules. The staff believes a mandatory rule would:

- enable staff to seek civil penalties for violations that would deter other manufacturers from making non-complying beds,
- increase the identification and subsequent recalls of non-complying beds by state and local officials who are familiar with mandatory rules enforced by CPSC,
- increase compliance by retailers and distributors who would be committing a prohibited act if they sold a product that did not meet applicable Federal standards,
- prevent non-complying beds made by foreign manufacturers from entering the United States through cooperative efforts with the U.S. Customs Service.

The staff also recommends that bunk beds intended for institutional use be exempt from these rules.



UNITED STATES  
 CONSUMER PRODUCT SAFETY COMMISSION  
 WASHINGTON, DC 20207

Memorandum

Date: NOV 3 1999

TO : The Commission  
 Sadye E. Dunn, Secretary

THROUGH Jeffrey S. Bromme, General Counsel *JB*  
 Pamela Gilbert, Executive Director *PG*

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SUBJECT : Final Rule to Address Entrapment in the Structure of Bunk Beds

I. INTRODUCTION

The Commission staff recommends that the Commission issue a final rule addressing entrapment of children in the structure of bunk beds.

II. BACKGROUND

On January 14, 1998, the Commission voted 2-1 to publish an advance notice of proposed rulemaking (ANPR) addressing entrapment in the structure of bunk beds. The ANPR was published in the Federal Register on January 22, 1998, and 420 comments were received in response. Of these, 398 commenters favored of a mandatory rule, 19 opposed such a rule, and three did not say whether they favored a mandatory rule.

On February 3, 1999, the Commission voted 2-1 to publish a notice of proposed rulemaking (NPR) addressing entrapment hazards associated with bunk beds. The NPR was published in the Federal Register on March 3, 1999 and contained proposed rules under both the Consumer Product Safety Act (CPSA) and Federal Hazardous Substances Act (FHSA). The CPSA rule addresses hazards associated with adult bunk beds, and the FHSA rule addresses hazards associated with bunk beds intended for children. The entrapment requirements in the two rules are identical. The NPR requested that written comments be submitted by May 17, 1999, and, in response, 21 written comments were received. In addition, at a public hearing held on May 6, 1999, five persons appeared before the Commission and provided oral comments on the pros and cons of a mandatory rule for bunk beds.

Since the February 3, 1999, Commission decision to publish an NPR, ASTM Subcommittee F15.30 for Bunk Beds held three meetings to discuss revisions to the ASTM

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F1427 standard for bunk beds that could make the entrapment requirements in the standard the same as those proposed by the Commission. During one of those meetings, it became evident that the proposed requirement addressing entrapment in bunk bed end structures in the March 3, 1999, NPR was not sufficient to address the entrapment hazard that it was intended to address. Therefore, a revised NPR containing an additional requirement addressing neck entrapment in bed end structures was published in the Federal Register on July 9, 1999. The requirement is similar, but not identical, to one addressing neck entrapment in partially bounded openings in an ASTM voluntary standard for public playground equipment (ASTM F1487-98). Five comments were received in response to the revised NPR.

### III. DISCUSSION

#### A. Incident Data (Tab A)

**Deaths** – Since the January 7, 1999, Commission briefing on bunk beds, two additional bunk-bed-related deaths have been reported to CPSC. Neither of these deaths involved entrapment. One was the result of a fall in which the victim became impaled on a metal prong on a lamp, and the other victim was hanged by a dress sash that was tied to the upper bunk of a bunk bed. From January 1990 through August 9, 1999, CPSC has received reports of 91 bunk-bed-related deaths to children under 15 years of age (see Table 1 below). Of these, 57 children became fatally entrapped, 25 children died when they inadvertently became hung from a bunk by such items as a belt or sash, a rope, clothing or bedding, and nine children died due to falls from bunk beds.

Table 1 - Reported Bunk Bed Fatalities by Year and Hazard Pattern - January 1990 to August 9, 1999

Year	Hazard Pattern			
	Total*	Entrapment	Hanging	Falls
Total	91	57	25	9
1990	7	5	2	--
1991	15	10	2	3
1992	4	3	1	--
1993	19	10	7	2
1994	10	6	3	1
1995	12	5	5	2
1996	12	11	1	--
1997**	8	6	2	--
1998**	3	1	1	1
1999**	1	--	1	--

\* These deaths are neither a complete count of all that occurred during this time period nor a sample of known probability of selection. However, they provide a minimum number of deaths occurring during this time period and illustrate the circumstances involved in some bunk bed-related fatalities.

\*\* The Death Certificate files for 1997 through August 9, 1999 are not complete.

Table 2 (below) shows that over 96 percent (55 out of 57) of the entrapment fatalities were of children age 3 and younger and that all but one was younger than 5. In contrast, 76 percent (19 out of 25) of those who died in hanging incidents were age 6 and over. Fall deaths were split among children 4 years of age and under and children 9 and older.

Table 2 - Bunk Bed Fatalities Reported to CPSC by Age of Victim and Hazard Pattern – January 1990 to August 9, 1999

Age	Hazard Pattern			
	Total	Entrapment	Hanging	Falls
Total	91	57	25	9
<1	18	16	1	1
1	20	19	1	--
2	16	13	2	1
3	8	7	--	1
4	4	1	1	2
5	1	--	1	--
6	3	--	3	--
7	3	1*	2	--
8	2	--	2	--
9	3	--	2	1
10+	13	--	10	3

\* Child was blind and was confined to upper bunk by removal of the ladder.

Using statistical methodology, the total annual number of bunk bed entrapment deaths in the U.S. since 1990 is about ten (95% confidence interval = (6.0 - 14.4)).

**Injuries** – CPSC’s National Electronic Injury Surveillance System (NEISS) estimates there were 34,300 bunk-bed-related injuries to children under the age of 15 treated in U.S. hospital emergency rooms in 1998. Forty-one percent of the victims were younger than five years. Over one-half (54 percent) of the injuries involved the head/face area. The arm/hand area was involved in 28 percent of the injuries, followed by the leg/foot area with 11 percent.

A staff review of the descriptive comments for each injury revealed that falls from the bunk bed were involved in a majority of the incidents. There were a few reports of limb entrapment incidents, and one incident involved a 2-year-old male who was found hanging from a bunk bed with a sheet wrapped around his neck; he was admitted to the hospital with a head injury.

**Entrapment Incidents** – The staff reviewed entrapment-related incidents in further detail to obtain additional information about the circumstances involved. No new entrapment deaths have been reported since the November 1998 briefing package was prepared. However, since that time, six near-misses have been reported, increasing the total number of known entrapment incidents since January of 1990 to 122. The number of fatalities remains the same at 57, and the non-fatal entrapments increase to 65. None of the near-miss entrapments involved an injury to the victim, although the potential for serious injury or death is evident.

Out of the six new entrapment incidents, four were in the area of the top bunk. Three entrapments were in the guardrail/side rail, one in a headboard, and two in a ladder. Table 3 (below) shows the distribution of the fatal and near-miss entrapment incidents since January of 1990.

Based on a review of the 57 bunk bed entrapment deaths, the staff concludes that 39 deaths could have been prevented if the beds had conformed to the current ASTM standard and that 42 could have been prevented by the Commission’s proposed bunk bed rules. Of the three



incidents that occurred in bunk beds conforming to the ASTM standard, two involved entrapment in the upper bunk. In these separate incidents, an 18-month-old infant and a child who was almost 5 years old slipped through the space between the end of the guardrail and the end structure of the bed and became wedged between the bed and a wall. In the third incident, a 22-month-old child became entrapped by the head in an opening. The opening was between the underside of the upper bunk foundation support and a curved structural member in the bunk bed end structure.

Table 3 – Location of Entrapment in Bunk Bed for Fatal and Near-Miss Incidents from January 1990 to August 9, 1999

<b>Type of Incident</b>			
<b>Location of Entrapment</b>	<b>Total</b>	<b>Fatal</b>	<b>Near Miss</b>
<b>Total</b>	122	57	65
<b>Top Bunk</b>	77	39	38
Guardrail	51	27	24
Bed/Wall	11	9	2
End Structure	12	1	11
Add-On Rail	1	1	0
Other	1	0	1
Unknown	1	1	0
<b>Bottom Bunk</b>	27	12	15
Guardrail	1	0	1
Bed/Wall	6	6	0
End Structure	14	3	11
Add-On Rail	2	2	0
Other	4	1	3
<b>Ladder</b>	7	2	5
<b>Unknown Bunk</b>	11	4	7
Guardrail	2	0	2
Bed/Wall	1	1	0
End Structure	4	0	4
“Safety Rails”	1	1	0
Other	1	0	1
Unknown	2	2	0

## **B. Voluntary Standards Activities**

Since the February 3, 1999, Commission decision to publish an NPR addressing entrapment in bunk beds, three meetings of the ASTM bunk bed subcommittee have been held to attempt to harmonize the entrapment requirements in the ASTM standard with those in the staff’s recommended rule. Logs of these meetings are at Tab B. Table 4 (below) outlines the differences in the requirements in the proposed rule and the current ASTM standard (ASTM F1427-96).

	<b>Proposed Rule</b>	<b>ASTM F1427-96 Standard</b>
<b>Scope</b>	Includes both residential and institutional beds.	Addresses only residential beds. Institutional beds are exempt.
<b>Definition:</b>	Any bed in which the underside of the foundation is over 30 inches from floor.	Any bed in which the underside of foundation is over 35 inches from floor.
<b>Guardrails</b>	Requires two guardrails, one continuous and one can terminate 15 inches from each end structure.	Requires two guardrails, both of which can terminate 15 inches from each end structure.
<b>End Structure</b>	Openings in end structure from level of lower bunk foundation support to the level of upper bunk foundation support must be < 3½" or > 9". In addition, certain shaped openings are subject to test for neck entrapment.	Openings in end structure from level of lower bunk foundation support to a level that is 9" above top surface of mattress must be < 3½" or > 9". No neck entrapment test.

The following sections summarize the discussions at the three subcommittee meetings to attempt to harmonize the above differences in the proposed mandatory rule and current ASTM standard:

**1. March 24, 1999, ASTM Subcommittee Meeting** – A motion was approved to change the definition of a bunk bed to a bed in which the underside of the foundation is over 30 inches from the floor – the same as in the proposed mandatory rule.

After discussing the meaning of the term “continuous guardrail,” the subcommittee approved a revision that would require one guardrail on the upper bunk to terminate no greater than 1.5 inches from the end structures. The revision also clarified that the 15-inch space between the ends of the other upper bunk guardrail must be measured 5 inches above the sleeping surface of the maximum thickness mattress. In addition, the subcommittee approved a change to the instructions that must accompany a bunk bed to inform consumers that a bunk bed placed adjacent to a wall must have the continuous guardrail on the wall-side of the bed.

Manufacturers elected to postpone a decision on changing the requirements addressing entrapment in the lower bunk end structures until they could determine the effect of such a change on the safety and style of their products.

In discussing whether the ASTM standard should address bunk beds sold for institutional use, it was suggested that such beds could be required to bear a label stating “For institutional use only.” However, no decision was reached on this issue.

**2. April 21, 1999, ASTM Subcommittee Meeting** – After learning that the subcommittee chairman had received a letter from CPSC staff noting that the Commission had not yet made a decision on including institutional bunk beds in a mandatory rule, a motion was approved to leave the current exemption for institutional beds in the ASTM standard.

In a renewed discussion on the requirements in the proposed rule addressing entrapment in lower bunk end structures, several manufacturers stated that these may have a serious impact

on the design and aesthetic appearance of certain beds that are not known to have been involved in any entrapment incidents. The CPSC staff representative and a representative of an independent testing laboratory were asked to draft requirements addressing entrapment in lower bunk end structures that would continue to permit the sale of those beds for which their manufacturers expressed concern because of the absence of incident data to substantiate an entrapment hazard.

**3. August 24, 1999, ASTM Subcommittee Meeting** – Prior to this meeting, CPSC staff sent copies of the June 15, 1999, briefing package and the July 9, 1999, NPR concerning revised requirements addressing end structure entrapment to all members of the ASTM bunk bed subcommittee.

CPSC staff explained the reason for the revised requirements and the rationale for the test procedure to address neck entrapment. Manufacturers agreed to expand the current entrapment requirements to include the entire end structure between the level of the upper and lower bunk foundation support systems and were not opposed to adding a neck entrapment requirement to the ASTM standard. However, they questioned the need for a 75° angle on the test probe, when a 55° angle on a similar probe in the ASTM public playground equipment standard appeared to have been effective in addressing neck entrapment incidents in partially bounded openings. A working group was established to draft a recommendation for the subcommittee as to whether the probe to be used in the ASTM bunk bed standard should have a 75° angle as in the proposed rule or a 55° angle as in the playground equipment standard. A motion was approved to accept the recommendation of the working group and to forward it, together with the other previously approved revisions, to ASTM for a ballot by the full subcommittee. CPSC staff was requested to search CPSC playground incident data to verify that no neck entrapments had occurred in structures conforming to the requirements in the public playground standard.

A September 9, 1999, letter from the ASTM working group was submitted as a comment to the July 9, 1999 NPR. The letter informed the staff that the working group had recommended to the ASTM subcommittee that the neck entrapment requirement to be added to the ASTM standard for bunk beds will specify the probe in the ASTM public playground equipment standard, which uses a 55° angle.

Subsequent to the ASTM working group's decision to use the 55° playground equipment probe, there has been discussion among manufacturers on limiting the revision of the requirements for lower bunk end structures in the ASTM standard to metal bunk beds only. The rationale for such a limitation is that there have been no known neck entrapment incidents in wooden bunk beds and that it is not likely that a wooden bunk bed would be manufactured with openings of a shape that would present neck entrapment. At the present time, staff does not know whether the lower bed end structure requirements in the ASTM standard will apply only to metal beds.

As of this writing, the revisions to the voluntary standard that were approved during the three meetings of the ASTM bunk bed subcommittee have not been balloted by the entire subcommittee. Staff does not know when the ballot will be mailed or what new requirements will be approved.

### C. Compliance Activities (Tab C)

At the time of the January 7, 1999, Commission briefing, the Office of Compliance (EXC) was aware of 160 manufacturers or importers of bunk beds. Since that time, EXC has revised this figure by deleting firms no longer in business and adding new firms that were previously not known to be bunk bed manufacturers or importers. As of September 24, 1999, EXC is aware of 167 firms who currently either manufacture or import bunk beds.

Subsequent to the January 7, 1999, Commission briefing, one additional press release has been issued, announcing the recall of 5,400 bunk bed do-it-yourself kits. These kits were recalled because beds built in accordance with their instructions would present an entrapment hazard. With this recall, the total number of bunk beds subject to a recall by the Commission is more than 636,800. EXC expects to announce very shortly the recall of an additional 2,800 bunk beds that present an entrapment hazard.

Based on the staff's efforts to identify bunk beds that do not conform to the voluntary standard, it is evident that there are many small firms that enter this market and do not conform to the ASTM standard either because they are unaware of it or because the standard is voluntary.

Compliance staff indicates that a mandatory standard would:

- enable the staff to seek civil penalties for violations that would deter other manufacturers from making non-complying beds,
- increase the identification and subsequent recalls of non-complying beds by state and local officials who are familiar with mandatory rules enforced by CPSC,
- increase compliance by retailers and distributors, who would be committing a prohibited act if they sold a product that did not meet applicable Federal standards,
- prevent non-complying beds made by foreign manufacturers from entering the United States through cooperative efforts with the U.S. Customs Service.

Based on information currently available, the staff believes that the bunk bed industry is highly diverse and fragmented, with differing levels of sophistication relating to product safety. Firms can easily enter and leave the bunk bed manufacturing business. EXC staff believes that firms are more likely to be aware of a mandatory standard rather than a voluntary standard. EXC staff believes that a mandatory standard would maximize industry awareness.

### D. Response to Comments

The Commission received 21 comments in response to the NPR in the March 3, 1999, Federal Register. In addition, five people gave oral testimony in a public hearing held on May 6, 1999. Also, five comments were received in response to the revised entrapment requirements published in the July 9, 1999, Federal Register. A summary of the comments is at Tab D. Following are staff responses to these comments:

## 1. March 3, 1999, NPR Comments:

**a. General:** Seven commenters responding to the March 3, 1999, NPR, and two persons who commented at the May 6, 1999, public hearing, favored a mandatory rule addressing entrapment in bunk beds. Their reasons were varied and included:

- Reports of deaths show there is an unreasonable risk,
- a mandatory standard will improve compliance,
- the benefits show a reasonable relationship to costs,
- a mandatory rule permits the Commission to seek penalties from violators,
- there is increased awareness of mandatory standards,
- a mandatory standard removes the cost advantage of producing non-conforming beds.

Two comments on the NPR neither opposed nor favored a mandatory rule. The President of ASTM and the chairman of the ASTM F15.30 subcommittee for bunk beds requested that, if the Commission elects to proceed with a mandatory standard, it should do so via a reference to the ASTM F1427 voluntary standard. At the present time, there are some significant differences in the entrapment requirements in the ASTM standard and those in the proposed rule (see Table 4 on Page 5). Although the ASTM subcommittee for bunk beds has agreed to make certain revisions to the voluntary standard, these revisions would not make the entrapment requirements in the ASTM standard identical to those in the proposed rule (see additional discussion below in the staff response to comments on the July 9, 1999 NPR). Further, we do not know that these revisions will be approved by the formal ASTM ballot process. Therefore, the staff recommends that the rule not reference the ASTM standard in lieu of a rule with specific requirements addressing entrapment.

**b. Substantial Compliance:** Where there is a voluntary standard in place, both the CPSA and the FHSA prohibit the Commission from issuing a mandatory standard unless the Commission finds either that the voluntary standard is not likely to eliminate or adequately reduce the risk or that it is unlikely that there will be “substantial compliance” with the voluntary standard. Because the staff estimates that 90 percent or more of the industry may be complying with the ASTM standard, the Commission is presented with the issue of whether that level constitutes substantial compliance and whether the current ASTM standard is sufficient to address the risk of injury.

Twelve comments opposed a mandatory rule, and 10 of these were opposed because they disagreed with the interpretation of “substantial compliance” by the Office of General Counsel (OGC). Additionally, three persons who gave oral testimony opposed a mandatory rule on this ground. Several of these comments stated that the staff’s estimate of 90% conformance to the ASTM bunk bed standard meets the congressional intent of the term “substantial compliance” as it is used in the CPSA and FHSA. Following is a summary of OGC’s response to the comments about substantial compliance:

The December 16, 1998, memorandum to the Commission from OGC extensively discussed the statutory language and legislative history relating to substantial compliance. OGC concluded that substantial compliance will not exist if there would be a higher degree of compliance with a mandatory standard. In February 1999, a copy of the portion of OGC’s

memorandum dealing with substantial compliance was publicly released. The NPR expressly sought comment on the meaning of substantial compliance.

Some of the opposing commenters argued that OGC's interpretation violates congressional intent that the Commission defer to voluntary standards. However, OGC's interpretation does allow for deferral to voluntary standards, in situations where they are complied with as fully as a mandatory standard would be and where the standard is adequate to address the risk of injury. The commenters opposing OGC's interpretation fail to explain the particular circumstances defining the line between where the Commission should defer to a voluntary standard and where it should not.

Staff believes that the test OGC has articulated takes full account of congressional intent. No commenter identified a single passage of legislative history that OGC had overlooked or misinterpreted. Indeed, most commenters did not cite any legislative history at all. Thus, we find these comments unpersuasive.

Some commenters fear that OGC's interpretation will undermine the voluntary standards process. This view wrongly assumes that OGC's interpretation would produce results different from the way the Commission has interpreted substantial compliance in the past. No examples were given of voluntary standards that would be imperiled by this interpretation. Especially with the available protection of the informed judgment of the Commission, OGC concludes that there is no reason to believe that the future displacement of voluntary standards will occur with any greater ease than in the past. Thus, there is no reason to believe there will be a change in the voluntary standards system because of this rule.

Finally, the objecting commenters contend that the current rate of compliance is "substantial." However, the commenters supplied no reasoning for this conclusion. The legislative history of the substantial compliance provisions discredits the notion that a percentage test applicable to all situations is required. If these commenters relied on a percentage test, they failed to explain their choice of a number. If they arrived at their conclusions by applying some other test, they did not identify it. For the reasons given above and explained further in the separate OGC memorandum, OGC does not believe these commenters have provided grounds for OGC to alter its legal interpretation of "substantial compliance" as it applies in this situation.

One commenter noted that OMB Circular No. A-119 directs agencies to use voluntary standards in lieu of government-unique standards except where they are inconsistent with law or otherwise impractical. However, Circular No. A-119 states that it should not "be construed to commit any agency to the use of a voluntary standard which ... is, in its opinion, inadequate ... or is otherwise inappropriate." A decision by the Commission that a mandatory standard will prevent more deaths than a voluntary standard could certainly render reliance on the voluntary standard "inappropriate." Further, an OMB circular cannot limit the actions the Commission is authorized to take under the statutes it administers. Thus, Circular No. A-119 does not prevent issuance of a final rule under OGC's interpretation of substantial compliance.

**c. Incident Data:** A bunk bed manufacturer claimed that the extra cost and major design changes required to comply with the proposed rule do not reduce or eliminate the potential hazards. The manufacturer also claimed that there were no incidents of entrapment between a bunk bed and a wall prior to the inception of the 1996 ASTM standard. However, staff is aware of 9 fatalities resulting from entrapment between a bunk bed and wall from 1990 through August

9, 1999. Two of these fatalities occurred in beds conforming to the ASTM standard's requirement for a wall-side guardrail that permits gaps up to 15 inches in width between each end of the guardrail and the bed's end structures. One of these deaths occurred in 1994 and the other in 1996. In both, the victims slipped through the unprotected area between the end of the guardrail and bed end structure. The requirement in the proposed rule for a continuous wall-side guardrail would prevent future incidents of this type.

**d. Hazards in Other Types of Beds:** It was noted by one commenter that other types of beds, such as small single beds and trundle beds, could have the same entrapment hazards as bunk beds if they are used by preschool age children. The commenter, therefore, suggested that any bed intended for preschool age children, and adult beds, since it is predictable that young children will be placed in these beds, should be covered by a mandatory standard. An extension of the scope of the standard to cover beds other than bunk beds would involve different considerations of risk, cost, and benefits, and is outside the scope of the present proceeding.

This commenter also recommended that both adult and child bunk beds should be covered by a single standard, and that the standard should be issued under the CPSA. As explained in the proposal, the CPSA provides that a risk that can be adequately regulated under the FHSA can be regulated under the CPSA only if the Commission determines by rule that regulating the risk under the CPSA is in the public interest. Bunk beds intended for use by children, but not other bunk beds, could adequately be regulated under the FHSA, and the Commission did not find reasons why it would be in the public interest to regulate the risk from children's bunk beds under the CPSA. Accordingly, the Commission proposed to regulate bunk beds intended for use by children under the FHSA and to regulate other (adult) bunk beds under the CPSA. Although this does not comply with the commenter's recommendation that both categories of bunk beds be regulated under the CPSA, it does comply with the recommendation that the standard's requirements apply to both adults' and children's beds.

**e. Bunk Beds for Institutional Use:** Two comments addressed the issue of whether the proposed rule should apply to bunk beds sold for institutional use, such as school or college dormitories, prisons, and military facilities. One comment, from a trade association representing a number of major producers of bunk beds, notes that to include institutional beds in the scope of the rule would be a departure from past CPSC practice. The association asserts that the regulation of public accommodations has traditionally been accomplished through state and municipal building codes. The other comment, from a manufacturer of college dormitory furniture, strongly objects to a regulation that is unsupported by any data to show that there is a high risk [of injury] for adults or college students. Institutional bunk beds are generally not provided with guardrails, and the manufacturer claims that to add such rails, and comply with other provisions in the proposed rule, would add \$225 to the cost of each of his beds and be of no benefit to an adult user. While staff cannot confirm the commenter's cost estimate, staff agrees that the cost of compliance to the rule would be substantially higher for institutional bunk beds than for residential beds, in part because institutional beds do not have any guardrails (since they are intended for teenagers or adults). Furthermore, of the two known fatalities of children that occurred in beds that were originally sold for institutional use, one was an entrapment between the lower bunk mattress and a wall, a scenario not addressed by the proposed rule. The other incident was an entrapment in a gap between the end structure and a mattress that was too short to fit properly on the lower bunk. This incident would be addressed if institutional beds are included in the scope of the rule. However, Economics has concluded that the benefits of including institutional beds in the rule are likely to be substantially less than the costs.

Therefore, the staff recommends that the Commission exempt bunk beds sold for institutional use from the proposed rule.

**f. Effective Date:** A trade association representing a number of major bunk bed producers commented that there should be an 18-month lead-time before the rule becomes effective; the association reiterated this in its comments on the July 9, 1999, NPR. A time line showing the breakdown of tasks to comply with the proposed rule was included in the association's comments. Between five and ten months of time were to allow manufacturers, distributors, and retailers to sell their inventories. An allowance of lead-time to deplete inventory is not necessary because the rule will apply only to bunk beds manufactured or imported after the rule's effective date.

The CPSC provides that an effective date shall not exceed 180 days unless the Commission finds that a longer period is in the public interest. Although the schedule provided by the association might be reasonable for a high-volume manufacturer with numerous models affected by the rule, the staff considers the schedule to be unnecessarily long for the minor changes imposed by the rule on the small manufacturers likely to be affected. Thus, the staff cannot conclude it is in the public interest to extend the effective date past the proposed 180-day period. The staff concludes that the 180-day period between publication of a final rule and its effective date is reasonable and adequate to allow manufacturers time to make any necessary product changes.

## **2. July 9, 1999, NPR Comments:**

**a. General:** One commenter, who had previously submitted a comment supporting the rule in the March 3, 1999, NPR, also supports the revised rule on the grounds that "these requirements are necessary to address fatalities due to entrapment of children's necks in end structures of bunk beds." The commenter also believes "that the Commission should not defer to the ASTM voluntary standard because of widespread lack of compliance and because the current voluntary standard is inadequate." As previously stated, the staff does not favor deferral to the voluntary standard since it currently does not contain certain provisions that are in the proposed rule and, in any event, would not be complied with as much as with a mandatory standard.

**b. Neck Entrapment Probe:** Two comments from bunk bed manufacturers who are members of the ASTM F15.30 subcommittee, addressed the angle on the probe in the revised proposed rule. One of the comments, submitted on behalf of the entire subcommittee, informed staff that the lower bunk end structure requirements in the ASTM standard would be revised in accordance with the requirements in the proposed rule (sections 1213.3(b)(3), & (4), 1213.4, 1513.3(b)(3) & (4) and 1513.4)), except that the probe (see Figure 2 of the proposed rule at Tab E) would have a 55° angle rather than the 75° angle of the probe in the proposed rule. The comment from the other manufacturer, a member of the ASTM bunk bed subcommittee, also addressed the angle on the end structure probe and stated that, while he could accept a probe with either angle, it was his opinion that the 55° angle should be adopted. Both of these comments rationalized the choice of a 55° angle based on its apparent success in preventing neck entrapment incidents in playground equipment.

Another comment, from a trade association representing major manufacturers of bunk beds, reiterated its comment to the March 3, 1999 NPR, that it was not opposed to a mandatory rule for bunk beds, and supported a provision to address neck entrapment in lower bunk end



structures. It also takes no position on the appropriate probe for this purpose, but recommends “a probe which eliminates or adequately reduces the risk of neck entrapment.”

In drafting the neck entrapment requirements, the staff initially considered using a probe identical to that in the ASTM F1487 standard for public playground equipment (with a 55° angle). The rationale for the 55° angle stems from a recommendation by a committee convened by the National Recreation and Park Association (NRPA) that developed requirements for a CPSC mandatory standard for playground equipment in 1976. The angle requirement was “intended to eliminate dangerous angles that could form openings tending to entrap or strangle the user.” The rationale for the committee’s recommendation stated: “it is best engineering judgement at this point, and takes into consideration the fact that most angles present in current equipment are 60° or greater.” Based on this NRPA committee recommendation, the CPSC Handbook for Public Playground Safety, first published in 1981, also addresses neck entrapment in angles by recommending that they be greater than 55°.

The staff recommended that the angle on the neck entrapment probe in the bunk bed standard be 75°, instead of 55°, for a number of reasons. First, in 1985, following a number of deaths resulting from neck entrapment in accordion-style baby gates and enclosures, the staff worked with industry to draft requirements for a voluntary standard for these products. The staff developed a probe that had an angle of 75° at its base because it was known that an 11-month-old child had become fatally entrapped in a diamond-shaped opening in a baby gate having a 71° angle at its base. The probe was designed to protect children two years of age and younger. It was accepted by the ASTM gate and enclosure subcommittee and eliminated ‘V’ shaped openings with angles less than 75°.

Second, the pieces of public playground equipment most likely to have angles that could cause neck entrapment are dome climbers and handrails on ladders. Public playground equipment is generally intended for children from 2 through 12 years of age. The potential for children to become entrapped in an angle between 55° and 75° depends on the type of equipment. Dome climbers are not appropriate for children under 5 years of age. Children 5 years of age and older who use dome climbers are more likely to be able to call out for assistance or pull themselves up and out if they become entrapped. As for ladder handrails, the angles that potentially could be an entrapment hazard are generally located at the bottom of the ladder below the neck level of even small children.

Finally, children under two years of age are almost always supervised when playing in public playgrounds and adult assistance would be readily available if needed. This is not the case with bunk beds, where children are left to sleep unattended.

For the above reasons, the staff concludes that a 75° angle on the proposed neck entrapment probe is necessary to adequately address the risk of entrapment in bunk bed end structures to protect children under two years of age.

#### **E. Product, Market and Conformance Information (Tab G)**

**Product and Market Information** – The retail prices of bunk beds range from about \$100 to over \$700; manufacturers estimate the average retail price to be about \$300.

The American Furniture Manufacturers Association (AFMA) represents manufacturers of bunk beds. According to AFMA, 40 firms, either AFMA members or members of the existing ASTM bunk bed subcommittee, account for 75-80% of total known annual sales of bunk beds. Through Compliance staff activities, staff is now aware of 167 manufacturers of bunk beds. The share of the market accounted for by the 127 manufacturers or distributors who are not AFMA members or members of the ASTM subcommittee is not known, but is believed to account for a majority of the remaining 20-25% of annual sales.

Bunk beds are a category of bedroom furniture, and every manufacturer of bedroom furniture is a potential producer of bunk beds. Further, because of their straightforward design, others can also produce these products. Thus, it is likely that there are other unidentified firms, each producing small numbers of bunk beds.

Industry sources estimate that about 500,000 bunk beds are sold annually for household use, and that the expected useful life of these products is 13-17 years. Based on this information, the CPSC's Product Population Model (a computer-generated statistical program) estimates that there may be on the order of 8 million bunk beds in household use.

AFMA sources indicate that imports of bunk beds by its members appear to be increasing. Industry sources indicate that most, if not all, metal bunk beds sold are imported. Metal bunk beds are estimated to account for about 20% of annual sales of bunk beds.

**Conformance with Existing Voluntary Standard** – There are no known government or industry data describing the extent of conformance to the voluntary standard. However, based on its knowledge of industry practices, the Commission's Engineering Sciences staff (ES) estimated that roughly 50% of production from 1979 to 1986 was in conformance to the standard's upper bunk entrapment requirements. Staff estimates that, as the industry publicized the guidelines and CPSC staff became involved in the standards process, conformance increased to roughly 75% of production during the period 1986 to 1992. The conformance was estimated to have increased after 1992, when ASTM published its bunk bed standard and EXC staff became active in monitoring for conformance to the standard. Staff estimates that 90% or more of production since 1992 conforms to the ASTM standard.

The Commission's Compliance staff (EXC) reported that the bunk beds produced by the 40 firms that are either members of AFMA or the ASTM subcommittee all conform to the existing voluntary standard. EXC staff also examined the product lines of the remaining 127 identified firms, and believes that, after a number of recall activities, all of the beds produced by these firms were in conformance with the standard.

## **F. Costs and Benefits**

**Potential Costs** – The costs associated with the proposed mandatory rule include the cost of adapting to the provisions of the rule for any firms not now meeting those requirements. The cost factors affected by these requirements are any increases in the cost of materials, and any redesign costs necessary to comply with the proposed mandatory rule.

Four manufacturers that modified production stated that additional materials needed to address entrapment were nominal compared to overall materials costs consumed in bunk bed production, and that any redesign costs would not be significant on a per-unit basis. The most

significant cost was the addition of a continuous guardrail to the top bunk, which might add \$15 to \$40 to the average retail price of bunk beds (or 5% to 13% of the average retail price). This cost would apply only to bunk beds in current production that do not now meet the voluntary standard.

There are also costs to some of the firms that now conform to the voluntary standard requirement for a wall-side guardrail, because the current voluntary standard allows for a 15-inch gap at either or both ends of this guardrail. A spokesman for a major independent bunk bed testing lab estimated that bunk bed models conforming to the voluntary standard are split about equally between those having a continuous wall-side rail (about 72 inches in length) and those having a 15-inch gap on one or both ends of the wall-side rail.

Thus, about 50% of all models that meet the current voluntary standard may require some change in design, as well as additional materials, to meet the requirements in the proposed mandatory standard. The incremental cost of closing the gap (or gaps) in the wall-side top rail is unknown. However, because a continuous rail is merely an extension of the existing rail already in place, the increase in the retail price is probably less than proportional to the increase in length. Thus, if a continuous rail adds \$15 to \$40 to the price of a bunk bed, closing the gap on the wall-side rail may cost consumers no more than about \$5 to \$10.

For a small number of firms, the rule may also result in costs associated with modifications of some bottom bunk end structures. Such modifications may be required to openings to prevent the free passage of a wedge block (simulating a child's torso) if they do not allow the free passage of a sphere (simulating a child's head). The requirement also addresses the shape of openings that could admit a child's neck, and entrap the head in the end structure. The staff is aware of few current designs that would be affected by this latter requirement. However, if these one-time redesign costs are amortized over the entire production runs for these firms, the per-unit costs are expected to be small.

**Potential Benefits** – The expected societal costs of bunk bed entrapment deaths represent the potential benefits of preventing them. Epidemiology staff reported that there were 57 entrapment deaths associated with bunk beds from 1990 through August 9, 1999. Based on a review of the circumstances of the reports, staff concluded that the voluntary standard would have addressed 37 of the 39 top bunk entrapment deaths and 2 of the 3 bottom bunk end structure entrapment deaths. Altogether, staff believes that the voluntary standard would have addressed 68% (39/57) of the reported fatalities due to entrapment in both the top and bottom bunk locations. Additionally, conformance to the proposed rule (as opposed to the voluntary standard) would address another 3 of the 57 (about 5%) entrapment deaths, including the 2 top bunk deaths that would not have been addressed by the voluntary standard, and 1 bottom bunk end structure death.

EHHA staff projected that about 10 bunk bed entrapment fatalities have occurred annually since 1990. Thus, for the segment of bunk beds that do not conform to the voluntary standard, the proposed rule would have addressed about 7 deaths per year; and for the segment of bunk beds that conform to the requirements of the voluntary standard but not the proposed rule, the proposed rule would have addressed an additional death every other year, or about 0.5 deaths per year.

To determine the expected benefits of the rule, it is necessary to estimate the risk of entrapment death associated with bunk beds not conforming to the requirements of the proposed mandatory rule during the study period. In this case, the risk computation requires information on the number of bunk beds that did not conform to the voluntary standard and the number of bunk beds that conformed to the voluntary standard but not the proposed mandatory rule.

Given an estimate of about 1.2 to 2.4 million bunk beds in use during the study period did not conform to the voluntary standard, the risk of entrapment addressed by the proposed rule for this group of beds would have ranged from about 2.9 to 5.8 deaths per million nonconforming beds (7 deaths per 2.4 million beds to 7 deaths per 1.2 million beds). At an assumed societal cost of \$5 million per death, a useful life of about 15 years for a bunk bed, and a discount rate of 3%, the estimated present value of averting entrapment fatalities on beds that did not conform to the voluntary standard ranges from about \$175 to \$350 per non-complying bed.

The rule will also address another 0.5 entrapment deaths annually that would not have been addressed by the voluntary standard. Assuming that about one-half of the 5.6 to 6.8 million bunk beds would have conformed to the voluntary standard but not the proposed mandatory rule, the risk of entrapment for these beds would have ranged from about 0.15 to 0.18 deaths per million beds (0.5 deaths per 3.4 million beds to 0.5 deaths per 2.8 million beds). At an assumed societal cost of \$5 million per death, a useful life of about 15 years for a bunk bed, and a discount rate of 3%, the estimated present value of averting entrapment fatalities not addressed by the voluntary standard ranges from \$9 to \$11 per non-complying bed.

**Comparison of Costs and Benefits** – The above analysis has evaluated the costs and benefits of the proposed rule for two market segments: bunk beds that do not conform to the voluntary standard, and bunk beds that conform to the requirements of the voluntary standard but not to the requirements of the proposed rule. For the segment of bunk beds that does not conform to the voluntary standard, the expected benefits of the rule (about \$175 to \$350 per bed) are substantially greater than the expected costs of the rule (about \$15 to \$40 per bed). Thus, if the standard prevented all of the deaths addressed on bunk beds not conforming to the voluntary standard, the expected net benefits per bed sold would range from a low of about \$135 (\$175-\$40) to about \$335 (\$350-\$40), and would average about \$235 per bed.

For the second segment, those beds that meet the requirements of the voluntary standard but not those of the rule, the expected benefits range from about \$9 to \$11 per bed and the costs range from about \$5 to \$10.

The rule does not have to be fully effective (i.e., it does not have to prevent all the deaths addressed) to be in the public interest. Given the estimated range of costs and benefits for those bunk beds that do not meet the requirements of the voluntary standard, the rule would need to be no more than about 23% ( $\$40 \div \$175$ ) effective for the benefits to be equal to the costs. Effectiveness is expected to be much higher.

**Institutional Bunk Beds** – The staff also considered applying the rule to bunk beds produced for the institutional market (such as for colleges, the military, etc.). Staff reviewed available information and determined that there has been one entrapment death in an institutional bunk bed, since 1990, that could have been averted by conformance to the proposed rule. That incident involved a bunk bed that had been purchased used.

According to information supplied by industry, there are about 200,000 bunk beds sold for the institutional market each year for use by colleges and boarding schools, the military, mental health facilities, and correctional facilities. The expected useful life of these institutional products is estimated by industry at 7 to 10 years. Therefore, there may be about 1.7 million institutional beds in use. Manufacturers projected that the cost of compliance for institutional bunk beds would be considerably higher than that of residential bunk beds, due to the addition of two guard rails (rather than one for residential) and the heavier-duty materials used in institutional bunk beds. For comparison purposes, if the only significant cost was the addition of two guardrails (equivalent to rails used in residential beds), the cost of compliance for institutional bunk beds would be twice that of residential units, or \$30 to \$80 per bed.

Given that one death would have been addressed during the last 9.5 years, and that an average of about 1.7 million institutional bunk beds may have been in use during those years, the risk addressed by inclusion of institutional beds in the mandatory standard would be about 0.06 deaths per million beds in use per year ((1 death/9.5 years)/1.7 million beds). Assuming a societal cost of \$5 million per death, the annual societal value of averting this risk is about \$0.30 per bed per year. If we assume a useful life of 10 years, and a discount rate of 3%, the estimated present value of averting this risk would be about \$2.55 per bed over its entire useful life. Thus, based on available information, the benefits of the rule, for institutional bunk beds, are likely to be substantially less than the costs. Because of this, and because likelihood that consumers will purchase institutional beds in the future is not known, the staff recommends that institutional bunk beds not be covered by the rule.

#### **G. Final Regulatory Flexibility Act Certification**

The Commission is required by the Regulatory Flexibility Act of 1980 (RFA) to address and give particular consideration to the economic effects of the rule on small entities.

The precise number of firms manufacturing bunk beds is not known. Commission staff has identified 167 firms that have produced bunk beds: these were identified through the trade association, national and regional trade shows, industry contacts, the Internet, and retail inspections. Small Business Administration guidelines classify firms in the furniture industry as small if they have less than 500 employees, are independently owned, and are not dominant in the field; thus, most of the identified firms would be classified as small businesses. It is likely that there are additional unidentified firms that produce relatively small numbers of bunk beds. These remaining producers are also likely to be small businesses.

Even though there is a substantial number of small firms, staff does not expect that there will be a significant effect on these firms. As noted earlier, after extensive recall activities all of the 167 firms identified by staff are now in conformance to the existing voluntary standard, and will require only slight modifications to comply with the recommended mandatory rule. For firms not conforming, the requirements are expected to result in cost increases which are small and are likely to be passed on to consumers. Accordingly, the Commission could certify that the rule will not cause significant economic effects on a substantial number of small entities.

The proposed mandatory rule would not require third-party testing, and it is anticipated that firms would self-certify that their products are in compliance with the mandatory standard.

There are no reporting or recordkeeping requirements under the proposed rule. Staff is not aware of any federal rules that the proposed rule would duplicate, or with which it would overlap or conflict.

#### **H. Environmental Assessment**

The rule would not cause manufacturers to dispose of existing construction materials or packaging. Sale of inventories of finished non-complying products (including those at retail) would not be prohibited, since the rule would apply only to units produced or imported after the effective date.

The rule is not expected to have a significant effect on the materials used in the production and packaging of subject bunk beds, or in the number of units discarded after the rule. Therefore, no significant environmental effects would result from the recommended mandatory rule for bunk beds.

#### **IV. OPTIONS**

1. If the Commission concludes that conformance to the ASTM standard for bunk beds is not satisfactory and/or that the voluntary standard does not adequately address entrapment hazards, and that a rule may be reasonably necessary to address an unreasonable risk of injury, it could publish a final rule.
2. If the Commission concludes that conformance to the ASTM standard is acceptable and that the current ASTM standard is adequate to address the entrapment hazards associated with the use of bunk beds, or if the Commission believes that available information does not indicate that a rule is necessary to address an unreasonable risk of injury, the Commission could terminate the project.

#### **V. RECOMMENDATION**

The staff recommends that the Commission publish final rules under both the CPSA and FHSA addressing entrapment in bunk beds with an effective date that is 180 days after the date of publication of the rule. The staff also recommends that bunk beds sold for institutional use be excluded from these rules.

**A**





UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

## Memorandum

Date: OCT 15 1999

TO : John Preston, ESME

THROUGH: Susan Ahmed, Ph.D., AED for Epidemiology 

FROM : Joyce McDonald  
Program Analyst  
Division of Hazard Analysis 

SUBJECT : Bunk Bed Death and Injury Update

This updates the October 27, 1998 EPHA memorandum on bunk bed deaths and injuries. It also responds to the public comments received in response to the U.S. Consumer Product Safety Commission (CPSC) March 3, 1999 proposed rule for bunk beds.

### Deaths

Since the October 1998 memorandum, two additional bunk bed-related deaths were reported to CPSC; neither death involved entrapment.<sup>1</sup> Thus, from January 1990 through August 9, 1999, CPSC has received 91 bunk bed-related deaths to children under 15 years of age (Table 1).<sup>2</sup> Of these, 57 deaths were the result of entrapment. An additional 25 children died when they inadvertently became hung from a bed bunk by such items as a belt or sash, a rope, clothing and bedding. Nine children died due to falls from bunk beds.

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<sup>1</sup> One death occurred as the result of a fall from a bunk bed. A 12-year-old male died after grabbing his 2-year-old cousin to keep the child from falling off a bunk bed resulting in the victim losing his balance and falling off the bunk bed. When he fell from the top bunk, the victim impaled himself through the rectum on a metal prong of a lamp, lacerating an artery, which caused massive bleeding, and death. The other death occurred when a 2-year-old female victim hanged herself from a dress sash tied to the top bunk of a bunk bed.

<sup>2</sup> These deaths are neither a complete count of all that occurred during this time period nor a sample of known probability of selection. However, they provide a minimum number of deaths occurring during this time period and illustrate the circumstances involved in some fatal bunk bed-related incidents.



**Table 1**  
**FATAL BUNK BED INCIDENTS REPORTED TO CPSC**  
**BY YEAR AND HAZARD PATTERN**  
 (January 1990 to August 9, 1999)

Hazard Pattern				
*Year	Total	Entrapment	Hanging	Falls
<b>Total</b>	91	57	25	9
1990	7	5	2	--
1991	15	10	2	3
1992	4	3	1	--
1993	19	10	7	2
1994	10	6	3	1
1995	12	5	5	2
1996	12	11	1	--
1997	8	6	2	--
1998	3	1	1	1
1999	1	--	1	--

Source: U.S. Consumer Product Safety Commission data files, January 1990 to August 9, 1999  
 \* The Death Certificate files for 1997 through August 9, 1999 are not complete.

Table 2 shows that over 96 percent (55 out of 57) of the entrapment fatalities were age 3 and younger and all but one was younger than 5. In contrast, 76 percent (19 out of 25) of those who died in hanging incidents were age 6 and over. Fall deaths were split among children 4 years of age and under and children 9 and older.

**Table 2**  
**BUNK BED FATALITIES REPORTED TO CPSC**  
**BY AGE OF VICTIM AND HAZARD PATTERN**  
 (January 1990 to August 9, 1999)

Hazard Pattern				
Age	Total	Entrapment	Hanging	Falls
<b>Total</b>	91	57	25	9
<1	18	16	1	1
1	20	19	1	--
2	16	13	2	1
3	8	7	--	1
4	4	1	1	2
5	1	--	1	--
6	3	--	3	--
7	3	1	2	--
8	2	--	2	--
9	3	--	2	1
10+	13	--	10	3

Source: U.S. Consumer Product Safety Commission data files, January 1990 to August 9, 1999

A national estimate of the total annual number of entrapment deaths was developed using statistical methodology that examines the extent of overlap between data reporting sources (capture/recapture). Using this method, about ten bunk bed entrapment deaths were estimated to have occurred annually since 1990 (95% confidence interval = (6.0, 14.4)).

## **Injuries**

Based on data from CPSC's National Electronic Injury Surveillance System (NEISS), there were an estimated 34,300 bunk bed-related injuries to children under the age of 15 treated in U.S. hospital emergency rooms in 1998. Forty-one percent of the victims were younger than five years. Over one-half (54 percent) of the injuries involved the head/face area. The arm/hand area was involved in 28 percent of the injuries, followed by the leg /foot area with 11 percent.

A review of the descriptive comments received for each injury revealed that falls from the bunk bed were involved in a majority of the incidents. There were a few limb entrapment incidents reported and an incident involving a 2-year-old male who was found hanging from a bunk bed with a sheet wrapped around his neck. The hanging victim was admitted to the hospital with a head injury.

## **Entrapment Incidents**

Entrapment-related incidents were reviewed in further detail to provide additional information about the circumstances involved. There have been no new entrapment deaths reported since the October 1998 memorandum. However, there were 6 near-misses reported since that memorandum covering the time period of October 24, 1998 to August 9, 1999. That increased the total number of entrapment incidents since January of 1990 to 122. The number of fatalities remained the same with 57 and the non-fatal entrapments increased to 65. Notably, all of the near-miss entrapments involved no injury to the victim, although the potential for serious injury or death was evident.

Out of the six new entrapment incidents, four involved the top bunk area. Three entrapments were in the guardrail/siderail, 1 in a headboard and 2 in a ladder. Table 3 shows the distribution of the fatal and near-miss entrapment incidents since January of 1990.

Where information was available, it appeared that all but three of the 57 fatal entrapment incidents occurred on beds that did not meet the entrapment requirements of the voluntary standard. Of the three incidents, two involved entrapment in the upper bunk. In these separate incidents, an 18-month-old infant and a child who was almost 5 years old slipped through the space between the end of guardrail and the end structure of the bed and became wedged between the bed and a wall. In the third incident, a 22-month-old child became entrapped by the head in an opening between the underside of the upper bunk foundation support and a curved structural member in the bunk bed end structure.

**Table 3**  
**LOCATION OF BUNK BED ENTRAPMENT**  
**FOR FATAL AND NEAR MISS INCIDENTS**  
 (January 1990 to August 9, 1999)

Location of Entrapment	Type of Incident		
	Total	Fatal	Near Miss
<b>Total</b>	122	57	65
<b>Top Bunk</b>	77	39	38
Guardrail	51	27	24
Bed/Wall	11	9	2
End Structure	12	1	11
Add-on Rail	1	1	0
Other	1	0	1
Unknown	1	1	0
<b>Bottom Bunk</b>	27	12	15
Guardrail	1	0	1
Bed/Wall	6	6	0
End Structure	14	3	11
Add-on Rail	2	2	0
Other	4	1	3
<b>Ladder</b>	7	2	5
<b>Unknown Bunk</b>	11	4	7
Guardrail	2	0	2
Bed/Wall	1	1	0
End Structure	4	0	4
"Safety Rails"	1	1	0
Other	1	0	1
Unknown	2	2	0

Source: U.S. Consumer Product Safety Commission data files, January 1990 to August 9, 1999

## **Response to Public Comments**

CPSC received public comments in response to the March 3, 1999 proposed rule for bunk beds. Several of those comments were related to the hazard data, as discussed below.

### **RISK OF ENTRAPMENT**

Comment CH99-1-2 received from the Consumer Federation of America (CFA) favors a mandatory rule because the injury data show unreasonable risk.

Response:

The CPSC staff position is that conformance to entrapment requirements (whether mandatory or voluntary standards) is especially important considering the vulnerable age group involved in these entrapment incidents and the potentially fatal consequences associated with non-conformance.

### **ENTRAPMENT BETWEEN THE WALL AND THE BUNK BED**

Comment to Commissioner Moore by Woodcrest Sales states that prior to the inception of ASTM F1427-96, there were no incidents of entrapment between the wall and the bed and that with the addition of a full length guardrail there will still be the potential for entrapment.

Response:

From January 1 of 1990 through August 9, 1999, there were 9 fatalities reported to CPSC that involved an entrapment between the upper bunk bed and the wall. Of these, two deaths involved entrapment in an unprotected area between the end of the guardrail and the bed end structure. One of these deaths occurred in 1994 and the other in 1996. Staff believes that the proposed requirement for a full-length wall side guardrail would address upper bunk entrapment incidents that occurred between the bed and wall.

**B**

**LOG OF MEETING**  
**DIRECTORATE FOR ENGINEERING SCIENCES**

CPSA 6 (b)(1) Cleared  
3/26/99  
No Mfrs/PrvtLbrs or  
Products Identified  
Excepted by \_\_\_\_\_  
Firms Notified, \_\_\_\_\_  
CPSC OFFICE OF  
THE SECRETARY

**SUBJECT:** Meeting of ASTM Subcommittee F15.30 for Bunk Beds

1999 MAR 29 A 8:51

**DATE OF MEETING:** March 24, 1999

**PLACE:** Marriott Motel  
Greensboro, NC, Airport

**LOG ENTRY SOURCE:** John Preston, ES *apl*

**DATE OF ENTRY:** March 26 1999

**COMMISSION ATTENDEES:** John Preston, ES

**NON-COMMISSION ATTENDEES:**

Russell Batson, AFMA  
Bohdan Brodycz, Fashion Bed Group  
David Burkhart, Thomasville Furniture  
Billy Chitwood, Bassett Furniture  
Mary Ellen Fise, CFA  
Danny Hodges, Bassett Furniture  
Geoffrey Jackson, Vermont Precision  
Mark James, Lea Industries  
Jed Johnsrud, Cargo Furniture  
Tom Josam, This End Up Furniture  
Les Kilkian, Broyhill Furniture  
Michael Krygier, Detroit Testing Lab.  
Keith Leazer, Pine Valley/Ethan Allen  
Tom Lowery, Ethan Allen

David Macintosh, Powell Co.  
Karon Matkins, Diversified Testing Lab.  
Greg Meimar, Dorel Industries  
Ken Midriff, This End Up Furniture  
Kevin Minarz, Pallister Furniture  
Robert Monaghan, Global Furniture  
Sonny Morgan, Barn Door Furniture  
Bobby Puett, Diversified Testing Lab.  
Bob Smith, Stanley Furniture  
Bill Suvak, Child Craft  
John Turbeyfill, Vaughan Furniture  
Mark Woohams, Woodcrest  
Joe Ziolkowski, AFMAe

**SUMMARY OF MEETING:**

After a self introduction of the attendees, Joe Ziolkowski, the subcommittee chairman, stated that the main purpose of the meeting was to consider four revisions to the ASTM standard for bunk beds that, if approved would make the requirements addressing entrapment identical to those that were in a notice of proposed rulemaking (NPR) drafted by the U.S. CPSC staff and published in the Federal Register on March 3, 1999. Copies of the NPR were distributed together with copies of the specific revisions to the ASTM standard that would make it the same as the CPSC proposed requirements. These had been drafted by John Preston who explained why the CPSC staff's proposed rule differed somewhat from the entrapment requirements in the ASTM standard.

The first item of discussion was the suggested revisions to 3.1.5 and 4.5.1 that would reduce the height from 35 inches to 30 inches above which a bed would be considered to be in the scope of the standard. There was no opposition to this revision and it was approved unanimously.

The second item was the revisions of 4.5.1.1, 4.5.1.2 and 4.5.5 concerning a requirement for a continuous guardrail on the wall-side of a bunk bed. While there was no opposition to this suggested revision, manufacturers stated that the word "continuous" needed to be defined. After much discussion the following language was drafted for 4.5.5:

"One guardrail may terminate before reaching the bed end structure, providing there is no more than 15 in. (380 mm) between either end of the guardrail and the bed end structures. The second guardrail may terminate before reaching the bed end structure. If this guardrail terminates before reaching the bed end structure, there shall be no more than 1.5 in. nor less than 0.5 in. between either end of the guardrail and the bed end structure when measured horizontally from the point on the guardrail closest to the bed end structure."

A change to the instructions at 7.3.5 was also proposed. This would add the following statement:

"If the bed is placed against a wall, the long guardrail must be on the wall-side of the bed to prevent entrapment between the bed and the wall."

A motion to approve these revisions carried with nine affirmatives and one abstention.

There was considerable discussion on the CPSC staff proposed revision of 4.6.3 addressing entrapment in end structures below the level of the upper bunk foundation. Some manufacturers were opposed to this revision because they claimed that it would require changes to some bunk beds that they did not believe were hazardous. Generally, the manufacturer members of the subcommittee agreed that some changes should be made to 4.6.3 but there was no agreement on what these changes should be.

There was a brief discussion of the deletion of 1.4 that, if approved, would include institutional beds within the scope of the ASTM standard. It was suggested that a requirement for a warning label on institutional beds might be appropriate. Such a label could state "Not intended for use by children." There was not enough time to resolve this proposed revision.

Before adjourning the meeting, it was agreed that another meeting would be held on April 21, beginning at 1:00 p.m., to attempt to resolve issues on revisions of 1.4 and 4.6.3

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**Proposed Revisions to ASTM Standard Specification for Bunk Beds, ASTM F1427-96**

Following are proposed revisions to the subject ASTM bunk bed standard that, if approved, would make the requirements addressing entrapment the same as those in a notice of proposed rulemaking drafted by the U.S. Consumer Product Safety Commission. Deletions of existing requirements are shown as ~~strike-outs~~ and additions are double underlined.

~~1.4 This consumer safety specification does not address bunk beds for institutional use (for example, in prisons, military facilities, dormitories, and so forth).~~

3.1.5 *bunk bed, n* - for the purpose of this specification, any bed in which the underside of the foundation is ~~35 in. (890 mm)~~ 30 in. (760 mm) from the floor.

4.5.1 Two guardrails shall accompany any bed in which the underside of the foundation is ~~35 in. (890 mm)~~ 30 in. (760 mm) from the floor. Guardrails may be separate from or integral with the ladder.

4.5.1.1 One guardrail shall be continuous between each of the bed's end structures. The other guardrail may terminate before reaching the bed's end structures, providing there is no more than 15 inches (380 mm) between either end of the guardrail and the nearest bed end structures.

4.5.1.2 For bunk beds designed to have a ladder attached to one side of the bed, the continuous guardrail shall be on the other side of the bed.

~~4.5.5 A guardrail may terminate before reaching the bed end structure, providing there is no more than 15 in. (380 mm) between either end of the guardrail and the bed end structures in the same plane.~~

4.6.3 When tested in accordance with 5.6.2, there shall be no openings in the end structures ~~of the lower bunk~~ between the underside of the foundation of the upper bunk and upper side of the foundation of the lower bunk that will permit the free passage of the wedge block shown in Fig. 1, unless they the openings are also large enough to permit the free passage of a 9-inch (230-mm) diameter rigid sphere. ~~This requirement does not apply to openings that are below the level of the lower bunk foundation support system or above a level that is 9.0 in. (230 mm) above the sleeping surface of the maximum thickness mattress and foundation combined as recommended by the manufacturer.~~



**LOG OF MEETING**  
**DIRECTORATE FOR ENGINEERING SCIENCES**

**SUBJECT:** Meeting of ASTM Subcommittee F15.30 for Bunk Beds

**DATE OF MEETING:** April 21, 1999

**PLACE:** Airport Marriott  
Greensboro, NC

**LOG ENTRY SOURCE:** John Preston, ES *J.P.*

**COMMISSION ATTENDEES:** John Preston, ES

**NON-COMMISSION ATTENDEES:**

Russell Batson, AFMA  
Brodycz Bohdan, Fashion Bed Group  
David Bukhart, Thomasville Furniture  
Jim Cameron, This End Up Furniture  
Will Johnson, Butler Woodcrafters  
Less Killian, Broyhill Furniture  
Michael Krygier, Detroit Testing Lab.  
David MacIntosh, Powell Co.

Karon Matkins, Diversified Testing Lab  
Kevin Minarz, Pallister Furniture  
Wade Peele, This End Up Furniture  
Bobby Puett, Diversified Testing Lab.  
William Suvak, Childcraft  
John Turbyfill, Vaughan Furniture  
Joe Ziolkowski, AFMA

**SUMMARY OF MEETING:**

The purpose of the meeting was to continue an effort, begun at a 3/24/99 meeting, to revise the ASTM F1427 voluntary standard for bunk beds to make its entrapment provisions the same as those in a CPSC notice of proposed rulemaking (NPR) published in the Federal Register on 3/3/99.

After making several changes to the minutes of the 3/24/99 meeting, a motion was approved to accept them. The chairman then read a letter from AFMA that had been sent to CPSC as a comment to the NPR.

An issue that was not resolved at the last meeting concerned changing the scope of the ASTM standard to include beds intended for institutional use. After discussion on this issue, which noted that a 4/8/99 letter to Chairman Ziolkowski from John Preston stated that the Commission had not yet made a decision on including institutional beds in a rule, a motion was approved to leave the exemption for institutional beds in paragraph 1.4 of the ASTM standard.

At the previous meeting, the subcommittee approved a provision requiring the wall-side guardrail to terminate not more than 1.5 inches but not less than 0.5 inch from the end structures. After discussion, a new motion was approved to remove the "not less than 0.5 inch" requirement. Paragraph 4.5.5 of the ASTM standard will now read as follows:

"4.5.5 One guardrail may terminate before reaching the bed end structure provided there is no more than 15 in. (380 mm) between either end of the guardrail and the bed end structure when measured at a point 5 in. (127 mm) above the sleeping surface as established by the maximum

mattress thickness specified by the manufacturer. The second guardrail may terminate before reaching the bed end structure. If this guardrail terminates before reaching the bed end structure, there shall be no more than 1.5 in. (38 mm) between either end of the guardrail and the bed end structure when measured horizontally between the bed end structure and the nearest point on the guardrail.”

A second issue that was not resolved at the 3/24/99 meeting concerned the change to the entrapment requirement for bed end structures below the level of the upper bunk foundation support. The CPSC proposal contains an entrapment requirement addressing the entire end structure between the upper and lower bunk foundation supports but the ASTM standard only covers that portion of the end structure between the lower bunk foundation support and a location 9 inches above the sleeping surface of the lower bunk mattress.

The CPSC end structure requirement attempts to address an entrapment fatality that occurred in an opening that was  $3\frac{13}{16}$ " in height located immediately beneath the upper bunk foundation support. This opening would not conform to the CPSC proposed rule which requires such openings to be less than  $3\frac{1}{2}$ " or greater than 9". However, during discussion on this issue, it became evident that the opening in which the fatality occurred could comply with the CPSC proposed rule (be less than  $3\frac{1}{2}$ " ) yet still present a neck entrapment hazard. John Preston noted that the victim had placed his head through a wide section of the opening then moved sideways toward a narrower part of the opening until his neck was between bars spaced  $3\frac{13}{16}$ " apart. To prevent entry of the neck, the space between the bars would have to be sufficiently narrow to prevent entry of the neck which is significantly less than  $3\frac{1}{2}$ " in diameter.

At least two manufacturers expressed concern that a change to the end structure requirement in the ASTM standard, such as is being proposed in the NPR, may have a serious impact on the design and aesthetic appearance certain beds that are not known to have been involved in any entrapment incidents.

The chairman asked Mike Krygier and John Preston to draft language for the end structure requirement that would permit the beds whose manufacturers expressed concern to continue to be sold. Krygier and Preston were asked to submit the draft requirement to the chairman within a week for mailing to the subcommittee together with the meeting minutes.

The meeting concluded with a discussion and decisions on a number of editorial changes to the F1427 standard that had been submitted by Detroit Testing Laboratory.

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**LOG OF MEETING**  
**DIRECTORATE FOR ENGINEERING SCIENCES** CPSC/OFFICE OF THE SECRETARY

1999 AUG 27 A 8:05

**SUBJECT:** Meeting of ASTM Subcommittee F15.30 for Bunk Beds

**DATE OF MEETING:** August 24, 1999

**PLACE:** Airport Marriott  
Greensboro, NC

**LOG ENTRY SOURCE:** John Preston, ES *JEP*

**DATE OF ENTRY:** August 26, 1999

**COMMISSION ATTENDEES:** John Preston, ES and Ron Medford, EXHR

**NON-COMMISSION ATTENDEES:**

Russell Batson, AFMA  
Brodycz Bohdan, Fashion Bed Group  
David Bukhart, Thomasville Furniture  
Jim Cameron, This End Up Furniture  
Jesse Cannaday, Stanley Furniture  
Andy Counts, AFMA  
Danny Hodges, Bassett Furniture Ind.  
Geoffrey Jackson, Vermont Precision  
Mark James, Lea Industries  
Will Johnson, My Room/ButlerWood  
Jed Johnsrud, Cargo Furniture

Les Killian, Broyhill Furniture  
Tom Lowery, Ethan Allen  
David MacIntosh, Powell Co.  
Karon Matkins, Diversified Testing Lab  
Kevin Minarz, Pallister Furniture  
Wade Peele, This End Up Furniture  
Bobby Puett, Diversified Testing Lab.  
Bob Smith, Stanley Furniture  
William Suvak, Childcraft  
John Turbyfill, Vaughan Furniture  
Joe Ziolkowski, AFMA

**SUMMARY OF MEETING:**

The purpose of the meeting was to discuss the Consumer Product Safety Commission's (CPSC's) proposed test and requirement addressing neck entrapment in bunk bed end structures that was in an NPR in the 7/9/99 Federal Register and to decide whether the ASTM F1427 standard for bunk beds should be revised to include this requirement

The chairman noted that the previous subcommittee meeting of 4/21/99 concluded with a request for Mike Krygier and John Preston to draft requirements addressing entrapment in bunk bed end structures as discussed at that meeting. He also noted that, as a result of the discussion at that meeting, CPSC had published a second NPR proposing an additional test and requirement for certain openings in bunk bed end structures. A copy of that NPR had been mailed to all members of the ASTM bunk bed subcommittee during July 1999.

John Preston explained the rationale for the test and requirement in the 7/9/99 NPR and discussion ensued on this issue. Manufacturers present at the meeting were not opposed to adding this requirement to the ASTM bunk bed standard but questioned the need for a 75° angle on the 'A' section of the proposed test template when a 55° angle on a similar template in the ASTM F1487 standard for public playground equipment appeared to be effective in preventing entrapment incidents on such equipment. Preston was asked to search CPSC playground incident data to verify that no entrapment incidents had occurred in structures conforming to the F1487 entrapment requirements.

Four manufacturers were appointed to a working group to determine whether the template (referred to as the fish probe because of its shape) should have a 75° angle on the 'A' section as proposed by CPSC or a 55° angle as in the ASTM F1487 standard. The chairman requested a response from the working group by September 8<sup>th</sup>. A motion was approved to accept the recommendation of the working group and forward revisions to the standard to ASTM for a ballot.

The meeting concluded with a discussion of recently published requirements for bunk beds in the state of Oklahoma that had been drafted by the Oklahoma State Dept. of Health and contain labeling requirements that differ from those in the ASTM standard. Chairman Ziolkowski will attempt to resolve these differences

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**C**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: October 29, 1999

TO : John Preston, Project Manger  
Engineering Sciences

THROUGH: Alan H. Schoem, Assistant Executive Director  
Office of Compliance

Terri Rogers, Acting Associate Director, Recalls and Compliance Division,  
Office of Compliance

FROM : Pamela C. Major, Compliance Officer  
Office of Compliance

SUBJECT : Bunk Bed Activities Since January 7, 1999

Since the last briefing on January 7, 1999, Compliance has purged its list of bunk bed importers and manufacturers by deleting firms no longer in business and adding new firms as we became aware of them. As of September 24, 1999, we are aware of 167 firms currently importing and manufacturing bunk beds.

In addition, since January 7, 1999, CPSC has issued one additional press release announcing the recall of 5,400 bunk bed kits. This brings the total number of bunk beds recalled to more than 636,800 since 1994.

Finally, Compliance expects to announce the recall of an additional 2,800 in the very near future.



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: October 28, 1999

TO : John Preston, ESME

FROM : Alan H. Schoem, EXC *AHS*

SUBJECT : Bunk Beds

You have asked for the views of the Office of Compliance on the advantages of a mandatory standard over a voluntary standard for bunk beds. It is our view that based on our efforts to identify bunk beds that do not conform to the voluntary standard, there are many small firms that enter the bunk bed market and do not conform to the ASTM standard. This occurs either because the firms are unaware of the voluntary standard or because they do not believe they need to conform to a voluntary standard.

A mandatory standard would:

- enable the staff to seek civil penalties for violations. These penalties would deter other manufacturers from making non-complying beds,
- increase the identification and subsequent recalls of non-complying beds by state and local officials who are familiar with mandatory rules enforced by CPSC,
- increase compliance by retailers and distributors who would be committing a prohibited act if they sold a product that did not meet applicable Federal standards,
- prevent non-complying beds made by foreign manufacturers from entering the United States through cooperative efforts with the U.S. Customs Service.

Based on information currently available, the staff believes the bunk bed industry is highly diverse and fragmented, with differing levels of sophistication relating to product safety. Firms can easily enter and leave the bunk bed manufacturing business. Based on our experience in enforcing mandatory standards, EXC staff believes firms are more likely to be aware of a mandatory standard rather than a voluntary standard. EXC staff believes that a mandatory standard would maximize industry awareness.

**D**



### Summary of Comments Responding to 3/3/99 Proposed Rule for Bunk Beds

Comment #	Received From	Date	Summary of Comment
CH99-1-1	The Danny Foundation	1/5/99 & 3/30/99	Urges CPSC to proceed with rulemaking for following reasons: 1) improve compliance, 2) public unaware of hazard, 3) voluntary standard flawed, 4) too many manufacturers to develop acceptable voluntary standard, 5) standard should address both children's and adult's beds, 6) publish single standard under CPSA, 7) mandatory standard levels the playing field.
CH99-1-2	Consumer Federation of America (CFA)	1/19/99	Favors a mandatory rule because: injury data shows unreasonable risk; lack of substantial compliance; benefits show reasonable relationship to costs; agrees with staff proposal for continuous guardrail and expanded end structure requirement.
CH99-1-3	Lynn S. Williams	1/19/99	Favors mandatory rule after losing her daughter because manufacturer didn't take the time to see if there were any standards to follow.
CH99-1-4	Arkansas Public Policy Panel	1/19/99	Favors mandatory rule because: deaths/injuries continue to occur; compliance with voluntary standard is weak; rule has threat of civil penalties, state and local officials and the U.S. Customs can help CPSC. Agree with staff proposals for continuous guardrail & expanded end structure requirement.
CH99-1-5	Illinois PIRG	1/21/99	Favors mandatory rule to deter manufacturers from producing unsafe beds and hopes staff's end structure requirement is included.
CH99-1-6	Chairman of ASTM F15.30 Subcommittee	1/27/99 & 4/30/99	Letter informs Commission that F15.30 subcommittee will change definition from 35" from floor to 30", require wall-side guardrail to terminate no more than 1.5" from ends, expand existing requirements for end structures to entire area between upper and lower bunk. F15.30 does not want to include institutional beds. If Commission decides to issue rule, F15.30 wants rule to reference ASTM F1427 standard.
CH99-1-7	Coalition for Consumer Health & Safety	1/28/99	Favors mandatory rule because: compliance to vol. Std. is insufficient, retailers/distributors will require compliance to mandatory rule; U.S. Customs will stop imports of non-complying beds, CPSC will be able to seek civil penalties for violators and state & local officials will support CPSC enforcement efforts.
CH99-1-8	AFMA	4/13/99	Not opposed to mandatory rule. Share CPSC's concern for bunk bed safety & will cooperate fully with either mandatory or voluntary effort. Draw attention to previous comments on Substantial Compliance. Request 18 month lead time to effective date if mandatory rule is published. Opposed to regulation of institutional beds.
CH99-1-9	National Propane Gas Association (NPGA)	5/6/99	CPSC staff's interpretation of the term substantial compliance will corrupt the U.S. standards development process by causing standards organizations to write their standards specifically to withstand CPSC review..
CH99-1-10	American Academy of Pediatrics (AAP)	5/13/99	Supports mandatory standard: to increase awareness and sense of urgency among manufacturers; allow Commission to seek penalties from violators; identify and prevent sale of non-conforming beds; remove cost advantage of non-conforming beds; require ID on beds to assist consumers in identifying recalled beds. Mandatory standard should be reworded to require continuous guardrails, 5" above mattress, on both sides and ends of upper bunk except for one ladder opening.
CH99-1-11	American Fiber Manufacturers Assn	5/11/99	Strongly supports voluntary consensus standards. Urges Commission to comply with the spirit of the legislative requirement and defer to existing voluntary standard whenever there is reasonable industry conformance. The Commission reports compliance with ASTM bunk bed standard to be in the range of 90% which, by any reasonable definition, constitutes substantial compliance. A Commission decision to issue mandatory standard for bunk beds would set a dangerous precedent and seriously erode the existing consensus standards system. Urge Commission to refrain from promulgating the proposed rule.

## 3/3/99 Comments (continued)

Comment #	Received From	Date	Summary of Comment
CH99-1-12	ASTM President	5/11/99	While ASTM takes no position on need for mandatory bunk bed standard, if a mandatory standard is implemented, ASTM requests that reference be made to ASTM F1427 in the rulemaking. Such a reference would be in accord with Public Law 104-113. Failure to reference F1427 in the public rulemaking would certainly discourage future initiatives.
CH99-1-13	Gas Appliance Manufacturers Assn.	5/13/99	The Commission General Counsel's interpretation of "substantial compliance" has no basis in the statutory language or in the legislative history of the Consumer Product Safety Act and is inconsistent with Congress' stated preference for voluntary standards over government mandated standards.
CH99-1-14	American Textile Manufacturers Institute	5/14/99	Concerned about the precedent set by OGC's interpretation of substantial compliance with ASTM F1427. Believe that the F1427 standard is effective and industry is in substantial compliance. Notes OMB Letter Circular A-119. Want Commission to review its decision on issue of substantial compliance before proceeding with a mandatory standard.
CH99-1-15	Underwriters Laboratories UL	5/17/99	Concerned that the NPR for bunk beds may unintentionally expand the CPSC's statutory direction and authority. By adopting the opinion of OGC, a precedent may be set that, in the long run, could weaken an effective and proven [voluntary standards] process on which all Americans have come to depend. UL encourages CPSC to hold a forum outside the bunk bed rulemaking procedure to identify the factors that need to be considered in determining substantial compliance.
CH99-1-16	Society of the Plastics Industry, SPI	5/17/99	It would not be in the consumer's best interest for a Federal regulatory agency to create a circumstance that replaces a [voluntary standards] system that is working well with one that would lead to confusion, confrontation, and potentially undermine U.S. competitiveness.
CH99-1-17	International Mass Retail Association, IMRA	5/17/99	Opposes mandatory bunk bed design standard and the underlying interpretation of substantial compliance. Mass retailers strive to comply with all industry-recognized product voluntary standards. Most bunk bed retailers make clear to manufacturers that every bunk bed sold to the retailer <u>must</u> meet the ASTM standard. As clearly shown by the agency's own survey, since mass retailers are only selling bunk beds compliant with the voluntary standard, a mandatory standard would not increase compliance amongst the nation's largest retailers. Supports the comments on substantial compliance made by NAM at the 5/6/99 public hearing.
CH99-1-18	Portable Power Equipment Manufacturers Association	5/17/99	Opposed to CPSC's finding that "substantial compliance" to a voluntary standard does not exist where a mandatory standard would achieve a higher degree of compliance. CPSC's new test for substantial compliance is directly at odds with Congressional intent.
CH99-1-19	Juvenile Products Manufacturers Association	5/17/99	Support the testimony of NAM. The Commission should be allowed the utmost flexibility in determining, on a case by case basis, whether mandatory rulemaking or deferral to effective voluntary standards is appropriate.
CH99-1-20	R.T. London, Co	5/17/99	Opposed to including institutional beds in a rule. Colleges would need to add \$150 - \$200 to the cost of each bed. Requirements addressing entrapment in end structures would add a cost of \$25 to a bed and would be of no value in protecting an adult. This and the side guardrail requirement would add \$225 to each bed. There is no data to rationalize imposing this children's regulation on adults.
Comment to Comm. Moore. Sent to ES on 7/13/99	Woodcrest Sales	4/9/99	Prior to inception of ASTM F1427-96, there were no incidents of entrapment between the wall and a bed. With addition of full length guard rail there will still be the potential for entrapment between wall and revised guardrail. Will also be a 10% increase in cost to consumer. Also, this design change may create a choking hazard on metal bunk beds. Feel that energy should be directed to more public education on hazards of bunk beds to children 1, 2, & 3 years of age. Changes to end structures will necessitate major design changes and cost. The extra cost and major design changes do not reduce or eliminate the potential hazards.

### Summary of Oral Comments Presented at 5/6/99 Public Hearing

Comment #	Received From	Date	Summary of Comment
Oral	Lynn Starks	5/6/99	In 1997, 3-year-old daughter became fatally entrapped in bunk bed not conforming to ASTM standard. Wants mandatory rule like federal rules for many other children's products.
Oral	Association of Home Appliance Manufacturers	5/6/99	The General Counsel's interpretation of "substantial compliance" is improper as a matter of law and would be a grave error as a matter of policy for the Commission to adopt. Do not believe it is justified for Commission to reverse its 18-year interpretation of the CPSA amendment. Cannot improve on fine legal analysis of AFMA. Urge Commission not to adopt General Counsel's opinion and maintain present relationship between manufacturers, voluntary standards & Commission.
Oral	National Association of Manufacturers (NAM) & CPSC Coalition	5/6/99	Opinion of General Counsel [on substantial compliance] is in conflict with clear congressional intent & could cause problems with vast majority of industries engaged in international competition. Interpretation could well lead to less rather than more effective consumer safety and compliance levels. Making a [voluntary] standard "mandatory" under the guise that there is not "substantial compliance" is disingenuous.
Oral	Consumer Alert	5/6/99	The interpretation of the term "substantial compliance" by the General Counsel is quite alarming. The General Counsel's position is contrived, strained, even tortured, in its attempts to bend the law. To say that a voluntary standard must achieve the same degree of conformance as a mandatory standard flies in the face of both common sense and a credible understanding of Congressional intent. Until now the Commissioners have had no difficulty in interpreting what "substantial compliance" means. Consumer Alert feels that the Commission has no option but to defer to the existing standard and terminate this rulemaking if it is serious about abiding by its own statute.
Oral	David Schmeltzer	5/6/99	Testimony supports the proposed rule for bunk beds.

### Summary of Comments Responding to 7/9/99 Proposed Rule for Bunk Beds

Comment #	Received From	Date	Summary of Comment
CH99-2-1a	Will Johnson, ASTM F15.30 Subcommittee Working Group	9/2/99	The ASTM bunk bed working group concludes that the "fish probe" used to test for neck entrapment in the ASTM public playground equipment standard (ASTM F1487) would effectively reduce or eliminate neck entrapment hazard in lower bunk end structures. Believes that a probe with 75° angle offers no additional protection over probe with a 55° angle.
CH99-2-2a	Geoffrey Jackson, Vermont Precision Woodworks	9/10/99	Believes that a probe with a 55° angle should be adopted for neck entrapment test in lower bunk end structures but could live with either a 75° angle or 55° angle probe.
CH99-2-3a	Mary Ellen Fise, CFA	9/22/99	Strongly supports the revised proposed rule to address neck entrapment of children in end structures of bunk beds.
CH99-2-4a	Doug Brackett, AFMA	9/22/99	Does not oppose a mandatory rule should the Commission determine that such is necessary. Notes that the ASTM F15.30 subcommittee has accepted revisions to ASTM standard similar to NPR to reduce height of bunk bed to 30" and for continuous wall-side guardrail. Notes that subcommittee will use 55° angle probe to address neck entrapment in end structures. Also requests serious consideration for 18-month lead time for compliance to mandatory rule.
CH99-2-5a	Jack Walsh, The Danny Foundation	9/20/99	Supports mandatory rule including test for neck entrapment in lower bunk end structures. Notes that two states have established requirements for bunk beds that differ from ASTM standard and CPSC proposed rule.

E

## **PART 1213 – SAFETY STANDARD FOR ENTRAPMENT HAZARDS IN BUNK BEDS**

### **§1213.2 Definitions**

As used in this part 1213:

- (a) *Bed*: see Bunk bed
- (b) *Bed End Structure*: an upright unit at the head and foot of the bed to which the side rails attach.
- (c) *Bunk bed*: a bed sold for residential use in which the underside of the foundation is over 30 inches (760 mm) from the floor. The rule does not apply to bunk beds for institutional use (e.g. in prisons, military facilities, dormitories, etc.).
- (d) *Foundation*: the base or support on which the mattress rests.
- (e) *Guard Rail*: A rail or guard on the side of the upper bunk to prevent a sleeping occupant from falling or rolling out.

### **§1213.3 Requirements.**

#### (a) *Guardrails.*

- (1) Any bunk bed shall provide at least two guardrails, at least one on each side of the bed.
- (2) One guardrail shall be continuous between each of the bed's end structures. The other guardrail may terminate before reaching the bed's end structures, providing there is no more than 15 inches (380 mm) between either end of the guardrail and the nearest bed end structure.
- (3) For bunk beds designed to have a ladder attached to one side of the bed, the continuous guardrail shall be on the other side of the bed.
- (4) Guardrails shall be attached so that they cannot be removed without either intentionally releasing a fastening device or applying forces sequentially in different directions.
- (5) The upper edge of the guardrails shall be no less than 5 inches (130 mm) above the top surface of the mattress when a mattress and foundation of the maximum thickness specified by the bed manufacturer's instructions is on the bed.
- (6) With no mattress on the bed, there shall be no openings in the structure between the lower edge of the uppermost member of the guardrail and the underside of the upper bunk's foundation that would permit passage of the wedge block shown in Fig. 1 when tested in accordance with the procedure in §1213.4(a).

**(b) *Bed end structures.***

(1) The upper edge of the upper bunk end structures shall be at least 5 inches (130 mm) above the sleeping surface for at least 50 percent of the distance between the two posts at the head and foot of the upper bunk when a mattress and foundation of a thickness that is the maximum specified by the manufacturer's instructions is used on the bed.

(2) With no mattress on the bed, there shall be no openings in the end structures above the foundation of the upper bunk that will permit the free passage of the wedge block shown in Fig 1 when tested in accordance with the procedure at §1213.4(b).

(3) When tested in accordance with §1213.4(c), there shall be no openings in the end structures between the underside of the foundation of the upper bunk and the upper side of the foundation of the lower bunk that will permit the free passage of the wedge block shown in Fig. 1, unless the openings are also large enough to permit the free passage of a 9-inch (230 mm) diameter rigid sphere.

(4) All portions of the boundary of any opening required by §§1213.4(c)(1) and (2) to be probed by the wedge block of Fig. 1 to this part, that permits free passage of a 9-inch (230 mm) diameter sphere must conform to the neck entrapment requirements of §1213.4(c)(3).

**§1213.4. Test methods.**

(a) *Guardrails* (see §1213.3(a)(6)). With no mattress on the bed, place the wedge block shown in Fig. 1, tapered side first, into each opening in the bed structure below the lower edge of the uppermost member of the guardrail and above the underside of the upper bunk's foundation. Orient the block so that it is most likely to pass through the opening (e.g. the major axis of the block parallel to the major axis of the opening) ("most adverse orientation"). Then gradually apply a 33-lbf (147-N) force in a direction perpendicular to the large end of the block. Sustain the force for 1 minute.

(b) *Upper bunk end structure* (see §1213.3(b)(2)). Without a mattress or foundation on the upper bunk, place the wedge block shown in Fig. 1 into each opening, tapered side first, and in the most adverse orientation. Determine if the wedge block can pass freely through the opening.

(c) *Lower bunk end structure* (see §1213.3(b)(3)).

(1) Without a mattress or foundation on the lower bunk, place the wedge block shown in Fig. 1, tapered side first, into each opening in the lower bunk end structure in the most adverse orientation. Determine whether the wedge block can pass freely through the opening. If the wedge block passes freely through the opening, determine whether a 9-inch (230-mm) diameter rigid sphere can pass freely through the opening.

(2) With the manufacturer's recommended maximum thickness mattress and foundation in place, repeat the test in paragraph (c)(1) of this section.

(3) All portions of the boundary of any opening that is required to be probed by the wedge block of Fig. 1 of this part by paragraphs (c)(1) and (c)(2) of this section, and that permits free passage of a 9-inch (230 mm) diameter sphere, must satisfy the requirements of paragraphs (c)(3)(i) and (c)(3)(ii) of this section addressing neck entrapment:

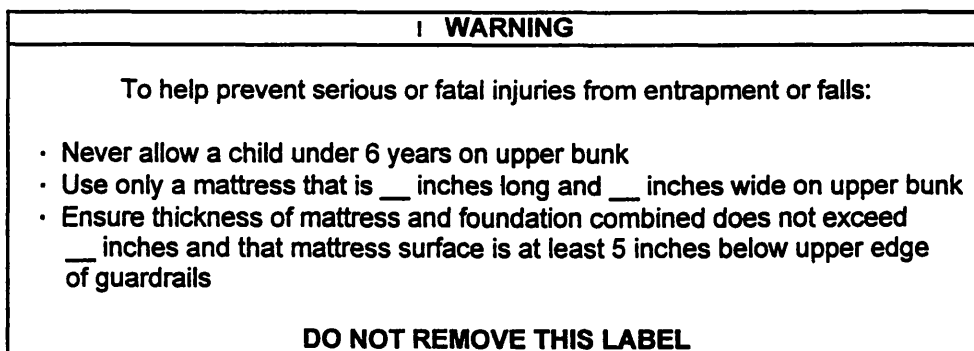
(i) Insert the "A" section of the test probe shown in Fig. 2 of this part into the portion of the boundary of the opening to be tested, with the plane of the probe in the plane of the opening and with the centerline of the top of the probe (as shown in Fig. 2 of this part) aligned parallel to the centerline of the opening, until motion is stopped by contact between the test probe and the boundaries of the opening (see Fig. 3 of this part). By visual inspection, determine if there is simultaneous contact between the boundary of the opening and both sides of the "A" section of the probe. If simultaneous contact occurs, mark the contact points on the boundary of the opening and conduct the additional test described in paragraph (c)(3)(ii) of this section.

(ii) To check the potential for neck entrapment, place the neck portion of the "B" section of the probe into the opening, with its plane perpendicular to both the plane of the opening and the centerline of the opening (see Fig. 4 to this part). If the neck portion of the "B" section of the probe completely enters the opening (passes 0.75 inch (19 mm) or more beyond the points previously contacted by the "A" section of the probe), the opening is considered to present a neck entrapment hazard and fails the test, unless its lower boundary slopes downward at 45 degrees or more for the whole distance from the narrowest part of the opening the neck can reach to the part of the opening that will freely pass a 9-inch (230 mm) diameter sphere.

### §1213.5 Marking and labeling

(a) There shall be a permanent label or marking on each bed stating the name and address (city, state and zip code) of the manufacturer, distributor, or retailer, the model number, and the month and year of manufacture.

(b) The following warning label shall be permanently attached to the inside of an upper bunk bed end structure in a location that cannot be covered by the bedding but that may be covered by the placement of a pillow.



## §1213.6. Instructions

Instructions shall accompany each bunk bed set, and shall include the following information:

(a) *Size of mattress and foundation.* The length and width of the intended mattress and foundation shall be clearly stated, either numerically or in conventional terms such as twin size, twin extra-long, etc. In addition, the maximum thickness of the mattress and foundation required for compliance with §1213.3(a)(5) and (b)(1) of this standard shall be stated.

(b) *Safety warnings* - The instructions shall provide the following safety warnings:

- (1) Do not allow children under 6 years of age to use the upper bunk.
- (2) Use guardrails on both sides of the upper bunk.
- (3) Prohibit horseplay on or under beds.
- (4) Prohibit more than one person on upper bunk.
- (5) Use ladder for entering or leaving upper bunk.



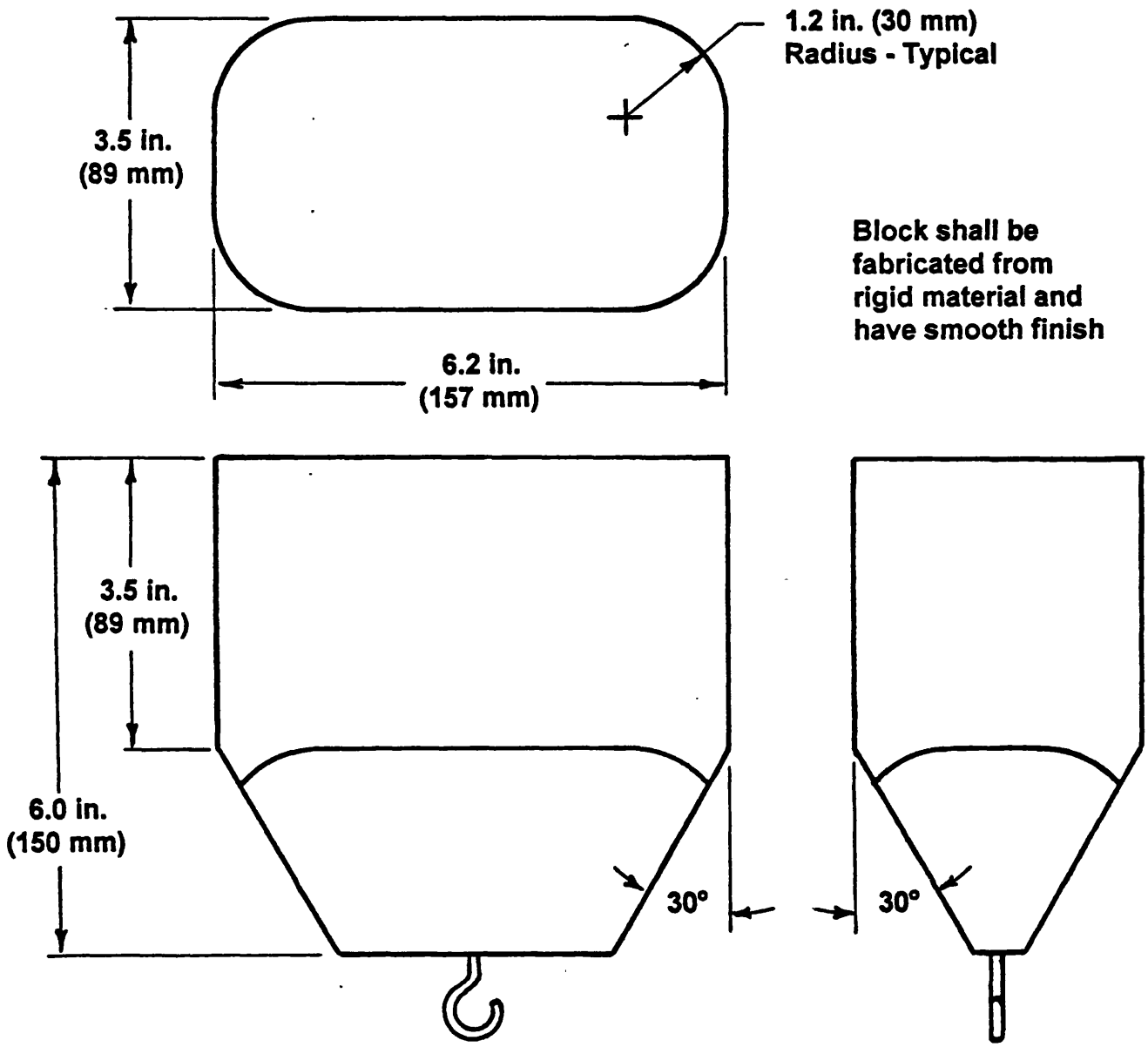
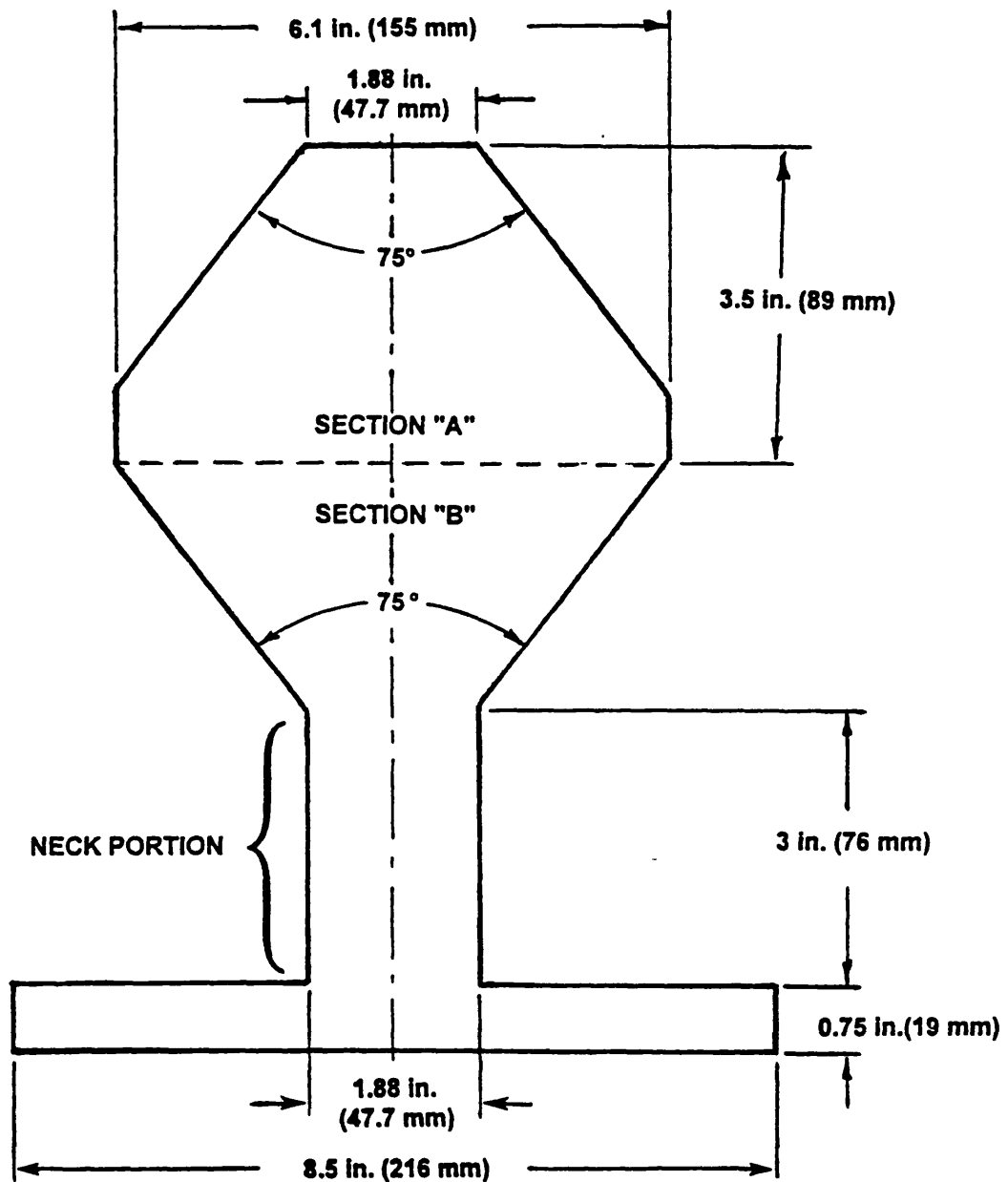
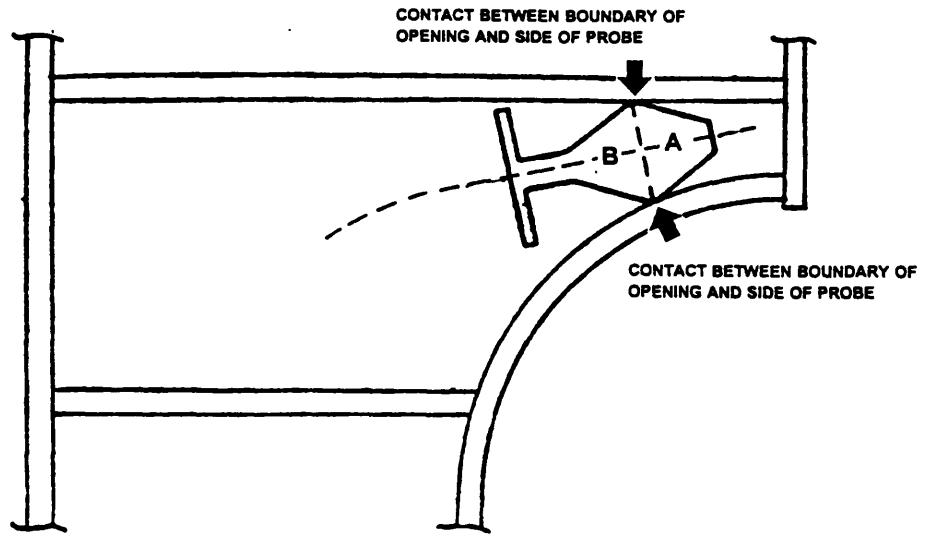


Figure 1 to Part 1213 - Wedge Block for Tests in § 1213.4(a), (b) and (c)

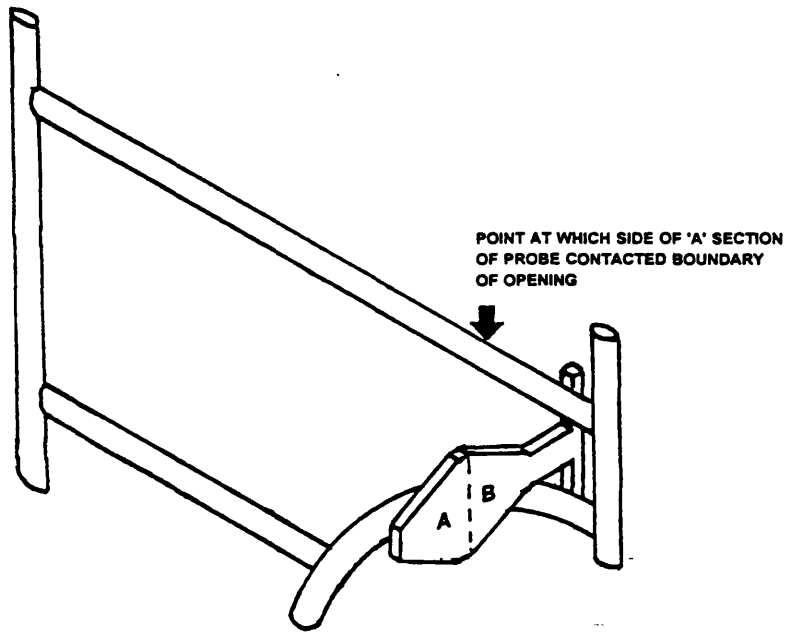


NOTE - Probe to be constructed from any rigid material 0.75 in. (19 mm) thick

**Fig. 2 - Test Probe for Neck Entrapment**



**Fig. 3 – Motion of Test Probe Arrested by Simultaneous Contact With Both Sides of “A” Section of Probe and Boundaries of Opening**



**Fig 4 – Neck Portion of “B” Section of Probe Enters Completely into Opening**

**F**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

## Memorandum

Date: October 14, 1999

TO : John D. Preston, Project Manager  
THROUGH: /s/ Robert B. Ochsmann, Ph.D., HF Division Director  
FROM : Celestine T. Kiss, HF *CTK*  
SUBJECT : Human Factor's comments on 55 or 75 degree probe for bunk bed testing

The Division of Human Factors was asked to discuss the differences between using the 55- and 75-degree probe to address neck entrapment hazards on bunk beds.

### Evolution of the 55-degree angle

In 1976, The National Recreation and Park Association developed for the U.S. Consumer Product Safety Commission (CPSC) a Proposed Safety Standard for Public Playground Equipment. In this proposed standard they recommended that "[a]ny accessible angle or group of angles forming an opening more than 24 inches above the ground or similar surface (as measured from the apex) must be greater than 55 degrees..." Their rationale stated "[t]his requirement is intended to eliminate dangerous angles that could form openings tending to entrap or strangle the user." The actual angle degree was based on "best engineering judgement at this point and takes into consideration the fact that most angles present in current equipment are 60° or greater." The 55-degree angle is still in use in the current ASTM voluntary standard for Public Playground Equipment and in the CPSC's "Handbook for Public Playground Safety." The handbook specifically states in Section 9.6.2 on angles that for playground equipment "the angle of any vertex formed by adjacent components should be greater than 55 degrees, unless the lower leg is horizontal or projects downwards."

### Evolution of the 75-degree angle

In 1985, as part of CPSC's work on a voluntary standard for baby gates and enclosures a template was developed to address head/neck entrapment in "V" shapes. The template was designed using neck measurements from the smallest (6-month-old) and largest (24-month-old) users. Allowing for 25 percent tissue compression and based on available incident data, a 75-degree angle for the template was recommended.

### Entrapment potential on playground equipment

Based on CPSC's Handbook, all public playground equipment is potentially subject to the 55-degree probe test. However, the pieces of equipment most likely to have the angles of concern are dome climbers and handrails on ladders. Because public playground equipment is designed

for use by children ages 2 through 12 years of age, it is possible that children as young as 2 years will come in contact with potential entrapment angles. The possibility that children between 2 and 12 years could become entrapped in an angle between 55 and 75 degrees depends on the piece of equipment. It is more likely that the older children will be on the more complex climbing equipment, such as free standing arch climbers, which are not appropriate for children under 5 years of age. These older children are capable of calling for assistance or pulling themselves back up and out of the entrapment situation. As for the ladder handrails, the potential entrapment angle is generally located at the bottom of the rail so the younger children would be more likely to encounter this. However, because of the location they may be able to extract themselves or be extracted by an adult before a fatality occurred.

### **Entrapment potential on bunk beds**

Of the 57 entrapment fatalities on bunk beds from January 1990 to August 9, 1999<sup>1</sup>, 48 occurred to children 2 years and younger. At this age, children are not fully aware of the danger when they are in potentially hazardous situations and are less likely than older children to cry out for help. Also, because bunk beds are intended for sleeping, the children are unlikely to be supervised and may slip into an entrapment space unaware of the danger. Therefore, the likelihood of entrapment on a bunk bed is higher for younger children than for older children.

### **Human Factors Recommendation**

Human Factors recommends use of the 75-degree angle on the testing probe for bunk beds. The most vulnerable children as determined by the bunk bed injury and fatality data are children under 2 years of age. Since, the 75-degree angle was developed based on measurements for children 6 months to 24 months it is more appropriate than the 55-degree angle, which was developed to protect older children on playground equipment.

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<sup>1</sup> McDonald, J. (1999), "CPSC Memo to John Preston, Bunk Bed Death and Injury Update" U. S. Consumer Product Safety Commission, Washington, D.C.

**G**





UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: November 2, 1999

TO : John D. Preston, ESME  
Project Manager, Bunk Beds

THROUGH: Warren J. Prunella, Associate Executive Director for Economic Analysis *WJP*

FROM : Terrance R. Karels, EC *TRK*

SUBJECT : Final Regulatory Analysis - Bunk Beds

Attached is the Final Regulatory Analysis of the proposed standard for bunk beds, as required under Section 9( c ) of the Consumer Product Safety Act.

**Attachment**



**PROPOSED RULE FOR BUNK BEDS  
FINAL REGULATORY ANALYSIS**

**Terrance R. Karels  
Directorate for Economic Analysis  
U.S. Consumer Product Safety Commission  
November 2, 1999**

## **INTRODUCTION**

The Consumer Product Safety Commission (CPSC) published a Notice of Proposed Rulemaking (March 3, 1999), that addresses the risk of entrapment deaths to children posed by bunk beds.

The rule is published under the authority of both the Consumer Product Safety Act (CPSA) and the Federal Hazardous Substances Act (FHSA), statutes which require that the Commission publish a final regulatory analysis of the rule. (Since the technical requirements of the rule under the CPSA and the FHSA are identical, this analysis will refer to "the rule.") This report provides a summary of the requirements of the rule, background, product and market information and, as required by these statutes, a discussion of the potential benefits and costs of the rule. The statutes also require a summary of significant issues raised during the public comment period in response to the preliminary regulatory analysis, and an assessment of these issues.

In addition to the requirements of the CPSA and the FHSA, the Regulatory Flexibility Act of 1980 (RFA) requires the Commission to address and give particular attention to the economic effects of the rule on small entities. The National Environmental Policy Act (NEPA) requires the Commission to consider the potential environmental impact of the rule. This report addresses both the RFA and NEPA requirements.

## **REQUIREMENTS**

Epidemiological data indicate that there are about 10 entrapment deaths annually involving children in bunk beds. The rule contains several requirements to address these entrapment deaths. It requires guardrails on both sides of the top bunk and it requires that the wall side rail be continuous. Second, openings in the top bunk structure (e.g., between the lower edge of the uppermost member of the guard rail and the underside of the upper bunk's foundation) must be small enough to prevent passage of the torso of a child (simulated by a device 3.5 inches by 6.2 inches).

Third, the proposed rule requires openings in the end structures between the underside of the upper bunk foundation and the upper side of the foundation of the lower bunk to be small enough to prevent entry by either the head or torso of a child or large enough to permit the free passage of both a child's torso and head. It also prevents openings in the end structure from having a shape that could allow a child's neck to be lodged in the structure. Finally, the rule also includes requirements for warnings on a label that must be affixed to the bed and in instructions that must accompany the bed.

There is a current voluntary standard for residential bunk beds. However, the voluntary standard does not require a continuous wall-side top bunk guard rail, and does not contain specific requirements addressing curved designs in bunk bed end structures that might allow a child's head to become lodged. The voluntary standard has limited lower bunk end structure requirements.

The rule requires that all bunk beds that are produced or imported 180 days after publication of the rule meet the proposed mandatory provisions of the rule. Although the rule may require some firms to make design changes in order to comply, these design changes are not expected to be substantial and can be accommodated in the 180-day time frame.

## **PRODUCT AND MARKET INFORMATION**

Bunk beds are essentially stackable twin beds, most often constructed with a wood or metal frame. Some models now incorporate a lower double bed with a twin upper bunk. The retail prices of these products range from about \$100 to over \$700; manufacturers estimate the average retail price of bunk beds at about \$300.

The American Furniture Manufacturers Association (AFMA) represents manufacturers of bunk beds. According to AFMA, 40 firms, either AFMA members or members of the existing bunk bed ASTM standards committee, account for 75-80% of total known annual sales of bunk beds. Through Compliance staff activities, staff is aware of 167 manufacturers of bunk beds. The share of market accounted for by the 127 other, non-AFMA or non-ASTM members is not known but is believed to account for a large majority of the remaining 20-25% of annual sales.

Bunk beds are a category of bedroom furniture, and every manufacturer of bedroom furniture is a potential producer of bunk beds. Further, because of their straightforward design, others can also produce these products. Thus, it is likely that there are other unidentified firms producing small numbers of bunk beds.

Industry sources estimate that about 500,000 bunk beds are sold annually for household use, and that the expected useful life of these products is 13-17 years. Based on this information, the CPSC's Product Population Model (a computer generated statistical program) estimates that there may be on the order of 8 million bunk beds in household use.

AFMA sources indicate that imports of bunk beds by its members appear to be increasing. Industry sources indicate that most, if not all, metal bunk beds sold are imported. Metal bunk beds are estimated to account for about 20% of annual sales of bunk beds.

## **Conformance with Existing Voluntary Standard**

There are no known government or industry data describing the extent of conformance to the voluntary standard since 1979 (the initial year industry guidelines were available). However, in order to conduct a cost-benefit analysis, an estimate must be made of the benefits that the rule would provide, and this requires an estimate of the extent to which the voluntary standard is not followed. Only then can societal costs of nonconforming beds be calculated.

Based on its knowledge of industry practices, the Commission's Engineering Sciences staff (ES) estimated that roughly 50% of production from 1979 to 1986 was in conformance to the standard's upper bunk entrapment requirements. As the industry publicized the guidelines and CPSC staff became involved in the standards process, staff estimated that conformance increased to roughly 75% of production from 1986 to 1992. After 1992, when ASTM published its bunk bed standard, EXC staff became active in monitoring for conformance to the standard, and the share of conformance was estimated to have increased to 90% or more.

Many of the bunk beds produced in the early to mid-1980s (the period of highest non-conformance) have reached the end of their expected useful lives, and are probably no longer in use. Thus, although it is not possible to estimate precisely what proportion of bunk beds in use during the study period conformed to the standard, it is likely that the percentage is in the range of 50-90%.

Assuming a conformance range between these extremes, on the order of 70-85%, some 15-30% of all bunk beds in use since the early 1990s (the period for which fatality data are available) may not have conformed to the ASTM standard. Therefore, given an average of about 8 million bunk beds in use annually during the study period, the number of bunk beds that did not conform to the voluntary standard may have averaged about 1.2 to 2.4 million units. The number that did conform may have averaged about 5.6 to 6.8 million.

## **POTENTIAL COSTS**

The costs associated with the proposed mandatory rule include the cost of adapting to the provisions of the rule for any firms not now meeting those requirements. The cost factors affected by these requirements are any increases in the cost of materials, and any redesign costs necessary to comply with the proposed mandatory rule.

Four manufacturers that modified production stated that additional materials needed to address entrapment were nominal compared to overall materials consumed in bunk bed production, and that any redesign costs would not be significant on a per-unit basis. The most significant cost is associated with the addition of a continuous guardrail to the top bunk, which might add \$15 to \$40 to the average retail price of bunk beds (or

5% to 13% of the average retail price). This cost would apply only to the bunk beds in current production that do not now conform to the requirements of the voluntary standard.

There are also costs to some of the firms that now conform to the voluntary standard requirement for a wall side top rail, since the current voluntary standard allows for a 15-inch gap at either or both ends of the wall side top rail. A spokesman for a major independent bunk bed testing lab estimated that about 50% of all bunk bed models that already meet the voluntary standard use a continuous wall side rail (about 72 inches in length). The source also stated that 50% of all models had a 15-inch gap on one or both ends of the wall side rail.

Thus, about 50% of all models that meet the current voluntary standard may require some change in design and additional materials. The incremental cost of closing the gap (or gaps) in the wall side top rail is unknown. However, because a continuous rail is merely an extension of the existing rail already in place, the increase in the retail price is probably less than proportional to the increase in length. Thus, if a continuous rail adds \$15 to \$40 to the price of a bunk bed, closing the gap on the wall side rail may cost consumers no more than about \$5 to \$10.

For a small number of firms, the rule may also result in costs associated with modifications of some bottom bunk end structures. Such modifications require that the structures not allow the free passage of a wedge block (approximating the size of a child's torso) unless it also allows the free passage of a sphere (approximating a child's head). The requirement also addresses the shape of openings that could accommodate a child's neck, which could entrap and lodge a child's head in the end structure. While the staff is aware of only a few current designs that would be affected by these requirements, some future designs may be precluded by the requirement, and some designs used by smaller, as yet unidentified firms may be affected. However, if these one-time redesign costs are amortized over the entire production runs for these firms, the per-unit costs are expected to be small.

## **POTENTIAL BENEFITS**

The rule addresses the risk of entrapment deaths to children from bunk beds. The potential benefits are the decrease in entrapment deaths. Avoidance of other incidents (such as near-entrapments) also may be considered as benefits, but do not contribute significantly to the monetized benefits since, according to the Commission's Epidemiology staff (EPI), they produce no or only minor injury. All of the known entrapment deaths involved children under the age of eight.

The expected societal costs of bunk bed entrapment deaths represent the potential benefits of preventing them. Epidemiology staff reported that there were 57 entrapment deaths associated with bunk beds from 1990 through August 9, 1999. Based on a review of the circumstances of the reports, staff concluded that the voluntary standard would have addressed 37 of the 39 top bunk entrapment deaths and 2 of the 3 bottom bunk end

structure entrapment deaths. Altogether, staff believes that the voluntary standard would have addressed 68% (39/57) of the reported fatalities due to entrapment in both the top and bottom bunk locations. Additionally, conformance to the proposed rule (as opposed to the voluntary standard) would address another 3 of the 57 (about 5%) entrapment deaths, including the 2 top bunk deaths that would not have been addressed by the voluntary standard, and 1 bottom bunk end structure death.

EPI staff projected that about 10 bunk bed entrapment fatalities have occurred annually since 1990 (95% confidence interval, 6.0-14.4). Thus, for the segment of bunk beds that do not conform to the voluntary standard, the proposed rule would have addressed about 7 deaths per year [10 deaths X (68% + 5%)]; and for the segment of bunk beds that conform to the requirements of the voluntary standard but not the proposed rule, the proposed rule would have addressed an additional death every other year, or about 0.5 deaths per year (10 deaths X 5%).

To determine the expected benefits of the rule, it is necessary to estimate the risk of entrapment death associated with bunk beds not conforming to the requirements of the proposed mandatory rule during the study period. In this case, the risk computation requires information on the number of bunk beds that did not conform to the voluntary standard and the number of bunk beds that conformed to the voluntary standard but not the proposed mandatory rule.

If (as noted earlier) an average of about 1.2 to 2.4 million bunk beds in use during the study period did not conform to the voluntary standard, the risk of entrapment addressed by the proposed rule for this group of beds would have ranged from about 2.9 to 5.8 deaths per million nonconforming beds ([7 deaths/2.4 million beds] to [7 deaths/1.2 million beds]). At an assumed societal cost of \$5 million per death, the annual societal value of averting all such fatalities is about \$15 to \$30 per bed per year.<sup>1</sup> If we assume a useful life of 15 years for a bunk bed, and a discount rate of 3%, the estimated present value of averting entrapment fatalities on beds that did not conform to the voluntary standard ranges from about \$175 to \$350 per bed.

As described above, the rule would have addressed another 0.5 entrapment deaths annually that would not have been addressed by the voluntary standard. Assuming that about one-half of the 5.6 to 6.8 million bunk beds would have conformed to the voluntary standard but not the proposed mandatory rule, the risk of entrapment for these beds would have ranged from about 0.15 to 0.18 deaths per million beds ([0.5 deaths/3.4 million beds] to [0.5 deaths/2.8 million beds]). At an assumed societal cost of \$5 million per death, the annual societal value of averting such fatalities is about \$0.75 to \$0.90 per bed per year.<sup>2</sup> Again, if we assume a useful life of 15 years for a bunk bed, and a discount

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<sup>1</sup> These estimates were calculated as follows: (2.9 deaths/1 million nonconforming beds) X \$5 million, at the lower end of the range, to about (5.8 deaths/1 million nonconforming beds) X \$5 million, at the upper end.

<sup>2</sup> The estimates were calculated as follows: (0.15 deaths/1 million nonconforming beds) X

rate of 3%, the estimated present value of averting entrapment fatalities not addressed by the voluntary standard ranges from \$9 to \$11 per bed.

## **COMPARISON OF COSTS AND BENEFITS**

This analysis has evaluated the costs and benefits of the proposed rule for two market segments: bunk beds that do not conform to the voluntary standard, and bunk beds that conform to the requirements of the voluntary standard but not to the requirements of the proposed rule. For the segment of bunk beds that does not conform to the voluntary standard, the expected benefits of the rule (about \$175 to \$350 per bed) are substantially greater than the expected costs of the rule (about \$15 to \$40 per bed). Thus, if the standard prevented all of the deaths addressed on bunk beds not conforming to the voluntary standard, the expected net benefits per bed sold would range from a low of about \$135 (\$175-\$40) to about \$335 (\$350-\$40), and would average about \$235 per bed.

For the second segment, those beds that meet the requirements of the voluntary standard but not those of the rule, the expected benefits range from about \$9 to \$11 per bed and the costs range from about \$5 to \$10. Thus, for this segment, both the benefits and costs are small, but generally comparable.

Consequently, based on this analysis, the expected net benefits of the proposed rule are primarily associated with bringing bunk beds that do not now conform with the voluntary standard into conformance with the proposed rule. At the same time, the rule does not have to be fully effective (i.e., it does not have to prevent all the deaths addressed) to be in the public interest. Given the estimated range of costs and benefits for those bunk beds that do not meet the requirements of the voluntary standard, the rule would need to be no more than about 23% (\$40/\$175) effective for the benefits to be equal to the costs. Effectiveness is expected to be much higher.

## **ALTERNATIVES**

### **Defer to Voluntary Standard**

The Commission may determine that a proposed mandatory rule is not needed. If there were no proposed mandatory rule, there would be no additional costs of conformance. Conversely, no additional deaths would be averted. The proposed mandatory rule also addresses three additional deaths that the voluntary standard does not address, and deaths would likely occur in the future in these scenarios.

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\$5 million, at the lower end of the range, to (0.18 deaths/1 million nonconforming beds) X \$5 million, at the upper end.



## **Include Institutional Bunk Beds in Rule**

The staff considered applying the proposed mandatory rule to bunk beds produced for the institutional market (such as for colleges, the military, etc.). EPI staff reviewed available information and determined that there has been one entrapment death since 1990 that would have been addressed by the proposed mandatory rule.

According to information supplied by industry, there are about 200,000 bunk beds sold for the institutional market each year, for use by colleges and boarding schools, the military, mental health facilities, and correctional facilities. The expected useful life of these products is estimated by industry at 7 to 10 years. Therefore, there may be about 1.7 million institutional beds in use. Manufacturers projected that the cost of compliance for institutional bunk beds would be considerably higher than that of residential bunk beds, due to the addition of two guard rails (rather than one for residential) and heavier duty materials used in institutional bunk beds. For comparison purposes, if the only significant cost were the addition of two guardrails (equivalent to rails used in residential beds), the cost of compliance for institutional bunk beds would be twice that of residential units, or \$30 to \$80 per bed.

Given that one death would have been addressed during the last 9.5 years, and that an average of about 1.7 million institutional bunk beds may have been in use during those years, the risk addressed by inclusion of institutional beds in the proposed mandatory standard would be about 0.06 deaths per million beds in use per year [(1 death/9.5 years)/1.7 million beds]. Assuming a societal cost of \$5 million per death, the annual societal value of averting this risk is about \$0.30 per bed per year. If we assume a useful life of 10 years, and a discount rate of 3%, the estimated present value of averting this risk would be about \$2.55 per bed over its entire useful life. Thus, based on available information, the benefits of the rule, for institutional bunk beds, are likely to be substantially less than the costs.

## **FINAL REGULATORY FLEXIBILITY ACT CERTIFICATION**

The Commission is required by the Regulatory Flexibility Act of 1980 (RFA) to address and give particular consideration to the economic effects of the rule on small entities.

The precise number of firms manufacturing bunk beds is not known. Commission staff has identified 167 firms that have produced bunk beds: these were identified through the trade association, national and regional trade shows, industry contacts, the Internet, and retail inspections. Small Business Administration guidelines classify firms in the furniture industry as small if they have less than 500 employees, are independently owned, and are not dominant in the field; thus, most of the identified firms would be classified as small businesses. It is likely that there are additional unidentified firms that produce relatively small numbers of bunk beds. These remaining producers are also likely to be small businesses.

Even though there is a substantial number of small firms, staff does not expect that there will be a significant effect on these firms. As noted earlier, all of the 167 firms identified by staff are, after extensive enforcement efforts, believed to be in conformance to the existing voluntary standard, and will require only slight modifications to comply with the proposed mandatory rule. For firms not conforming, the requirements are expected to result in cost increases which are small and likely to be passed on to consumers.

The proposed mandatory rule would not require third-party testing, and it is anticipated that firms would self-certify that their products are in compliance with the proposed mandatory standard. There are no reporting or recordkeeping requirements under the rule. Staff is not aware of any federal rules with which the rule would duplicate, overlap, or conflict.

Accordingly, the Commission could certify that the rule will not bear significant economic effects on a substantial number of small entities.

#### **ENVIRONMENTAL ASSESSMENT**

The rule would not cause manufacturers to dispose of existing materials of construction or existing packaging. Inventories of finished products (including those at retail) would not be rendered unsellable, since the rule would apply only to units produced or imported after the effective date. Similarly, manufacturer inventories would not require retrofit in order to comply with the rule.

The rule is not expected to have a significant effect on the materials used in the production and packaging of subject bunk beds, or in the number of units discarded after the rule. Therefore, no significant environmental effects would result from a proposed mandatory rule for bunk beds.