

CONSUMER PRODUCT SAFETY COMMISSION

16 CFR Parts 1112 and 1261

[Docket No. CPSC–2017–0044]

Safety Standard for Clothing Storage Units

AGENCY: Consumer Product Safety Commission.

ACTION: Notice of proposed rulemaking.

SUMMARY: The U.S. Consumer Product Safety Commission (Commission or CPSC) has determined preliminarily that there is an unreasonable risk of injury and death, particularly to children, associated with clothing storage units (CSUs) tipping over. To address this risk, the Commission proposes a rule addressing the stability of CSUs. Specifically, the proposed rule would require CSUs to be tested for stability, exceed minimum stability requirements, be marked and labeled with safety information, and bear a hang tag providing performance and technical data about the stability of the CSU. The Commission issues this proposed rule under the authority of the Consumer Product Safety Act (CPSA). The Commission requests comments about all aspects of this notice, including the risk of injury, the proposed requirements, alternatives to the proposed rule, and the economic impacts of the proposed rule and alternatives.

DATES: Submit comments by April 19, 2022.

ADDRESSES: Direct comments related to the Paperwork Reduction Act aspects of the proposed rule to the Office of Information and Regulatory Affairs, the Office of Management and Budget, Attn: CPSC Desk Officer, fax to: 202–395–6974, or email oir_submission@omb.eop.gov. Submit other comments, identified by Docket No. CPSC–2017–0044, by any of the following methods:

Electronic Submissions: Submit electronic comments to the Federal eRulemaking Portal at: <https://www.regulations.gov>. Follow the instructions for submitting comments. CPSC does not accept comments submitted by electronic mail (email), except through <https://www.regulations.gov>, and as described below. CPSC encourages you to submit electronic comments by using the Federal eRulemaking Portal, as described above.

Mail/Hand Delivery/Courier Written Submissions: Submit comments by mail/hand delivery/courier to: Division of the Secretariat, Consumer Product

Safety Commission 4330 East-West Highway, Bethesda, MD 20814; telephone: (301) 504–7479. Alternatively, as a temporary option during the COVID–19 pandemic, you can email such submissions to: cpsc-os@cpsc.gov.

Instructions: All submissions must include the agency name and docket number for this notice. CPSC may post all comments without change, including any personal identifiers, contact information, or other personal information provided, to: <https://www.regulations.gov>. Do not submit electronically: Confidential business information, trade secret information, or other sensitive or protected information that you do not want to be available to the public. If you wish to submit such information, please submit it according to the instructions for mail/hand delivery/courier written submissions.

Docket: To read background documents or comments regarding this proposed rulemaking, go to: <https://www.regulations.gov>, insert docket number CPSC–2017–0044 in the “Search” box, and follow the prompts.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION:

I. Background

CSUs are freestanding furniture items, typically used for storing clothes. Examples of CSUs include chests, bureaus, dressers, chests of drawers, drawer chests, door chests, chifforobes, armoires, and wardrobes. CPSC is aware of numerous deaths and injuries resulting from CSUs tipping over, particularly onto children. CPSC identified 226 fatalities associated with CSUs tipping over that were reported to have occurred between January 1, 2000 and December 31, 2020.¹ Of these, 193 (85 percent) involved children (*i.e.*, under 18 years old), 11 (5 percent) involved adults (*i.e.*, 18 to 64 years old), and 22 (10 percent) involved seniors (*i.e.*, 65 years and older). In addition, there were an estimated 78,200 nonfatal CSU tip-over injuries that were treated in U.S. hospital emergency departments (EDs) between January 1, 2006 and December 31, 2019. Of these, an estimated 56,400 (72 percent) involved children, and the remaining estimated 21,800 (28 percent) involved adults and seniors.

¹ Reporting is considered incomplete for the years 2018–2020 because reporting is ongoing.

To address the hazard associated with CSU tip overs, the Commission has taken several steps. In June 2015, the Commission launched the Anchor It! campaign. This educational campaign includes print and broadcast public service announcements; information distribution at targeted venues, such as childcare centers; social media; blog posts; videos; and an informational website (www.AnchorIt.gov). The campaign explains the nature of the risk, provides safety tips for avoiding furniture and television tip overs, and promotes the use of tip restraints to anchor furniture and televisions.

In addition, CPSC’s Office of Compliance and Field Operations has investigated and recalled CSUs. Between January 1, 2000 and March 31, 2021, 40 consumer-level recalls occurred to address CSU tip-over hazards. The recalled products were responsible for 328 tip-over incidents, including reports of 149 injuries and 12 fatalities.² These recalls involved 34 firms and affected approximately 21,500,000 CSUs.

In 2016, CPSC staff prepared a briefing package on furniture tip overs, looking at then-current levels of compliance with the voluntary standards, and the adequacy of the voluntary standards.³

In 2017, the Commission issued an advance notice of proposed rulemaking (ANPR), discussing the possibility of developing a rule to address the risk of injury and death associated with CSU tip overs. 82 FR 56752 (Nov. 30, 2017).⁴ The ANPR began a rulemaking proceeding under the CPSA (15 U.S.C. 2051–2089). CPSC received 18 comments during the comment period, as well as five additional correspondences after the comment period, which staff also considered.

The Commission is now issuing a notice of proposed rulemaking (NPR), proposing to establish requirements for CSU stability.⁵ The information discussed in this preamble is derived

² For the remaining incidents, either no injury resulted from the incident, or the report did not indicate whether an injury occurred.

³ Massale, J., Staff Briefing Package on Furniture Tipover, U.S. Consumer Product Safety Commission (2016), available at: <https://www.cpsc.gov/s3fs-public/Staff%20Briefing%20Package%20on%20Furniture%20Tipover%20-%20September%2030%202016.pdf>.

⁴ The briefing package supporting the ANPR is available at: https://www.cpsc.gov/s3fs-public/ANPR%20-%20Clothing%20Storage%20Unit%20Tip%20Overs%20-%20November%2015%202017.pdf?5IsEEedW_Cb3ULO3TUGjHEl875Adhvsg. After issuing the ANPR, the Commission extended the comment period on the ANPR. 82 FR 2382 (Jan. 17, 2018).

⁵ The Commission voted 4–0 to approve this notice.

from CPSC staff's briefing package for the NPR, which is available on CPSC's website at: <https://www.cpsc.gov/s3fs-public/Proposed%20Rule-%20Safety%20Standard%20for%20Clothing%20Storage%20Units.pdf>. This preamble provides key information to explain and support the rule; however, for a more comprehensive and detailed discussion, see the NPR briefing package.

II. Statutory Authority

CSUs are "consumer products" that the Commission can regulate under the authority of the CPSA. *See* 15 U.S.C. 2052(a)(5). Section 7 of the CPSA authorizes the Commission to issue a mandatory consumer product safety standard that consists of performance requirements or requirements that the product be marked with, or accompanied by, warnings or instructions. *Id.* 2056(a). Any requirement in the standard must be "reasonably necessary to prevent or reduce an unreasonable risk of injury" associated with the product. *Id.* Section 7 requires the Commission to issue such a standard in accordance with section 9 of the CPSA. *Id.*

Section 9 of the CPSA specifies the procedure the Commission must follow to issue a consumer product safety standard under section 7. *Id.* 2058. Under section 9, the Commission may initiate rulemaking by issuing an ANPR or NPR. *Id.* 2058(a). As noted above, the Commission issued an ANPR on CSU tip overs in November 2017. 82 FR 56752 (Nov. 30, 2017). When issuing an NPR, the Commission must comply with section 553 of the Administrative Procedure Act (5 U.S.C. 553), which requires the Commission to provide notice of a rule and the opportunity to submit written comments on it. 15 U.S.C. 2058(d)(2). In addition, the Commission must provide interested parties with an opportunity to make oral presentations of data, views, or arguments. *Id.*

Under section 9 of the CPSA, an NPR must include the text of the proposed rule, any alternatives the Commission proposes, and a preliminary regulatory analysis. 15 U.S.C. 2058(c). The preliminary regulatory analysis must include:

- A preliminary description of the potential costs and benefits of the rule, including costs and benefits that cannot be quantified, and the analysis must identify who is likely to receive the benefits and bear the costs;
- a discussion of the reasons any standard or portion of a standard submitted to the Commission in

response to the ANPR was not published by the Commission as the proposed rule or part of the proposed rule;

- a discussion of the reasons for the Commission's preliminary determination that efforts submitted to the Commission in response to the ANPR to develop or modify a voluntary standard would not be likely, within a reasonable period of time, to result in a voluntary standard that would eliminate or adequately reduce the risk of injury addressed by the proposed rule; and

- a description of alternatives to the proposed rule that the Commission considered and a brief explanation of the reason the alternatives were not chosen.

Id.

In addition, to issue a final rule, the Commission must make certain findings and include them in the rule. *Id.* 2058(f)(1), (f)(3). Under section 9(f)(1) of the CPSA, before promulgating a consumer product safety rule, the Commission must consider, and make appropriate findings to be included in the rule, concerning the following issues:

- The degree and nature of the risk of injury the rule is designed to eliminate or reduce;
- the approximate number of consumer products subject to the rule;
- the need of the public for the products subject to the rule and the probable effect the rule will have on the cost, availability, and utility of such products; and
- the means to achieve the objective of the rule while minimizing adverse effects on competition, manufacturing, and commercial practices.

Id. 2058(f)(1). Under section 9(f)(3) of the CPSA, the Commission may not issue a consumer product safety rule unless it finds (and includes in the rule):

- The rule, including the effective date, is reasonably necessary to eliminate or reduce an unreasonable risk of injury associated with the product;
- that issuing the rule is in the public interest;
- if a voluntary standard addressing the risk of injury has been adopted and implemented, that either compliance with the voluntary standard is not likely to result in the elimination or adequate reduction of the risk or injury, or there is unlikely to be substantial compliance with the voluntary standard;
- that the benefits expected from the rule bear a reasonable relationship to its costs; and

- that the rule imposes the least burdensome requirement that prevents or adequately reduces the risk of injury. *Id.* 2058(f)(3). At the NPR stage, the Commission is making these findings on a preliminary basis to allow the public to comment on the findings.

Section 9(g)(2) of the CPSA allows the Commission to prohibit manufacturers of a consumer product from stockpiling products subject to a consumer product safety rule to prevent manufacturers from circumventing the purpose of the rule. 15 U.S.C. 2058(g)(2). The statute defines "stockpiling" as manufacturing or importing a product between the date a rule is promulgated and its effective date at a rate that is significantly greater than the rate at which the product was produced or imported during a base period ending before the date the rule was promulgated. *Id.* The Commission is to define what constitutes a "significantly greater" rate and the base period in the rule addressing stockpiling. *Id.*

Section 27(e) of the CPSA authorizes the Commission to issue a rule to require manufacturers of consumer products to provide "such performance and technical data related to performance and safety as may be required to carry out the purposes of [the CPSA]." 15 U.S.C. 2076(e). The Commission may require manufacturers to provide this information to the Commission or, at the time of original purchase, to prospective purchasers and the first purchaser for purposes other than resale, as necessary to carry out the purposes of the CPSA. *Id.* Section 2(b) of the CPSA states the purposes of the CPSA, including:

- Protecting the public from unreasonable risks of injury associated with consumer products; and
- assisting consumers in evaluating the comparative safety of consumer products.

Id. 2051(b)(1), (b)(2).

III. The Product and Market

A. Description of the Product

The proposed rule defines a "CSU" as a freestanding furniture item, with drawer(s) and/or door(s), that may be reasonably expected to be used for storing clothing, that is greater than or equal to 27 inches in height, and that has a total functional volume of the closed storage greater than 1.3 cubic feet and greater than the sum of the total functional volume of the open storage and the total volume of the open space. Common names for CSUs include, but are not limited to: Chests, bureaus, dressers, armoires, wardrobes, chests of drawers, drawer chests, chifforobes, and

door chests. CSUs are available in a variety of designs (e.g., vertical or horizontal dressers), sizes (e.g., weights and heights), dimensions, and materials (e.g., wood, plastic, leather, manufactured wood or fiber board). Consumers may purchase CSUs that have been assembled by the manufacturer, or they may purchase CSUs as ready-to-assemble furniture.

The proposed definition includes several criteria to help distinguish CSUs from other furniture. As freestanding furniture items, CSUs remain upright without requiring attachment to a wall, when fully assembled and empty, with all extension elements closed. As such, built-in units or units intended to be permanently attached to a building structure (other than by tip restraints) are not considered freestanding. In addition, CSUs are typically intended and used for storing clothing and, therefore, they are commonly used in bedrooms. However, consumers may also use CSUs in rooms other than bedrooms and to store items other than clothing in them. For this reason, whether a product is a CSU depends on whether it meets the criteria in the proposed definition, rather than what the name of the product is or what is the marketed use for the product. The criteria in the proposed definition regarding height and closed storage volume (i.e., storage space inside a drawer or behind an opaque door) aim to address the utility of a unit for holding multiple clothing items. Some examples of furniture items that, depending on their design, may not meet the criteria in the proposed definition and, therefore, may not be considered CSUs are: Shelving units, office furniture, dining room furniture, laundry hampers, built-in closets, and single-compartment closed rigid boxes (storage chests).

CSUs may be marketed, packaged, or displayed as intended for children 12 years old and younger. Examples of such products include CSUs with pictures or designs on them that would appeal to children; CSU designs that would be useful for children; or CSUs that are part of a matching set with a crib, or similar infant product. However, CSUs are more commonly general-use products that are not specifically intended for children 12 years old and younger. The proposed rule applies to both children's products and non-children's products.

B. The Market

CPSC staff estimated the annual revenues and shipments of CSUs, using estimates of manufacturer and importer revenue, and estimated sales, by using

data on retail sales. The shipment value of chests of drawers and dressers combined for an estimated \$5.15 billion in 2018, and combined shipments of dressers and chests totaled 43.6 million units. Average manufacturer shipment value was \$118 per unit in 2018 (about \$104 for chests of drawers and \$144 for dressers).

Retail prices of CSUs vary substantially. The least expensive units retail for less than \$100, while more expensive units may retail for several thousand dollars. The estimated retail value of U.S. bedroom furniture sales in 2019 totaled \$60.3 billion, of which \$20.8 billion was sales of closets (which likely includes wardrobes and armoires), nightstands (some of which may be considered CSUs), and dressers (which likely includes chests of drawers).

According to data from the U.S. Census Bureau, in 2017, there were a total of 3,404 firms classified in the North American Industrial Classification System (NAICS) as non-upholstered wood household furniture manufacturing, upholstered household furniture manufacturing, metal household furniture manufacturing, or household furniture (except wood and metal) manufacturing. Of these firms, 2,024 were primarily categorized in the non-upholstered wood furniture category. However, these categories are broad and include manufacturers of furniture other than CSUs, such as tables, chairs, bed frames, and sofas. As such, it is likely that not all of the firms in these categories manufacture CSUs. Production methods and efficiencies vary among manufacturers; some use mass production techniques, and others manufacture their products one at a time or on a custom-order basis.

The number of U.S. firms that are primarily classified as manufacturers of non-upholstered wood household furniture has declined over the last few decades, as retailers have turned to international sources of CSUs and other wood furniture. Additionally, some firms that formerly produced all of their CSUs domestically have shifted production to foreign plants. More than half (64 percent) of the value of apparent consumption of non-upholstered wood furniture (net imports plus domestic production for the U.S. market) in 2019 was comprised of imported furniture, which may be true for CSUs as well. In addition to manufacturers, according to the Census Bureau data, in 2017, there were 5,117 firms involved in household furniture importation and distribution. According to the Census Bureau, there were 13,826 furniture retailers in 2017. Wholesalers

and retailers may obtain their products from domestic sources or import them from foreign manufacturers.

IV. Risk of Injury

A. Incident Data⁶

CPSC staff analyzed reported fatalities, reported nonfatal incidents and injuries, and calculated national estimates of injuries treated in EDs that were associated with CSU instability or tip overs. Each year, CPSC issues an annual report on furniture instability and tip overs.⁷ The information provided for this rulemaking is drawn from a subset of data from those annual reports, as well as from the National Electronic Injury Surveillance System⁸ (NEISS), which includes reports of injuries treated in U.S. EDs, and the Consumer Product Safety Risk Management System⁹ (CPSRMS). For this rulemaking, staff focused on incidents that involved products that would be considered CSUs.¹⁰ Staff considered incidents that involved the CSU tipping over, as well as incidents of CSU instability with indications of impending tip over. Tip-over incidents are a subset of product instability incidents, and involve CSUs actually falling over. Product instability incidents are a broader category that includes tip-over incidents, but may also include incidents where CSUs did not fully tip over. Staff considered instability incidents relevant because product instability can lead to a tip over, and the same factors, such as product design, can contribute to instability and tip overs.¹¹

The data presented here represent the minimum number of incidents or

⁶ For more details about incident data, see Tab A of the NPR briefing package.

⁷ These annual reports are available at: <https://www.cpsc.gov/Research--Statistics/Furniture-and-Decor-1>.

⁸ Data from NEISS is based on a nationally representative probability sample of about 100 hospitals in the United States and its territories. NEISS data can be accessed from the CPSC website under the "Access NEISS" link at: <https://www.cpsc.gov/Research--Statistics/NEISS-Injury-Data>.

⁹ CPSRMS is the epidemiological database that houses all anecdotal reports of incidents received by CPSC, "external cause"-based death certificates purchased by CPSC, all in-depth investigations of these anecdotal reports, as well as investigations of select NEISS injuries. Examples of documents in CPSRMS include: Hotline reports, internet reports, news reports, medical examiner's reports, death certificates, retailer/manufacturer reports, and documents sent by state/local authorities, among others.

¹⁰ Staff considered incidents that involved chests, bureaus, dressers, armoires, wardrobes, portable clothes lockers, and portable closets.

¹¹ This section refers to tip-over incidents and instability incidents collectively as tip-over incidents.

fatalities during the time frames described. Data collection is ongoing for CPRMS, and is considered incomplete for 2018 and after, so CPSC may receive additional reports for those years in the future.¹²

1. Fatal Incidents

Based on NEISS and CPRMS, CPSC staff identified 193 reported CSU tip-over fatalities to children (*i.e.*, under 18 years old),¹³ 11 reported fatalities to adults (*i.e.*, ages 18 through 64 years), and 22 reported fatalities to seniors (*i.e.*, ages 65 years and older) that were reported to have occurred between January 1, 2000 and December 31, 2020.¹⁴ Of the 193 reported CSU tip-over child fatalities, 89 (46 percent) involved only a CSU tipping over, whereas, 104 (54 percent) involved a CSU and a television tipping over. Of the child fatalities, 190 (98 percent) involved a chest, bureau, or dresser, 2 involved a wardrobe, and 1 involved an armoire. Of the 33 reported adult and senior fatalities, 32 (97 percent) involved only a CSU tipping over, whereas, 1 (9 percent) involved both a CSU and a television tipping over. Of the adult and senior fatalities, 29 involved a chest, bureau, or dresser, 2 involved a wardrobe, 1 involved an armoire, and 1 involved a portable storage closet.

For the years for which reporting is considered complete—2000 through 2017—there have been from 3 to 21 child fatalities each year from CSU tip overs, and from 0 to 5 fatalities each year to adults and seniors.

Of the 193 reported child fatalities from tip overs, 166 involved children 3 years old or younger; 12 involved 4-year-olds; 7 involved 5-year-olds; 4 involved 6-year-olds; 1 involved a 7-year-old; and 3 involved 8-year-olds. Of

the 89 reported child fatalities from tip overs involving only CSUs (*i.e.*, no televisions), 84 involved children 3 years old or younger; 2 involved 4-year-olds; 1 involved a 5-year-old; 1 involved a 6-year-old; and 1 involved a 7-year-old. Thus, 94 percent of these fatalities were children 3 years old and younger; 97 percent were 4 years old and younger; 98 percent were 5 years old and younger; and 99 percent were 6 years old and younger. Therefore, regardless of television involvement, the most reported CSU tip-over fatalities happened to children 3 years old or younger. Among children 4 years and older, a television was more frequently involved than not involved.

CSU tip-over fatalities to children were most commonly caused by torso injuries when only a CSU was involved, and were more commonly caused by head injuries when both a CSU and television tipped over. For the 89 child fatalities not involving a television, 58 resulted from torso injuries (chest compression); 13 resulted from head/torso injuries; 12 resulted from head injuries; 4 involved unknown injuries; and 2 involved a child's head, torso, and limbs pinned under the CSU. For the 104 child fatalities that involved both a CSU and television tipping over, 91 resulted from head injuries (blunt head trauma); 6 resulted from torso injuries (chest compression resulting from the child being pinned under the CSU); 2 resulted from head/torso injuries; 4 involved unknown injuries; and 1 involved head/torso/limbs.

2. Reported Nonfatal Incidents

CPSC staff identified 1,002 reported nonfatal CSU tip-over incidents for all ages that were reported to have occurred between January 1, 2005 and December 31, 2020.¹⁵ CPRMS reports are considered anecdotal because, unlike NEISS data, they cannot be used to identify statistical estimates or year-to-year trend analysis, and because they include reports of incidents in which no injury resulted. Although these anecdotal data do not provide for statistical analyses, they provide detailed information to identify hazard patterns, and provide a minimum count of injuries and deaths.

Of the 1,002 reported incidents, 64 percent (639 incidents) involved only a CSU, and 36 percent (363 incidents) involved both a CSU and television

tipping over. Of the 1,002 incidents, 99.5 percent (997 incidents) involved a chest, bureau, or dresser; less than 1 percent (4 incidents) involved an armoire; and less than 1 percent (1 incident) involved a wardrobe.

For the years for which reporting is considered complete—2005 through 2017—there were from 6 to 256 reported nonfatal CSU tip-over incidents each year, with 2016 (256 incidents) and 2017 (101 incidents) reporting the highest number of incidents. Each year, there were from 5 to 232 reported nonfatal incidents involving only a CSU, with the highest number (232 incidents) occurring in 2016.

Of the 1,002 nonfatal CSU tip-over incidents reported, 362 did not mention any specific injuries; 628 reported one injury; and 12 reported two injuries, resulting in a total of 652 injuries reported among all of the reported nonfatal incidents. Of these 652 reported injuries, 64 (10 percent) resulted in hospital admission; 296 (45 percent) were treated in EDs; 28 (4 percent) were seen by medical professionals; and the level of care is unknown¹⁶ for the remaining 264 (40 percent). Of 293 reports of nonfatal CSU tip-over injuries where only a CSU was involved; 7 resulted in hospital admission (of which 6 were children¹⁷); 23 were treated in the ED (of which 22 were children); 27 were seen by a medical professional (of which 19 were children); and the level of care is unknown for the remaining 236.

Of the victims whose ages were known, there were more injuries suffered by children 3 years old and younger, than to older victims; and the injuries suffered by these young children tended to be more severe, compared to older children and adults/seniors. The severity of injury ranged from cuts and bumps to concussions and skull fractures. Of the 7 victims admitted to the hospital, 5 were 3 years old or younger; 1 was a child of unknown age; and 1 was an adult. Of the 23 victims treated in the ED, 8 were 3 years old or younger; 4 were 4 to 5 years old; 4 were 6 to 17 years old; and 6 were children of unknown age.

¹⁶ These reports include bruising, bumps on the head, cuts, lacerations, scratches, application of first-aid, or other indications of at least a minor injury that occurred, without any mention of aid rendered by a medical professional. There were three NEISS cases in which the victim went to the ED, but then left without being seen.

¹⁷ Incidents involving children include those in which the age of the victim was reported as well as those in which the age was not reported, but the report included indications that the victim was a child (*e.g.*, a sibling of a small child, or referred to as a “child,” “daughter,” or “son”). For the remaining incidents, the victim was either an adult, or the age was unknown.

¹² Among other things, CPRMS houses all in-depth investigation reports, as well as the follow-up investigations of select NEISS injuries. As such, it is possible for a NEISS injury case to be included in the national injury estimate, while its investigation report is counted among the anecdotal nonfatal incidents, or for a NEISS injury case to appear on both the NEISS injury estimate and fatalities, if the incident resulted in death while receiving treatment.

¹³ Of the 193 reported fatalities, there was one tip-over incident that resulted in two deaths, making the number of fatal incidents 192.

¹⁴ Different time frames are presented for NEISS, CPRMS, fatal, and nonfatal data because of the timeframes in which staff collected, received, retrieved, and analyzed the data. One example of the reason for varied timeframes is that staff drew data from previous annual reports and other data-collection reports (which used varied start dates), and then updated the data set to include more recent data. Another example is that CPRMS data are available on an ongoing basis, whereas NEISS data are not available until several months after the end of the previous calendar year.

¹⁵ Nonfatal incident reports submitted to CPSC come from reports entered into CPSC's CPRMS database no later than December 31, 2020, and includes completed NEISS investigations. All of the investigation reports based on NEISS injuries that occurred from 2006 through 2020 appear in the reported nonfatal incidents.

3. National Estimates of ED-Treated Injuries¹⁸

According to NEISS, there were an estimated 78,200 injuries,¹⁹ an annual average of 5,600 estimated injuries, related to CSU tip overs for all ages that were treated in U.S. hospital EDs from January 1, 2006 to December 31, 2019. Of the estimated 78,200 injuries, 56,400 (72 percent) were to children, which is an annual average of 4,000 estimated injuries to children over the 14-year period. For the remaining estimated 21,800 injuries to adults and seniors, about 3,200 (15 percent) were to seniors (*i.e.*, 65 years and older).

An estimated 61,700 (79 percent) of ED-treated injuries involved only a CSU tipping over, whereas, an estimated 16,500 (21 percent) involved both a CSU and television tipping over. This ratio was similar for injuries to children, with an estimated 40,700 (72 percent) of child incidents involving only a CSU, and an estimated 15,700 (28 percent) involving both a CSU and a television. In contrast, nearly all (an estimated 21,000 or 96 percent) of the estimated injuries to adults and seniors involved only a CSU. For each year from 2006 through 2019, there have been more estimated ED-treated injuries to children involving only a CSU tipping over, compared to incidents involving a CSU and a television tipping over.

For all ages, an estimated 77,000 (98 percent) of the ED-treated injuries involved a chest, bureau, or dresser. Similarly, for child injuries, an estimated 55,800 (99 percent) involved a chest, bureau, or dresser.²⁰ Of the ED-treated injuries to all ages, 93 percent were treated and released, and 4 percent were hospitalized. Among children, 93 percent were treated and released, and 3 percent were hospitalized.

For each year from 2006 through 2019, there were an estimated 2,500 to 5,900 ED-treated injuries to children from CSU tip overs. The estimated annual number of ED-treated injuries to adults and seniors from CSU tip overs is fairly consistent over most of the 14-year period, with an overall yearly average of 1,600 estimated injuries, although data were insufficient to support reliable statistical estimates for

adults and seniors for 2014, 2015, and 2019.

CPSC focused on ED-treated injuries involving children because these make up the majority of ED-treated CSU tip-over injuries. For 2010 through 2019, there is a statistically significant linear decline in child injuries involving CSU tip overs (both with and without televisions);²¹ however, there is no linear trend detected in injuries to children involving only CSUs tipping over. This indicates that the statistically significant decrease in all CSU tip overs involving children is driven by the decline in tip overs involving televisions, while the rate of ED-treated incidents involving CSUs without televisions has remained stable.

Of the estimated ED-treated injuries to children, most involved 2- and 3-year-olds, followed by 1- and 4-year-olds. An estimated 7,900 ED-treated injuries involved 1-year-olds;²² an estimated 15,000 involved 2-year-olds;²³ an estimated 13,000 involved 3-year-olds;²⁴ and an estimated 7,500 involved 4-year-olds.²⁵ There were an estimated 2,300 injuries to 5-year-olds that involved only a CSU, and an estimated 1,800 injuries to 6-year-olds that involved only a CSU, but data were insufficient to support reliable statistical estimates for incidents involving CSUs and televisions for these ages. For children 7 to 17 years old,²⁶ there were an estimated 4,700 ED-treated injuries involving only a CSU, and an estimated 1,600 involving a CSU and a television.

Of the estimated 56,400 ED-treated CSU tip-over injuries to children, an estimated 20,800 (37 percent) resulted in contusions/abrasions;²⁷ an estimated 14,900 (26 percent) resulted in internal organ injury (including closed head injuries);²⁸ an estimated 7,600 (13 percent) resulted in lacerations;²⁹ an estimated 5,200 (9 percent) resulted in

fractures;³⁰ and the remaining estimated 7,800 (14 percent) resulted in other diagnoses.

Overall, an estimated 33,700 (60 percent) of ED-treated tip-over injuries to children were to the head, neck, or face; and an estimated 10,300 (18 percent) were to the leg, foot, or toe. The injuries to children were more likely to be head injuries when a television was involved than when no television was involved. Of the estimated number of ED-treated injuries to children involving a CSU and a television, 73 percent were head injuries, compared to 55 percent of injuries involving only a CSU. In addition, of the estimated injuries to children involving only a CSU, 20 percent were leg, foot, or toe injuries, and 14 percent were trunk or torso injuries. Data were insufficient to generate estimates of trunk/torso or arm/hand/finger injuries when both a CSU and television tipped over.

B. Details Concerning Injuries³¹

To assess the types of injuries that result from CSU tip overs, CPSC staff focused on incidents involving children, because the vast majority of CSU tip overs involve children. The types of injuries resulting from furniture tipping over onto children include soft tissue injuries, such as cuts and bruises (usually a sign of internal bleeding); skeletal injuries and bone fractures to arms, legs, and ribs; and potentially fatal injuries resulting from skull fractures, closed-head injuries, compressional and mechanical asphyxia, and internal organ crushing leading to hemorrhage. These types of injuries can result from tip overs involving CSUs alone, or CSUs with televisions.

As explained above, head injuries and torso injuries are common in CSU tip overs involving children. The severity of injuries depends on a variety of factors, but primary determinants include the force generated at the point of impact, the entrapment time, and the body part impacted. The head, neck, and chest are the most vulnerable. The severity of injury can also depend on the orientation of the child's body or body part when it is hit or trapped by the CSU. Sustained application of a force that affects breathing can lead to compressional asphyxia and death. In most CSU tip-over cases, serious injuries and death are a result of blunt force trauma to the head and intense pressure on the chest causing

¹⁸ Estimates are rounded to the nearest hundred and may not sum to total, due to rounding. NEISS estimates are reportable, provided the sample count is greater than 20, the national estimate is 1,200 or greater, and the coefficient of variation (CV) is less than 0.33.

¹⁹ Sample size = 2,629, coefficient of variation = .0667.

²⁰ Data on armoires, wardrobes, portable closets, and clothes lockers were insufficient to support reliable statistical estimates.

²¹ There were not enough CSU ED-treated incidents to children involving both a CSU and a television to make reliable estimates for the most recent 5 years, 2015 through 2019.

²² An estimated 6,300 involved only a CSU and the remaining 1,600 involved a CSU and television.

²³ An estimated 10,600 involved only a CSU, and the remaining 4,400 involved a CSU and television.

²⁴ An estimated 9,200 involved only a CSU, and the remaining 3,800 involved a CSU and television.

²⁵ An estimated 5,100 involved only a CSU, and the remaining 2,400 involved a CSU and television.

²⁶ These ages are grouped together because data were insufficient to generate estimates for any single age within that range.

²⁷ Seventy-six percent of these involved only a CSU, and the remainder involved a CSU and television tipping over.

²⁸ Sixty-one percent of these involved only a CSU, and the remainder involved a CSU and television tipping over.

²⁹ Eighty-two percent of these involved only a CSU, and the remainder involved a CSU and television tipping over.

³⁰ Sixty-nine percent of these involved only a CSU, and the remainder involved a CSU and television tipping over.

³¹ For more details about injuries, see Tab B of the NPR briefing package.

respiratory and circulatory system impairment.

Head injuries are produced by high-impact forces applied over a small area and can have serious clinical consequences, such as concussions and facial nerve damage. Such injuries are often fatal, even in cases where the child is immediately rescued and there is rapid intervention. An incident involving blunt head trauma can result in immediate death or loss of consciousness. Autopsies from CSU tip-over fatalities to children reported crushing injuries to the skull and regions of the eye and nose. Brain swelling, deep scalp hemorrhaging, traumatic intracranial bleeding, and subdural hematomas were often reported. These types of injuries are typical of crush injuries caused by blunt head trauma and often have a fatal outcome. Children who survive such injuries may suffer neurological deficits, require neurosurgical interventions, and can face lifelong disabilities.

Compressional and mechanical asphyxia is another potential cause of injury and death in CSU tip-over incidents. Asphyxia can be fatal within minutes. In multiple CSU tip-over incidents, there was physical evidence of chest compression visible as linear marks or abrasions across the chest and neck, consistent with the position of the CSU. Compressional and mechanical asphyxia can result from mechanical forces generated by the sheer mass of an unyielding object, such as furniture, acting on the thoracic and abdominal area of the body, which prevents thorax expansion and physically interferes with the coordinated diaphragm and chest muscle movement that normally occurs during breathing. Torso injuries, which include compressional and mechanical asphyxia, are the most common form of injury for non-television CSU fatalities. External pressure on the chest that compromises the ability to breathe by restricting respiratory movement or on the neck can cause oxygen deprivation (hypoxia). Oxygen deprivation to the brain can cause unconsciousness in less than three minutes and may result in permanent brain damage or death when pressure is applied directly on the neck by the CSU or a component of the CSU (such as the edge of a drawer). The prognosis for a hypoxic victim depends on the degree of oxygen deprivation, the duration of unconsciousness, and the speed at which cardiovascular resuscitation attempts are initiated relative to the timing of cardiopulmonary arrest. Rapid reversal of the hypoxic state is essential to prevent or limit the development of

pulmonary and cerebral edema that can lead to death or other serious consequences. The sooner the CSU (compression force) is removed and resuscitation initiated, the greater the likelihood that the patient will regain consciousness and recover from injuries.

In addition to chest compression, pressure on the neck by a component of the CSU can also result in rapid strangulation due to pressure on the blood vessels in the neck. The blood vessels that take blood to and from the brain are relatively unprotected in the soft tissues of the neck and are vulnerable to external forces. Sustained compression of either the jugular veins or the carotid arteries can lead to death. Petechial hemorrhages of the head, neck, chest, and the periorbital area were reported in autopsy reports of CSU tip-over incidents.

Pediatric thoracic trauma has unique features that differ from adult thoracic trauma, because of differences in size, structure, posture, and muscle tone. While the elasticity of a child's chest wall reduces the likelihood of rib fracture, it also provides less protection from external forces. Impact to the thorax of an infant or small child can produce significant chest wall deflection and transfer large kinetic energy forces to vital thoracic organs such as the lungs and heart, which can cause organ deflection and distention and lead to traumatic asphyxia, or respiratory and circulatory system impairment or failure. In addition, a relatively small blood volume loss in a child, due to internal organ injuries and bleeding, can lead to decreased blood circulation and shock.

The severity of the injury or likelihood of death can be reduced if a child is quickly rescued. However, children's ability to self-rescue is limited because of their limited cognitive awareness of hazards, limited skills to react quickly, and limited strength to remove the fallen CSU. Moreover, many injuries can result in immediate death or loss of consciousness, making self-rescue impossible.

*C. Hazard Characteristics*³²

To identify hazard patterns associated with CSU tip overs, CPSC focused on incidents involving children and CSUs without televisions because the majority of fatal and nonfatal incidents involve children and, in recent years, there has been a statistically significant decrease in the overall number of ED-treated CSU

tip-over incidents that appears to be driven by a decline in incidents involving CSUs with televisions, while the rate of ED-treated incidents involving CSUs without televisions has remained stable. Staff used NEISS and CPSRMS reports to identify hazard patterns, including In-Depth-Investigation (IDI) reports, and also considered child development and capabilities, as well as online videos of real-life child interactions with CSUs and similar furniture items (including videos of tip-over incidents).

1. Filled Drawers

Of the 89 fatal CPSRMS incidents involving children and only CSUs, 53 (59 percent) provided information about whether the CSU drawers contained items at the time of the tip over. Of those 53 incidents, 51 (96 percent) involved partially filled or full drawers. Of the 263 nonfatal CPSRMS tip overs involving children and only CSUs, drawer fill level was reported for 67 incidents (25 percent). Of these 67 incidents, 60 (90 percent) involved partially filled or full drawers.³³ CPSRMS incidents show that most items in the drawers were clothing, although a few mentioned other items along with clothing (e.g., diaper bag, toys, papers).

2. Interactions

Of the 89 fatal CPSRMS tip overs involving children and only a CSU, 47 reported the type of interaction the child had with the CSU at the time of the incident. Of these 47 incidents, 35 (74 percent) involved a child climbing on the CSU; 8 (17 percent) involved a child sitting, laying, or standing in a drawer; and 4 (9 percent) involved a child opening drawers. Climbing was the most common reported interaction for children 3 years old and younger.

Of the 263 nonfatal CPSRMS tip-over incidents involving children and only CSUs, the type of interaction was reported in 160 incidents. Of these, 101 (63 percent) involved opening drawers; 32 (20 percent) involved climbing on the CSU; 10 (6 percent) involved putting items in/taking them out of a drawer; 9 (6 percent) involved pulling on the CSU; 5 (3 percent) involved leaning or pushing down on an open drawer; 2 (1 percent) involved another interaction; and 1 (less than 1 percent) involved a child in the drawer. Opening drawers was the most common reported interaction for children 6 years old and younger, and was particularly common for 2- and 3-year-olds.

³² For additional information about hazard patterns, see Tab C of the NPR briefing package.

³³ Nonfatal NEISS incident reports did not contain information on drawer fill level or contents.

Of the 1,463 nonfatal NEISS incidents involving children and only CSUs, the type of interaction was reported in 559 incidents. Of these, the child was injured because of another person's interaction with the CSU in 22 incidents; the remaining 537 incidents involved the child interacting with the CSU. Of these 537 incidents, 412 (77 percent) involved climbing on the CSU; 42 (8 percent) involved opening drawers; and the remaining 83 incidents (15 percent) involved a child in the drawer, pulling on the CSU, putting items in or taking items out of a drawer, reaching, hitting, jumping, a child on top of the CSU, playing in a drawer, pulling up, swinging, or other interaction. For children 3 years old or younger, climbing constituted almost 80 percent of reported interactions. Overall, 81 percent (438 of 537) of the reported interactions in the nonfatal NEISS tip-over incidents involving children and only CSUs are those in which the child's weight was supported by the CSU (e.g., climbing, in drawer, jump, on top, swinging), and 12 percent (64 of 537) were interactions in which the child's strength determines the force (e.g., hit, opening drawers, pulled on, pulled up).

Thus, in fatal incidents, a child climbing on the CSU was, by far, the most common reported interaction; and in nonfatal incidents, opening drawers and climbing were the most common reported interactions. These interactions are examined further, below.

To learn more about children's interactions with CSUs during tip-over incidents, CPSC staff also reviewed videos, available from news sources, articles, and online, that involved children interacting with CSUs and similar products, and CSU tip overs. Videos of children climbing on CSUs and similar items show a variety of climbing techniques, including stepping on the top of the drawer face, stepping on drawer knobs, using the area between drawers as a foothold, gripping the top of an upper drawer with their hands, pushing up using the top of a drawer, and using items to help climb. Videos of children in drawers of CSUs and other similar products include children leaning forward and backward out of a drawer; sitting, lying, and standing in a drawer; and bouncing in a drawer. Some videos also show multiple children climbing a CSU or in a drawer simultaneously.

a. Climbing

As discussed above, climbing on the CSU was one of the primary interactions involved in CSU tip overs involving children and only a CSU. It was the

most common reported interaction (74 percent) in fatal CPSRMS incidents; it was the most common reported interaction (77 percent) in nonfatal NEISS incidents; and it was the second most common reported interaction (20 percent) in nonfatal CPSRMS incidents.

Children as young as 9 months, and up to 13 years old were involved in climbing incidents. Fatal climbing incidents most often involved 1-, 2-, and 3-year-old children, and nonfatal climbing incidents most often involved 2- and 3-year-old children. Of climbing incidents with a reported age, the children were 3 years old or younger in 94 percent (33 of 35) of the fatal CPSRMS incidents; 73 percent (301 of 412) of the nonfatal NEISS incidents; and 63 percent (17 of 27) of the nonfatal CPSRMS incidents.

The prevalence of children climbing during CSU tip overs is consistent with the expected motor development of children. Between approximately 1 and 2 years old, children can climb on and off of furniture without assistance, use climbers, and begin to use playground apparatuses independently; and 2-year-olds commonly climb. The University of Michigan Transportation Research Institute (UMTRI) focus groups on child climbing (the UMTRI study is described in section VII.B. Forces and Moments During Child Interactions with CSUs of this preamble) demonstrated these abilities, with child participants showing interest in climbing CSUs and other furniture.

b. Opening Drawers

As discussed above, opening the drawers of a CSU was a common interaction in CSU tip overs involving children and only a CSU. It was the most common reported interaction (63 percent) in nonfatal CPSRMS incidents; it was the second most common reported interaction (8 percent) in nonfatal NEISS incidents; and it was the third most common reported interaction (9 percent) in fatal CPSRMS incidents.

Children as young as 11 months, and up to 14 years old were involved in incidents where the child was opening one or more drawers of the CSU. In nonfatal CPSRMS incidents, opening drawer incidents most commonly involved 2-year-olds; in nonfatal NEISS incidents, opening drawer incidents most commonly involved 3-year-olds, followed by 2-year-olds, followed by 4-year-olds, followed by children under 2 years old; and in nonfatal CPSRMS incidents, opening drawer incidents most commonly involved 3-year-olds, followed by 2-year-olds. Children of all ages were able to open at least one drawer.

Looking at both fatal and nonfatal CPSRMS tip overs involving children and only CSUs, where the interaction involved opening drawers, overall, about 53 percent involved children opening one drawer, 10 percent involved opening two drawers, and almost 17 percent involved opening "multiple" drawers. In several incidents (23 CPSRMS incidents), children opened "all" of the drawers; it is possible that additional incidents, mentioning a specific number of open drawers (between 2 and 8), also involved all the drawers being opened. In incidents where all of the drawers were open, the CSUs ranged from 2-drawer to 8-drawer units. The youngest child reported to have opened all drawers was 13 months old.

Consistent with these incident data, the UMTRI child climbing study found that caregivers commonly reported that their children opened and closed drawers when interacting with furniture.

It is possible for CSUs to tip over from the forces generated by open drawers and their contents, alone, without additional interaction forces. However, pulling on a drawer to open it can apply increased force that contributes to instability. Once a drawer is fully opened, any additional pulling is on the CSU as a whole. The pull force, and the height of the drawer pull location, relative to the floor, are relevant considerations. To examine this factor, staff assessed 15 child incidents in which the height of the force application could be calculated based on descriptions of the incidents. Force application heights ranged from less than one foot to almost four feet (46.5 inches), and children pulled on the lowest, highest, and drawers in between.

c. Opening Drawers and Climbing Simultaneously

CPSC staff also examined incidents in which both climbing and open drawers occurred simultaneously. Of the 35 fatal CPSRMS climbing incidents, 13 reported the number of drawers open; in all of these incidents, the reported number of drawers open was one, although, based on further analysis, the number of open drawers could be as high as 8 in one incident.³⁴ Of the 32 nonfatal CPSRMS climbing incidents, 15 gave some indication of the number of open drawers. Of these, 7 reported that one drawer was open, 2 reported

³⁴ CPSC staff analysis suggests that 7 or more drawers of an 8-drawer unit were open and the child was in a drawer leaning out over the edge in a fatal incident. This analysis is described in Tab M of the NPR briefing package, as Model E.

that half or less of the drawers were open, 4 reported that multiple drawers were open, and 2 reported that all the drawers were open. In the 2 cases where all drawers were open, the children were 3 and 4 years old. Of the 412 climbing incidents in the nonfatal NEISS data, 28 gave some indication of the number of open drawers. Of these, 11 reported that one drawer was open, 12 reported that multiple drawers were open, 1 reported that two drawers were open, and 2 reported that all drawers were open. These data are consistent with the videos staff reviewed, which show a range of drawer positions when children climbed on units, including all drawers closed, one drawer open, multiple drawers open, and all drawers fully open.

There is limited information in the incident data about children's interaction with doors on CSUs, as opposed to interactions with drawers. Staff found two fatal CPSRMS and four nonfatal CPSRMS tip-over incidents involving wardrobes and armoires, which include doors. In one of the fatal incidents, the victim was found inside a wardrobe that had two doors and one drawer, suggesting that the child opened the doors of the wardrobe. In the other fatal incident, the victim was found under a two-door wardrobe. In most of the nonfatal incidents involving wardrobes or armoires, children were reportedly interacting with items inside the unit, which would require them to open the doors. The ages of the children in these incidents ranged from 3 to 11 years, although opening doors is easily within the physical and cognitive abilities of younger children.

These incidents indicate that children can and do open CSU doors. There is no direct evidence in the incident data that, once CSU doors are open, children put their body weight on the open doors (*i.e.*, open and climbing). However, this is a plausible interaction based on child capabilities, provided that the child has a sufficient hand hold.

d. Differences in Interactions by Age

Based on the incident data, children 3 years old and younger climb, open drawers without climbing, get items in and out of drawers, lean on open drawers, push down on open drawers, sit or lie in bottom drawers, or stand on open bottom drawers. Among fatal CPSRMS tip-over incidents involving children and only CSUs, climbing was the most common interaction for children 3 years old and younger; this drops off sharply for 4-year-olds. Starting at 4 years old, children do not appear to sit or lie in bottom drawers of a CSU. Among nonfatal CPSRMS tip-

over incidents involving children and only CSUs, opening drawers was, by far, the most common interaction for children 7 years old and younger; and climbing was also common among 3-year-olds and, to a lesser extent, among 2- and 4-year-olds. Among nonfatal NEISS tip overs involving children and only CSUs, climbing was common for 2- and 3-year-olds, slightly less common for 4-year-olds and children under 2 years, and dropped off further for children 5 years and older.

3. Flooring

Of the 89 fatal CPSRMS tip overs involving children and only CSUs, the type of flooring under the CSU was reported for 55 incidents. Of these, 45 (82 percent) involved carpeting, which includes rugs; 8 (15 percent) involved wood, hardwood, or laminate wood flooring; and 2 (4 percent) involved tile or linoleum flooring. The reports for 30 of the fatal CPSRMS tip-over incidents involving carpet included photos with visible carpet. All carpet in these pictures appeared to be typical wall-to-wall carpeting. Four appeared to be a looped pile carpet, and 26 appeared to be cut pile. Staff also identified two incidents with reported "shag" carpeting, including one fatal incident. Staff found one report mentioning a rug, although the thickness of the rug is unknown.

Of the 263 nonfatal CPSRMS tip overs involving children and only CSUs, the type of flooring under the CSU was reported for 60 incidents. Of these, 48 (80 percent) involved carpeting, which includes rugs; 10 (17 percent) involved wood, hardwood, or laminate wood flooring; 1 (2 percent) involved tile or linoleum flooring; and 1 (2 percent) indicated that the front legs of the CSU were on carpet while the back legs were on wood flooring.³⁵

Thus, for incidents where flooring type was reported, carpet was, by far, the most prevalent flooring type.

4. Characteristics of Children in Tip-Over Incidents

a. Age of Children

Children in fatal CPSRMS tip-over incidents involving only CSUs were 11 months through 7 years old. A total of 33 fatal incidents involved children under 2 years old; 30 involved 2-year-old children; 21 involved 3-year-olds; 2 involved 4-year-olds; and 1 incident each involved 5-, 6-, and 7-year-old children. Among the nonfatal CPSRMS tip-over incidents involving children and only CSUs where age was reported,

³⁵ Flooring type was not reported in nonfatal NEISS incident reports.

3-year-olds were involved in the highest number of incidents (59 incidents), followed by 2-year-olds (47 incidents).

Nonfatal NEISS tip-over incidents involving children and only CSUs follow a similar distribution, with the highest number of reported incidents involving 2-year-olds, followed by 3-year-olds, and children less than 2 years. Further details regarding the age of children involved in CSU tip overs is available in the discussion of incident data, above.

b. Weight of Children

Among the 89 fatal CPSRMS tip-over incidents involving children and CSUs without televisions, the child's weight was reported in 49 incidents and ranged from 18 pounds to 45 pounds. Where weight was not reported, staff used the most recent Centers for Disease Control and Prevention (CDC) Anthropometric Reference to estimate the weight of the children.³⁶ Staff used the 50th percentile values of weight that correspond to the victims' ages to estimate the weight range of the children. For the remaining 40 fatal CPSRMS incidents without a reported weight, the estimated weight range was 19.6 pounds to 45.1 pounds.

Among the 263 nonfatal CPSRMS incidents involving children and only CSUs, the weights of 47 children were reported, ranging from 26 pounds to 80 pounds. Where it was not reported, staff again estimated the weight of the children using the 50th percentile values of weight that correspond to the victims' ages from the most recent CDC Anthropometric Reference. The estimated child weights for the 164 nonfatal CPSRMS incidents without a reported child weight, but with a reported age (which included a 17-year-old), ranged from 19.6 pounds to 158.9 pounds.

Although nonfatal NEISS incident data did not include the children's weights, staff again estimated the children's weights by age, determining that for tip overs involving only CSUs, the estimated weights of the children ranged from 15.8 pounds to 158.9 pounds (this covered children from 3

³⁶ Fryar, C.D., Carroll, M.D., Gu, Q., Afful, J., Ogden, C.L. (2021). Anthropometric reference data for children and adults: United States, 2015–2018. National Center for Health Statistics. *Vital Health Stat 3(46)*. The CDC Anthropometric Reference is based on a nationally representative sample of the U.S. population, and the 2021 version is based on data collected from 2015 through 2018. CPSC staff uses the CDC Anthropometric Reference, rather than the CDC Growth Chart, because it is more recently collected data and because the data are aggregated by year of age, allowing for estimates by year. CDC growth charts are available at: https://www.cdc.gov/growthcharts/clinical_charts.htm.

months to 17 years old). The weighted average of children's estimated weight in nonfatal NEISS incidents was 40.26 pounds.³⁷

Overall, the weighted average of children's reported weight for CPSRMS incidents is 34.23 pounds; whereas, the weighted average of children's estimated weight was 38.8 pounds.

The weight of a child is particularly relevant for climbing incidents because weight is a factor in determining the force a child generates when climbing. For this reason, CPSC staff looked at the weights of children involved in climbing incidents, specifically. Of the 35 fatal CPSRMS child climbing incidents, the weight of the child was reported for 23 incidents, and ranged from 21.5 to 45 pounds. For the remaining 12 climbing incidents in which the child's weight was not reported, CPSC staff estimated their weights, based on age, and the weights ranged from 23.8 to 39 pounds. Of the 32 nonfatal CPSRMS child climbing incidents, the weight of the child was reported in 8 incidents, and ranged from 26 to 80 pounds. For the remaining 24 incidents, staff estimated the weights based on age, and the weights ranged from 25.2 to 45.1 pounds. Weight was not reported in the nonfatal NEISS data, however, using the ages of the children in the 412 nonfatal NEISS child climbing incidents (9 months to 13 years old), staff estimates that their weights ranged from 19.6 to 122 pounds, and the weighted average was 34.2 pounds.

5. Televisions

Of the 104 child fatalities involving a CSU and television tipping over, 85 (90 percent) involved a box or cathode ray tube (CRT) television, 2 involved a flat-panel television, and 16 did not provide information about the television. Of the incidents that provided information about television size, the most common television size was 27 inches. The approximate weight range of the CRT televisions, when provided, was between 70 pounds and 150 pounds.

Although televisions are involved in CSU tip overs, and the Commission raised the possibility of addressing televisions in the ANPR, the proposed rule does not focus on television involvement. This is primarily because, in recent years, there has been a decline in the overall number of CSU tip-over incidents that appears to be driven by a decrease in tip overs involving

televisions, while the rate of ED-treated incidents involving CSUs without televisions has remained stable.

V. Relevant Existing Standards³⁸

In the United States, the primary voluntary standard that addresses CSU stability is ASTM F2057–19, *Standard Consumer Safety Specification for Clothing Storage Units*. In addition, CPSC staff identified three international consumer safety standards and one domestic standard that are relevant to CSUs:

- AS/NZS 4935: 2009, the Australian/New Zealand Standard for *Domestic furniture—Freestanding chests of drawers, wardrobes and bookshelves/bookcases—determination of stability*;
- ISO 7171 (2019), the International Organization for Standardization *International Standard for Furniture—Storage Units—Determination of stability*;
- EN14749 (2016), the European Standard, *European Standard for Domestic and kitchen storage units and worktops—Safety requirements and test methods*; and
- ANSI/SOHO S6.5–2008 (R2013), *Small Office/Home Office Furniture—Tests American National Standard for Office Furnishings*.

This section describes these standards and provides CPSC staff's assessment of their adequacy to address CSU tip-over injuries and deaths.

A. ASTM F2057–19

ASTM first approved and published ASTM F2057 in 2000, and has since revised the standard seven times. The current version, ASTM F2057–19, was approved on August 1, 2019, and published in August 2019. ASTM Subcommittee F15.42, Furniture Safety, is responsible for this standard. Since the first publication of ASTM F2057, CPSC staff has participated in the F15.42 subcommittee and task group meetings and worked with ASTM to improve the standards; however, ASTM has not addressed several issues CPSC has identified.

1. Scope

ASTM F2057–19 is intended to reduce child injuries and deaths from hazards associated with CSUs tipping over and aims “to cover children up to and including age five.” The standard covers CSUs that are 27 inches or more in height, freestanding, and defines CSUs as: “furniture item[s] with drawers and/or hinged doors intended

for the storage of clothing typical with bedroom furniture.” Examples of CSUs provided in the standard include: Chests, chests of drawers, drawer chests, armoires, chifforobes, bureaus, door chests, and dressers. The standard does not cover “shelving units, such as bookcases or entertainment furniture, office furniture, dining room furniture, underbed drawer storage units, occasional/accent furniture not intended for bedroom use, laundry storage/sorting units, nightstands, or built-in units intended to be permanently attached to the building, nor does it cover ‘Clothing Storage Chests’ as defined in Consumer Safety Specification F2598.”

2. Stability Requirements

ASTM F2057–19 includes two performance requirements for stability. The first is in section 7.1 of the standard, *Stability of Unloaded Unit*. This test consists of placing an empty CSU on a hard, level, flat surface, opening all doors (if any) to 90 degrees, and extending all drawers and pull-out shelves to the outstop (which is a feature that limits outward motion of drawers or pull-out shelves). In the absence of an outstop, all drawers and pull-out shelves are opened to two-thirds of the operational sliding length (which is the length from the inside face of the drawer back to the inside face of the drawer). All flaps and drop fronts are opened to their horizontal position or as near to horizontal as possible. If the CSU tips over in this configuration, or is supported by any component that was not specifically designed for that purpose, it does not meet the requirement.

The second stability requirement is in section 7.2 of the standard, *Stability with Load*. This test consists of placing an empty CSU on a hard, level, flat surface, and gradually applying a 50±2-pound test weight. The 50-pound test weight is intended to represent the weight of a 5-year-old child. For units with drawers, the test requires opening one drawer to the outstop, or in the absence of an outstop, to two-thirds of its operational sliding length, and gradually applying the test weight to the front face of the drawer. For units with doors, the test requires opening one door to 90 degrees and gradually applying the test weight. All other drawers and doors remain closed, unless they must be opened to access other components behind them (e.g., a drawer behind a door). Each drawer and door is tested individually. If the CSU tips over in this configuration, or is supported by any component that was not specifically designed for that

³⁷ Weighted average is equal to the sum of the product of the number of reported incidents for that age times the estimated weight for that age divided by the total number of reported incidents.

³⁸ For additional information about relevant existing standards, see Tab C, Tab D, Tab F, and Tab N of the NPR briefing package.

purpose, it does not meet this requirement.

3. Tip Restraint Requirements

ASTM F2057–19 requires CSUs to include a tip restraint that complies with ASTM F3096–14, *Standard Performance Specification for Tipover Restraint(s) Used with Clothing Storage Unit(s)*.³⁹ ASTM F2057–19 and F3096–14 define a tip restraint as a “supplemental device that aids in the prevention of tip over.” ASTM F3096–14 provides a test protocol to assess the strength of tip restraints, but does not evaluate the attachment to the wall or CSU. The test method specifies that the tester attach the tip restraint to a fixed structure and apply a 50-pound static load.

4. Labeling Requirements

ASTM F2057–19 requires CSUs to be permanently marked in a conspicuous location with warnings that meet specified content and formatting. The warning statements address the risk of children dying from furniture tip overs; not allowing children to stand, climb, or hang on CSUs; not opening more than one drawer at a time; placing the heaviest items in the bottom drawer; and installing tip restraints. For CSUs that are not intended to hold a television, this is also addressed in the warning. Additionally, units with interlock systems must include a warning not to defeat or remove the interlock system. An interlock system is a device that prevents simultaneous opening of more drawers than intended by the manufacturer (like is common on file cabinets). The standard requires that labels be formatted in accordance with ANSI Z535.4, *American National Standard for Product Safety Signs and Labels*.

The standard also includes a performance requirement and test method for label permanence, which are consistent with requirements in other ASTM juvenile furniture product standards. The warning must be “in a conspicuous location when in use” and the back of the unit is not considered conspicuous; the standard does not define “conspicuous location when in use.”

5. Assessment of Adequacy

CPSC does not consider the stability requirements in ASTM F2057–19 adequate to address the CSU tip-over hazard because they do not account for multiple open and filled drawers, carpeted flooring, and dynamic forces

generated by children’s interactions with the CSU, such as climbing or pulling on the top drawer. As discussed earlier in this preamble, these factors are commonly involved in CSU tip-over incidents; and, as discussed later in this preamble, testing indicates that these factors decrease the stability of CSUs.

Although ASTM F2057–19 includes a test with all drawers/doors open, the unit is empty and no additional force is applied during this test. Consumers are likely to fill drawers with clothing, since that is the intended purpose of the product, and a CSU with filled drawers is likely to be less stable than an empty unit when more than half of the drawers are open. In addition, although ASTM F2057–19 includes a static weight applied to the top of one open drawer or door (intended to represent a 5-year-old child), this 50-pound weight does not include the additional moment⁴⁰ due to the center of gravity of a child climbing, dynamic forces, and horizontal forces when a child climbs, even when only considering the forces generated by very young children. As the UMTRI study described in this preamble found, the forces children can exert while climbing a CSU exceed their static weights. Finally, the testing does not account for the effect of carpeting, which is common flooring in homes (particularly in bedrooms), is commonly present in tip-over incidents, and decreases CSU stability. Thus, by testing CSUs with open drawers empty, a 50-pound static weight, and on a hard, level, flat surface, ASTM F2057–19 does not reflect real-world use conditions that decrease the stability of CSUs.

Staff also looked at whether CSUs involved in tip-over incidents complied with ASTM F2057–19 because it would give an indication of whether F2057 is effective at preventing tip overs and, by extension, whether it is adequate. Of the 89 fatal CPSRMS tip-over incidents involving children and only CSUs, CPSC staff determined that 1 of the CSUs complied with the ASTM F2057–19 stability requirements, 1 CSU met the stability requirements when a test weight at the lower permissible weight range was used, and 11 units did not meet the stability requirements. For the remaining 76 units, staff was unable to determine whether they met the ASTM F2057–19 stability requirements, although staff did determine that an exemplar of one of these CSUs complied with the requirements. Of 263 nonfatal CPSRMS incidents involving children and CSUs without televisions for which

staff assessed the compliance of the CSU, staff determined that 20 met the ASTM F2057–19 stability requirements, and 95 did not. For the remaining 148 units, staff was unable to determine whether the units met the ASTM F2057–19 stability requirements.⁴¹

Based on a limited review of the tip restraint requirements in ASTM F2057–19 and ASTM F3096–14, CPSC is concerned that these requirements may not be adequate either. ASTM F3096–14 does not address the whole tip-restraint system, which includes the connection to the CSU and the connection to the wall. The standard assumes an ideal connection to both the furniture and the wall, but incidents suggest that both of these are potential points of failure. In addition, ASTM F3096–14 uses a 50-pound static force. Based on the UMTRI study, this force may not represent the force on a tip restraint from child interactions, especially for interactions that can generate large amounts of force, including from older children. For example, the UMTRI study found that when a child bounced, leaned, or yanked on a CSU, the forces generated were equivalent to 2.7, 2.7, and 3.9 times the child’s body weight, respectively, at a distance of 1 foot from the fulcrum. However, staff did not evaluate the tip restraint requirements in ASTM F2057–19 and ASTM F3096–14 because, as discussed in this preamble, several research studies show that a large number of consumers do not anchor furniture, including CSUs, and there are several barriers to the use of tip restraints. As such, even if tip restraint requirements were effective, CSUs should be inherently stable to account for the lack of consumer use of tip restraints and additional barriers to proper installation and use of tip restraints.

CPSC also has some concerns with the effectiveness of the content in the warning labels required in ASTM F2057–19. For example, the meaning of “tipover restraint” may not be clear to consumers, and directing consumers not to open more than one drawer at a time is not consistent with consumer use. In addition, focus group testing discussed in this preamble indicated that consumers had trouble understanding the child climbing symbol required by the standard. CPSC staff also believes that greater clarity about the required placement of the label would make the warning more effective.

⁴¹ Staff did not assess whether NEISS incidents involved ASTM-compliant CSUs because the reports do not contain specific information about the products.

³⁹ Approved October 1, 2014 and published October 2014.

⁴⁰ Moment, or torque, is an engineering term to describe rotational force acting about a pivot point, or fulcrum.

6. Compliance With ASTM F2057

CPSC staff assessed compliance with the stability requirements in ASTM F2057–19. In 2016,⁴² staff tested 61 CSU samples and found that 50 percent (31 of 61) did not comply with the stability requirements in ASTM F2057.⁴³ In 2018, CPSC staff assessed a total of 188 CSUs, including 167 CSUs selected from among the best sellers from major retailers, using a random number generator; 4 CSU models that were involved in incidents;⁴⁴ and 17 units assessed as part of previous test data provided to CPSC.⁴⁵ Of the 188 CSUs, 171 (91 percent) complied with the stability requirements in ASTM F2057. One CSU (0.5 percent) did not comply with the Stability of Unloaded Unit test, and 17 (9 percent) did not meet the Stability with Load test. The unit that did not meet the requirements of the Stability of Unloaded Unit test also did not meet the requirements of the Stability with Load test.

In addition, as part of staff's incident recreation and modeling (discussed in section VII.D. Incident Recreation and Modeling of this preamble), staff determined that two of the seven tested CSU models that had been involved in tip-over incidents complied with the stability requirements in ASTM F2057, and one additional CSU was borderline on whether it complied with the standard. This suggests that the stability requirements in ASTM F2057–19 do not adequately reduce the risk of tip overs.

B. AS/NZS 4935: 2009

AS/NZS 4935 is a voluntary standard prepared by Standards Australia's and Standards New Zealand's Joint Technical Committee CS–088/CS–091, Commercial/Domestic Furniture. There is only one version of the standard, the current version AS/NZA 4935:2009, which was approved on behalf of the Council of Standards Australia on August 28, 2009, and on behalf of the Council of Standards New Zealand on

⁴² Although this testing involved ASTM F2057–14, the stability requirements were the same as in ASTM F2057–19. The test results are available at: https://www.cpsc.gov/s3fs-public/2016-Tipover-Briefing-Package-Test-Results-Update-August-16-2017.pdf?yMCHvzY_YtOZmBAAj0Gjih1lXE7vuu9K.

⁴³ This testing also found that 91 percent of CSUs (56 of 61) did not comply with the labeling requirements in ASTM F2057–14, and 43 percent (26 of 61) did not comply with the tip restraint requirements.

⁴⁴ Staff tested exemplar units, meaning the model of CSU involved in the incident, but not the actual unit involved in the incident.

⁴⁵ The CSUs were identified from the Consumer Reports study "Furniture Tip-Overs: A Hidden Hazard in Your Home" (Mar. 22, 2018), available at: <https://www.consumerreports.org/furniture/furniture-tip-overs-hidden-hazard-in-your-home/>.

October 23, 2009. It was published on November 17, 2009.

1. Scope

AS/NZS 4935 aims to address furniture tip-over hazards to children. It describes test methods for determining the stability of domestic freestanding chests of drawers over 500 mm (19.7 inch) high, freestanding wardrobes over 500 mm high (19.7 inch), and freestanding bookshelves/bookcases over 600 mm (23.6 inch) high. It defines "chest of drawers" as containing one or more drawers or other extendible elements and intended for the storage of clothing, and may have one or more doors or shelves. It defines "wardrobe" as a furniture item primarily intended for hanging clothing that may also have one or more drawers, doors or other extendible elements, or fixed shelves. It defines bookshelves and bookcases as sets of shelves primarily intended for storing books, and may contain doors, drawers or other extendible elements.

2. Stability Requirements

Similar to ASTM F2057–19, AS/NZS 4935 includes two stability requirements. The first requires the unit, when empty, to not tip over when a 29-kilogram (64-pound) test weight is applied to a single open drawer. The 64-pound test weight is based on the 95th percentile body mass of a 5-year-and-11-month-old child (which is 27 kilograms or 59.5 pounds), adjusted to reflect trends of increasing body mass. The test weight is applied to the top face of a drawer, with the drawer opened to two-thirds of its full extension length. The second test requires the unit not tip over when all of the extension elements are open and the unit is empty. Each drawer or extendible element is open to two-thirds of its extension length, and doors are open perpendicular to the furniture. Units do not pass the stability requirements if they cannot support the test weight, if they tip over, or if they are only prevented from tipping by an extendible element.

3. Tip Restraint Requirements

The standard does not require, but recommends, that tip restraints be included with units, along with attachment instructions.

4. Labeling Requirements

The standard requires a warning label, and provides example text that addresses the tip-over hazard. The standard also requires a warning tag with specific text and formatting. The label and tag include statements informing consumers about the hazard, warning of tip overs and resulting

injuries, and indicating how to avoid the hazard. These requirements do not address the use of televisions. The standard includes label permanency requirements and mandates that the warning label be placed "inside of a top drawer within clear view when the drawer is empty and partially opened, or on the inside face of a drawer" for chests of drawers and wardrobes.

5. Assessment of Adequacy

CPSC does not consider the stability requirements in AS/NZS 4935 adequate to address the CSU tip-over hazard because they do not account for multiple open and filled drawers, carpeted flooring, and dynamic forces generated by children's interactions with the CSU, such as climbing or pulling on the top drawer. As discussed in this preamble, these factors are commonly involved in CSU tip-over incidents and testing indicates that they decrease the stability of CSUs.

AS/NZS 4935 requires drawer extension to only two-thirds of extension length for both stability tests. This partial extension does not represent real-world use because children are able to open drawers fully, incidents involve fully open drawers, and opening a drawer further decreases the stability of a CSU. In addition, it does not account for filled drawers, which are expected during real-world use, are common in tip-over incidents, and contribute to instability when multiple drawers are open. It also does not account for carpeted floors, which are common in incidents and contribute to instability. Although AS/NZS 4935 uses a heavier test weight than ASTM F2057–19, it is inadequate because neither stability test accounts for the moments children can exert on CSUs during interactions, such as climbing. Considering additional moments, the 64 pounds of weight on the drawer face is equivalent to a 40-pound child climbing the extended drawer. A 40-pound weight corresponds to a 75th percentile 3-year-old child, 50th percentile 4-year-old child, and 25th percentile 5-year-old child.⁴⁶

C. ISO 7171 (2019)

The International Organization for Standardization (ISO) developed the voluntary standard ISO 7171 through the Technical Committee ISO/TC 136, *Furniture* and published the first version in May 1988. The current 2019

⁴⁶ Fryar, C.D., Carroll, M.D., Gu, Q., Afful, J., Ogden, C.L. (2021). Anthropometric reference data for children and adults: United States, 2015–2018. National Center for Health Statistics. Vital Health Stat 3(46).

version was published in February 2019.

1. Scope

ISO 7171 (2019) describes methods for determining the stability of freestanding storage furniture, including bookcases, wardrobes, and cabinets, but the standard does not define these terms.

2. Stability Requirements

ISO 7171 (2019) includes three stability tests, all of which occur on a level test surface. The first uses a weight/load on an open drawer. The second involves all drawers being filled and a load/weight placed on a single open drawer. In the loaded test, one drawer is opened to the outstop, and if no outstops exist, the drawer is opened to two-thirds of its full extension length. The test weight is applied to the top face of the opened drawer, and varies depending on the height of the unit (either 200 N (44 pounds) or 250 N (55 pounds)). The fill weight is also variable, depending on the clearance height and volume of the drawer (fill density ranges from 6.25 lb/ft³ to 12.5 lb/ft³). The third test is an unloaded test with all drawers open. For this test, drawers and extendible elements are open to the outstop and doors are open 90 degrees. If there are no outstops, then the extension elements are open to two-thirds of their extension length. Existing interlock systems are not bypassed for this test.

ISO 7171 (2019) does not include criteria for determining whether a unit passed or failed the loaded stability test. However, it includes a table of “suggested” forces, depending on the height of the unit.

An additional unfilled, closed drawer test is required for units greater than 1000 mm in height, where a vertical force of 350 N (77 pounds) along with a simultaneous 50 N (11 pounds) outward horizontal force is applied to the top surface of the unit.

3. Tip Restraint Requirements

ISO 7171 (2019) does not require tip restraints to be provided with units, but does specify a test method for them. The tip restraints are installed in both the wall and unit during the test and a 300 N (67.4 lbf) horizontal force is applied in the direction most likely to overturn the unit. The force is maintained between 10 and 15 seconds.

4. Labeling Requirements

The standard does not have any requirements or test methods related to warning labels.

5. Assessment of Adequacy

CPSC does not consider the stability requirements in ISO 7171 (2019) adequate to address the CSU tip-over hazard because they do not account for carpeted flooring, or dynamic and horizontal forces generated by children’s interactions with the CSU, such as climbing or pulling on the top drawer. In addition, although ISO 7171 (2019) includes a stability test with filled drawers, the multiple open drawer test does not include filled drawers, and the simultaneous conditions of multiple open and filled drawers during a child interaction are not tested. As discussed in this preamble, these factors are commonly involved in CSU tip-over incidents and testing indicates that they decrease the stability of CSUs. Finally, test weights are provided only as recommendations and there are no criteria for determining whether a unit passes.

D. EN 14749: 2016

EN 14749: 2016 is a European Standard that was prepared by Technical Committee CEN/TC 207 “Furniture.” This standard was approved by the European Committee for Standardization (CEN) on November 21, 2015, and supersedes EN 14749:2005, which was approved on July 8, 2005, as the original version. EN 14749:2016 is a mandatory standard and applies to all CEN members.

1. Scope

EN 14749: 2016 describes methods for determining the stability of domestic and non-domestic furniture with a height \geq 600 mm (23.6 in) and a potential energy, based on mass and height, exceeding 60 N-m (44.25 ft-lbs). Kitchen worktops and television furniture are the only furniture types defined. The test methods in this standard are taken from EN 16122: 2012, *Domestic and non-domestic storage furniture-test methods for the determination of strength, durability and stability*, which covers “all types of domestic and non-domestic storage furniture including domestic kitchen furniture.”

2. Stability Requirements

EN 14749: 2016 includes three stability tests, which are conducted with the units freestanding. In the first loaded test, a 75 N (16.9 lbf) test weight is applied to the top of the drawer face, when pulled to the outstop. However, if no outstops exist, the extension element is open to two-thirds of its full extension length. In the second test, all drawers and extendible elements are open to the outstop and doors are open

90 degrees. If no outstops are present, then the extension elements are open to two-thirds of their extension lengths. Existing interlock systems are not bypassed for this test. The third test involves filled drawers and a load; all storage areas are filled with weight and the loaded test procedure (above) is carried out but with a test weight that is 20 percent of the mass of the unit, including the drawer fill, not exceeding 300 N (67.4 pounds). Similar to ISO 7171, an additional unfilled, closed drawer test is required for units greater than 1000 mm in height, where a vertical force of 350 N (77 pounds) along with a simultaneous 50 N (11 pounds) outward horizontal force are applied to the top surface of the unit.

Relevant to the portions of stability testing that involve opening drawers, the standard also accounts for interlock systems, requiring one extension element to be open to its outstop, or in the absence of an outstop, two-thirds of its operational sliding length, and a 100 N (22 lbf) horizontal force to be applied to the face of all other extension elements. This is repeated 10 times on each extension element and all combinations of extension elements are tested.

3. Tip Restraint Requirements

EN 14749: 2016 does not include any requirements regarding tip restraints.

4. Labeling Requirements

EN 14749: 2016 does not include any requirements regarding warning labels.

5. Assessment of Adequacy

CPSC does not consider the stability requirements in EN 14749: 2016 adequate to address the CSU tip-over hazard because they do not account for carpeted flooring, or dynamic and horizontal forces generated by children’s interactions with the CSU, such as climbing or pulling on the top drawer. In addition, although the standard includes a stability test with filled drawers, the multiple open drawer test does not include filled drawers, and the simultaneous conditions of multiple open and filled drawers during a child interaction are not tested. Moreover, the fill weight ranges from 6.25 lb/ft³ to 12.5 lb/ft³, which includes fill weights lower than staff identified for drawers filled with clothing (discussed in section VII.A. Multiple Open and Filled Drawers of this preamble). As discussed in this preamble, these factors are commonly involved in CSU tip-over incidents and testing indicates that they effect the stability of CSUs.

E. ANSI/BIFMA SOHO S6.5–2008 (R2013)

ANSI/SOHO S6.5 does not address CSUs, but rather, applies to office furniture, such as file cabinets. However, CPSC considered this standard because it addresses interlock systems, which some CSUs include and are relevant to stability testing. This standard was completed by BIFMA Engineering Committee and its subcommittee on Small Office/Home Office Products in 2000. The first version was approved by ANSI on August 4, 2008. The current version of the standard was approved on September 17, 2013.

This standard specifies tests for “evaluating the safety, durability, and structural adequacy of storage and desk-type furniture intended for use in the small office and/or home office.” ANSI/BIFMA SOHO S6.5 includes testing to evaluate interlock systems. The test procedure calls for one extendable element to be fully extended while a 30 lbf horizontal pull force is applied to all other fully closed extendable elements. Every combination of open/closed extendable elements⁴⁷ must be tested. The interlock system must be fully functional at the completion of this test and no extendable element may bypass the interlock system.

As discussed in section VIII.B.2.a.ii Interlocks of this preamble, child strength studies show that children between 2 and 5 years old can achieve a mean pull force of 17.2 pounds. Therefore, CPSC considers a 30-pound horizontal pull force adequate to evaluate the strength of an interlock system. However, because ANSI/SOHO S6.5 does not include stability tests or requirements reflecting the real-world factors involved in CSU tip overs, the standard would not adequately address the CSU tip-over hazard.

VI. Technical Background

This preamble and the NPR briefing package include technical discussions of engineering concepts, such as center of gravity (also referred to as center of mass), moments, and fulcrums. Tab D of the NPR briefing package provides detailed background information on each of these terms, including how staff applies them to CSU tip-over analysis. This section provides a brief overview of that information; for further

information, see Tab D of the NPR briefing package.

A. Center of Gravity and Center of Mass

Center of Gravity (CG) or Center of Mass (CM)⁴⁸ is a single point in an object, about which its weight (or mass) is completely balanced. In terms of freestanding CSU stability, if the CSU’s CG is located behind the front foot, the CSU is stable and will not tip over on its own. Alternatively, if the CSU’s CG is in front of the front foot, the CSU is unstable and will tip over. The CG (and CM) of an object is dependent on its geometry and materials. For example, CSU drawers typically have a front that is thicker and larger than the back, which causes the drawer’s CG to be closer to the front. The CSU’s CG is defined by the position and weight of the CSU cabinet (without drawers), combined with the position and weight of each drawer. A CSU’s CG is equal to the sum of the products of the position and the weight of each component, divided by the total weight.

The CG of a CSU will change as a result of the position of the drawers, doors, and pull-out shelves (open or closed). Opening extendable elements, such as drawers, shifts the CG towards the front of the CSU. The closer the CG is to the front leg, the easier it is to tip forward if a force is applied to the drawer. Therefore, CSUs will tip more easily as more drawers are opened. The CG of a CSU will also change depending on the position and amount of clothing in each drawer. Closed drawers filled with clothing tend to stabilize a CSU, but as each filled drawer is pulled out, the CSU’s CG will shift further towards the front.

B. Moment and Fulcrum

Moment, or torque, is an engineering term to describe rotational force acting about a pivot point, or fulcrum. The moment is created by a force or forces acting at a distance, or moment arm, away from a fulcrum. One simple example is the moment or torque created by a wrench turning a nut. The moment or torque about the nut is due to the perpendicular force on the end of the wrench applied at a distance (moment arm) from the fulcrum (nut). Likewise, a downward force on an open CSU drawer creates a moment about the fulcrum (front leg) of the CSU. A CSU will tip over about the fulcrum due to

a force (e.g., weight of a child positioned over the front of a drawer) and the moment arm (e.g., extended drawer).

Downward force or weight applied to the drawer tends to tip the CSU forward around the fulcrum at the base of the unit, while the weight of the CSU opposes this rotation. The CSU’s weight can be modeled as concentrated at a single point: The CSU’s CG. The CSU’s stability moment is created by its weight, multiplied by the horizontal distance of its CG from the fulcrum. A child can produce a moment opposing the weight of the CSU, by pushing down or sitting in an open drawer. This moment is created by the vertical force of the child, multiplied by the horizontal distance to the fulcrum. The CSU becomes unbalanced and tips over when the moments applied at the front of the CSU exceed the CSU’s stability moment.

Horizontal forces applied to pull on a drawer also tend to tip the CSU forward around the front leg (pivot point or fulcrum) at the base of the unit, while the weight of the CSU opposes this rotation. In this case, the moment produced by the child is the horizontal pull force transmitted to the CSU (for example, through a drawer stop), multiplied by the vertical distance to the fulcrum. The CSU becomes unbalanced and tips over when the moments applied at the front of the CSU exceed the CSU’s stability moment.

When a child climbs a CSU, both horizontal forces and vertical forces acting at the hands and feet contribute to CSU tip over. Figure 1 shows a typical combination of forces acting on a CSU while a child is climbing, and it describes how those forces contribute to a tip-over moment. Note that when the horizontal force at the hands and feet are approximately equal, which will occur when the child’s CM is balanced in front of the drawers, the height of the bottom drawer becomes irrelevant when determining the tip-over moment. In this case, only the height of the hands above the feet matters. As Figure 1 shows, a child climbing on drawers opened distance A1 from the fulcrum, with feet at height B1 from the ground and hands at height B2 above the feet, will act on the CSU with horizontal forces F_H and vertical forces F_V . The CSU’s weight at a distance A2 from the CSU’s front edge touching the ground creates a stabilizing moment. The CSU will tip if Moment 1 is greater than Moment 2.

⁴⁷ Excluding doors, writing shelves, equipment surfaces, and keyboard surfaces.

⁴⁸ For CSU-sized objects, CG and CM are effectively the same. Therefore, CG and CM are used interchangeably in this preamble.

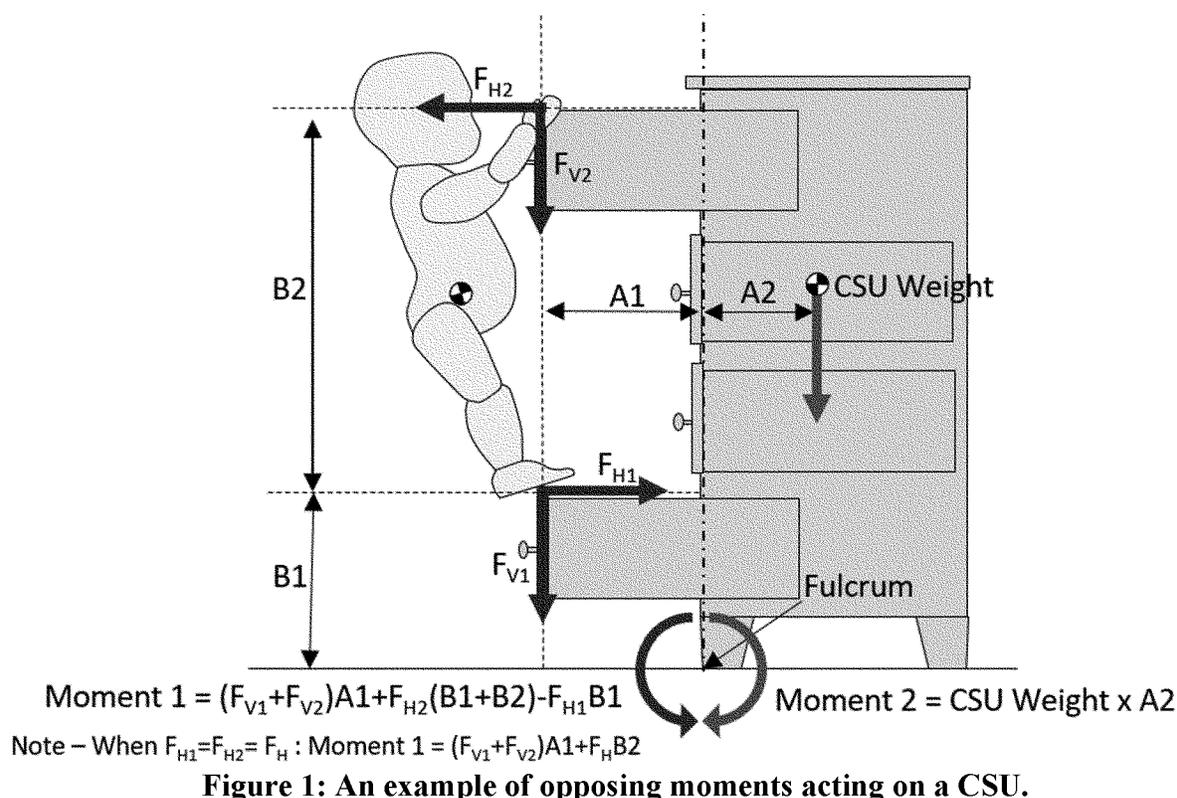


Figure 1: An example of opposing moments acting on a CSU.

VII. Technical Analysis Supporting the Proposed Rule

In addition to reviewing incident data, CPSC staff conducted testing and analysis, analyzed tip-over incidents, and commissioned several contractor studies to further examine factors relevant to CSU tip overs. This section describes that testing and analysis.

A. Multiple Open and Filled Drawers⁴⁹

Staff's technical analysis, as confirmed by testing, indicates that multiple open drawers decrease the stability of a CSU, and filled drawers further decrease stability when more than half of the drawers by volume are open, but increase stability when more than half of the drawers by volume are closed. Thus, while multiple open drawers, alone, can make a unit less stable, whether the drawers are full when open is also a relevant consideration. When filled drawers are closed, the clothing weight contributes to the stability of the CSU, because the clothing weight is behind the front legs (fulcrum). However, open drawers contribute to the CSU being less stable, because the clothing weight is shifted forward in front of the front legs (fulcrum).

⁴⁹ Further details about the effect of open and filled drawers on CSU stability is available in Tab D, Tab L, and Tab O of the NPR briefing package.

To assess the effect of open drawers and filled drawers on CSU stability, CPSC staff conducted testing to evaluate the effect of various combinations of open/closed and filled/empty drawers using a convenience sample of CSUs.⁵⁰ Staff conducted two phases of testing (Phase I and Phase II). The purpose of the testing was to assess the weight at which a CSU became unstable and tipped over with various configurations of drawers open/closed and filled/empty.

The primary variable of interest in the Phase I study was the influence of multiple open/closed drawers. The 11 CSUs tested in Phase I were primarily units with a single column of drawers. The Phase II study examined the influence of multiple open/closed drawers and filled/empty drawers. The 15 CSUs tested in Phase II included more complex units with multiple columns of drawers. Staff used the stability test methods in ASTM F2057–19, with some alterations, to collect information about variables that ASTM F2057–19 does not address (*i.e.*, the effect of open/closed drawers, filled/empty drawers, and tip weight). Filled drawers contained weight bags to simulate a drawer filled with clothing, based on the interior volume of the

⁵⁰ Because of the limited number of units tested, this study provides useful information, but the results are limited to the tested units.

drawer and 8.5 pounds per cubic foot (the explanation for this fill volume is provided below). In addition to various configurations of open/closed and filled/empty drawers, staff also varied the drawer on which the tip weight mechanism was applied, referred to as the “tip weight application location.”

The primary goal of the Phase I study was to gain insight into the influence of multiple open or closed drawers on CSU stability as a function of tip weight. Additionally, this study was designed to test and ideally confirm that identical drawer open/closed patterns (*e.g.*, two open drawers) yielded nearly identical tip weights, particularly when drawers were identical in size, regardless of the specific configuration (drawers open/closed and tip weight application location). The Phase I study confirmed that comparable tip weights existed for similar open/closed drawer configurations in the tested CSUs when considering a simple single column of drawers that are identically sized.

The primary goal of the Phase II study was to examine additional complexities with respect to real-world scenarios of CSUs. This included more complex CSUs and combinations of filled and/or empty drawers (including partially filled configurations, in which some drawers were filled and some were empty) within the same CSU, in addition to open/closed drawers. Staff also modified the test method to decrease

test-to-test variability, for example, by adding cross hatches on the drawer and the weight bag to ensure weight bags were centered within drawers.

Based on this testing, lighter and shorter units appear to be less stable, although a taller and heavier unit was also unstable; and similar units passed and failed ASTM's stability requirements. This suggests that specific heights or weights of a CSU do not correlate with stability or instability. Similarly, the footprint ratio (depth-to-width ratio) of the CSU, alone, did not appear to affect tip weight.

From the 26 CSUs tested, CPSC staff analyzed 1,777 data points for a variety of combinations (filled/empty drawers, open/closed drawers, and tip weight application location),⁵¹ and supplemented this data with results from other CSU testing CPSC staff had performed. The results of this testing indicated that individual CSUs vary in stability, depending on the configuration of open/closed drawers, and filled/empty drawers, and that different CSU drawer structures (e.g., number of columns, relative drawer

sizes) have an influence on tip weight. In general, the results indicated that CSUs were less stable as more drawers were opened, and that filled drawers have a variable effect on stability. A filled closed drawer contributes to stability, while a filled open drawer decreases stability. Depending on the percent of drawers that are open and filled, having multiple drawers open decreased the stability of the CSU.

To determine the appropriate method for simulating CSU drawers that are partially filled or fully filled, staff considered previous analyses, and conducted additional testing. Although ASTM F2057–19 does not include filled drawers as part of its stability testing, the ASTM F15.42 subcommittee has considered a “loaded” (filled) drawer requirement and test method. The ASTM task group used an assumed clothing weight of 8.5 pounds per cubic foot in testing and other discussions of filled drawers. Kids in Danger and Shane's Foundation found a similar density (average of 8.9 pounds per cubic foot) when they filled CSU drawers with

boys' t-shirts in a 2016 study on furniture stability.⁵²

To assess whether 8.5 pounds per cubic foot reasonably represents the weight of clothing in a drawer, CPSC staff conducted testing. As part of this assessment, staff looked at four drawer fill conditions. Staff considered folded and unfolded clothing with a total weight equal to 8.5 pounds per cubic foot of functional drawer volume in the drawer; and the maximum amount of folded and unfolded clothing that could be put into a drawer that would still allow the drawer to open and close. For these tests, staff used an assortment of boys' clothing in sizes 4, 5, and 6. Staff used a CSU with a range of drawer sizes to assess small, medium, and large drawers; the functional drawer volume of these 3 drawer sizes was 0.76 cubic feet, 1.71 cubic feet, and 2.39 cubic feet, respectively. Staff determined the calculated clothing weight for the 8.5 pounds per cubic foot drawer fill conditions by multiplying 8.5 by the drawer's functional volume, defined as:⁵³

$$\text{Functional Volume} = \left\{ [\text{Interior Area}] (ft^2) \left[\text{Clearance Height} - \frac{1}{8} \right] (in) \left[\frac{1}{12} \right] \left(\frac{ft}{in} \right) \right\}$$

For all three drawer sizes, staff was able to fit 8.5 pounds per cubic foot of folded and unfolded clothing in the drawers. When the clothing was unfolded, the clothing fully filled the drawers, but still allowed the drawer to close. Because the unfolded clothing was stuffed into the drawer fairly tightly, it was not easy to see and access clothing below the top layer. When the clothing was folded, the clothing also fully filled the drawers and still allowed the drawer to close. The folded clothing was tightly packed, but allowed for additional space when compressed. The maximum unfolded clothing fill weight was 6.52, 14.64, and 21.20 pounds for the three drawer sizes, respectively; and the maximum folded clothing fill weight was 7.72, 16.08, and 22.88 pounds for the three drawer sizes, respectively.

Staff also compared the calculated clothing weight (i.e., using 8.5 pounds per cubic foot), maximum unfolded drawer fill weight, and maximum folded drawer fill weight for each drawer. The maximum unfolded clothing fill weight was slightly higher than the calculated clothing fill weight for all tested

drawers. The difference between the maximum unfolded clothing fill weight and the calculated clothing weight ranged from 0.08 pounds to 0.87 pounds. The maximum unfolded clothing fill weight was 101 to 104 percent of the calculated clothing weight, depending on the drawer. The maximum folded clothing fill weight was higher than both the maximum unfolded clothing fill weight and the calculated clothing fill weight for all tested drawers; however, the differences were relatively small. The difference between the maximum folded clothing fill weight and the calculated clothing weight ranged from 1.28 to 2.55 pounds. The maximum unfolded clothing fill weight was 111 to 120 percent of the calculated clothing weight, depending on the drawer. The maximum unfolded clothing fill density was slightly higher than 8.5 pounds per cubic foot for all tested drawers; and the maximum unfolded clothing fill density ranged from 8.56 to 8.87 pounds per cubic foot, depending on the drawer. The maximum folded clothing fill density was higher than both the maximum

unfolded clothing fill density and 8.5 pounds per cubic foot for all tested drawers. The maximum folded clothing fill density ranged from 9.40 to 10.16 pounds per cubic foot, depending on the drawer. Thus, there does not appear to be a large difference in clothing fill density based on drawer size.

Based on this testing, staff found that 8.5 pounds per cubic foot of clothing will fill a drawer; however, this amount of clothing is less than the absolute maximum amount of clothing that can be put into a drawer, especially if the clothing is folded. The maximum amount of unfolded clothing that could be put into the tested drawers was only slightly higher than 8.5 pounds per cubic foot. Although staff achieved a clothing density as high as 10.16 pounds per cubic foot with folded clothing, consumers may be unlikely to fill a drawer to this level because it requires careful folding, and it is difficult to remove and replace individual pieces of clothing. On balance, staff concluded that 8.5 pounds per cubic foot of functional drawer volume is a reasonable approximation of

⁵¹ Staff excluded some data points for reasons explained in Tab O of the NPR briefing package.

⁵² Kids in Danger and Shane's Foundation (2016). Dresser Testing Protocol and Data. Data set provided to CPSC staff by Kids in Danger, January 29, 2021.

⁵³ “Clearance height” is the height from the interior bottom surface of the drawer to the closest vertical obstruction in the CSU frame. “Functional height” is clearance height minus 1/8 inch.

the weight of clothing in a fully filled drawer.

B. Forces and Moments During Child Interactions With CSUs⁵⁴

As indicated above, some of the common themes that staff identified in CSU tip-over incident data involve children interacting with CSUs, including climbing on them and opening drawers. To determine the forces and other relevant factors that exist during these expected interactions between children and CSUs, CPSC contracted with UMTRI to conduct research. The researchers at UMTRI, in collaboration with CPSC staff, designed a study to collect information about children's measurements and proportions, interest in climbing and climbing behaviors, and the forces and moments children can generate during various interactions with a CSU. Forty children, age 20 months to 65 months old, participated in the study. For additional details about the study, see UMTRI's full report in Tab R of the NPR briefing package.

1. Overview of Interaction Portion of UMTRI Study

The interaction portion of the study included children interacting with a CSU test apparatus with instrumented handles and a simulated drawer and tabletop (to simulate the top of a CSU or other tabletop or furniture unit). Researchers measured the forces of the children acting on the test apparatus and calculated moments generated by the children based on the location of the CSU's front leg tip point (fulcrum). The researchers based the fulcrum's location on a dataset of CSU drawer extensions and heights provided by CPSC staff.⁵⁵

⁵⁴ Further information about the study described in this section, and forces and moments generated by children's interactions with CSUs, is available in Tab C, Tab D, and Tab R of the NPR briefing package.

⁵⁵ CPSC staff provided UMTRI researchers with a dataset of drawer extensions and drawer heights

The interaction portion of the study looked at forces associated with several climbing-related interactions of interest, which staff and researchers selected based on CSU tip-over incidents, videos of children interacting with CSUs and similar furniture items, and plausible interactions based on children's developmental abilities. Staff focused on the ascent/climbing⁵⁶ interaction for this rulemaking because climbing incidents were the most common interaction among fatal CPSRMS incidents and nonfatal NEISS incidents, where the interaction was reported, and they were the second most common interaction in nonfatal CPSRMS incidents, where the interaction was reported; and because climbing begins with ascent, which is a child's initial step to climb up on to the CSU, and therefore, is considered an integral part of all climbing interactions.

2. Test Apparatus and Data Acquisition

UMTRI researchers created the test apparatus shown in Figure 2, which used a padded force plate to measure interactions with the floor and included a column to which the various instrumented test fixtures were

from the ground from a sample of approximately 180 CSUs. The researchers selected the 90th percentile drawer extension (12 inches) and drawer height (16 inches) as the basis for placing the moment fulcrum in most of their analysis.

⁵⁶ Ascending is a subcategory of climbing, and is described as a child's initial step to climb up on to a CSU. Therefore, ascending is an integral part of climbing. The UMTRI study provided information about forces children generate during ascent, because that testing measured forces children generate during an initial step onto the CSU test fixture. Those forces can be used to model children climbing because ascent is the first and integral step to climbing, but not all climbing interactions can be modeled with ascent, as forces associated with some other behaviors can exceed those for ascent. The term "climbing" is often used in this preamble and the NPR briefing package because that is the general behavior described in many incidents. Both climbing and ascending are used to refer to the force children generate on a CSU, for purposes of the proposed rule.

attached. Tests were conducted with a pair of handlebars (simulating drawer handles or fronts), a simulated drawer, and a simulated tabletop. In preparation for the study, CPSC staff worked with UMTRI researchers to develop a test fixture that modeled the climbing surfaces of a CSU. CPSC staff provided information to UMTRI researchers on drawer extension and heights from the sample of dressers used in CPSC staff's evaluation (Tab N of the NPR briefing package). Researchers selected and constructed a parallel bar test fixture, representing a lower foothold and an upper handhold. These bars represent a best-case CSU climbing surface, similar to the top of a drawer.

UMTRI researchers configured the test fixtures based on each child's anthropometric measurements. Researchers set the upper bar to three different heights relative to the padded floor surface: Low (50 percent of the child's upward grip reach), mid (75 percent of the child's upward grip reach), and high (100 percent of the child's upward grip reach); researchers set the lower bar to two different heights: Low (4.7 inches from the padded floor surface) and high (the child's maximum step height above the padded floor). The heights for the bars were within plausible heights for CSU drawers. Researchers set the horizontal position of the upper bar to two different positions: "aligned" with the lower bar, or "offset" from the lower bar, at a distance equal to 20 percent of the child's upward grip height. Tabs C and R of the NPR briefing package contain more information about the test fixture configurations. The bars, drawer, and tabletop, as well as the floor in front of the test fixture, had force measurement instrumentation that recorded forces over time in the horizontal (fore-aft, x) and vertical (z) directions.

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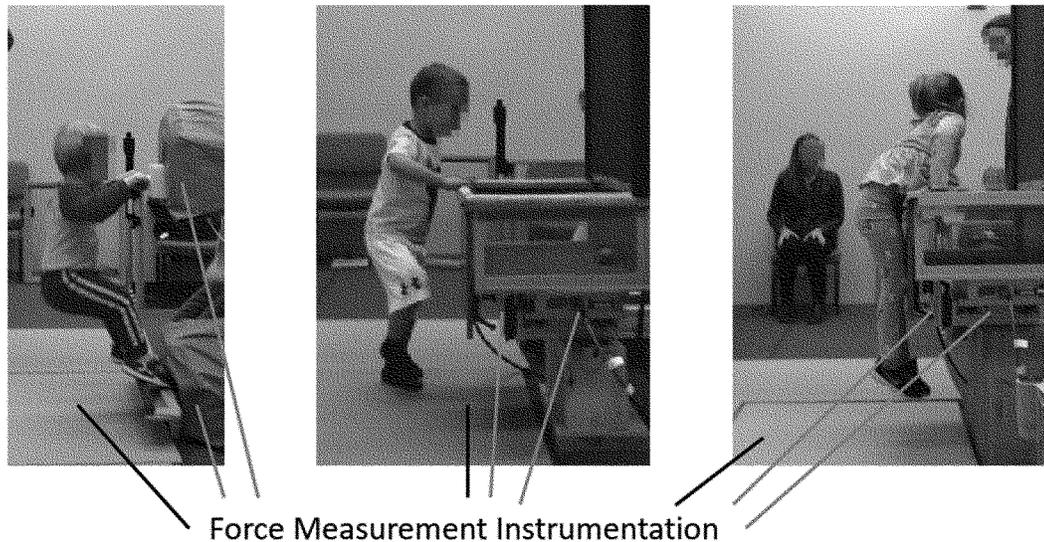


Figure 2: The test setup and location of instruments used to measure force during handle trials (left), box/drawer trials (center), and table trials (right).

3. Target Behaviors of Children Interacting With a CSU

CPSC staff worked with UMTRI researchers to develop a set of scripted interactions. Staff focused on realistic interactions in which the child's position and/or dynamic interactions were the most likely to cause a CSU to tip over. The interactions were based on incident data and online videos of children interacting with CSUs and other furniture items. The interactions UMTRI researchers evaluated included:

- *Ascend*: Climb up onto the test fixture;
- *Bounce*: Bounce vigorously without leaving the bar;
- *Lean back*: Lean back as far as possible while keeping both hands and feet on the bars;

- *Yank*: From the lean back position, pull on the bar as hard as possible;
- *1 hand & 1 foot*: Take one hand and foot (from the same side of the body) off the bars and then lean as far away from the bars as possible;
- *Hop up*: Hold the upper bar and try to jump from the floor to a position where the arms are straight and the hips are in front of the upper bar, an action similar to hoisting oneself out of a swimming pool;
- *Hang*: Hold onto the upper bar, lift feet off the floor by bending knees, hang still for a few seconds, and then straighten legs to return to the floor;
- *Descend*: Climb down from the test fixture.

As described above, the ascend interaction best models the climbing behavior commonly seen in incidents,

and is analogous to a child's initial step to climb up on to the CSU, which is an integral climbing interaction. The other, more extreme interactions, such as bounce, lean, and yank, were identified as plausible interactions, based on child behavior; but these interactions were not directly observed in the incident data.

After the children performed the interaction, the researchers reviewed video from each trial to isolate and characterize interactions of interest. Interactions of interest for the handle trials were categorized as: Ascent, Bounce, Lean (lean back), Yank, and One Hand (see Figure 3). Researchers analyzed forces from each extracted behavior to identify peak forces and moments.



Ascent

Bounce

Lean Back

Yank

One Hand

Figure 3: Children were instructed to climb on (ascend) the test fixture and perform certain targeted behaviors. The Ascent image on the left also shows markers that were used to find the CM location, discussed in the next section.

4. Image-Based Posture Analysis

Participant postures have strong effects on the horizontal forces exerted by the child and the subsequent calculated moments, due to the location of the child's CM during each behavior. Thus, the CM of the child is important when evaluating the stability or tip-over

propensity of the child/CSU-combined system. UMTRI researchers used the images of the subjects to estimate the location of the child's CM. The UMTRI researchers extracted video frames at time points of interest (typically when the child produced the maximum moment during the interaction) and

manually digitized the series of landmarks on the image of the child, as shown in Figure 4. The location of the CM was estimated, based on anthropometric information on children,⁵⁷ as 33 percent of the distance from the buttock landmark to the top-of-head landmark.

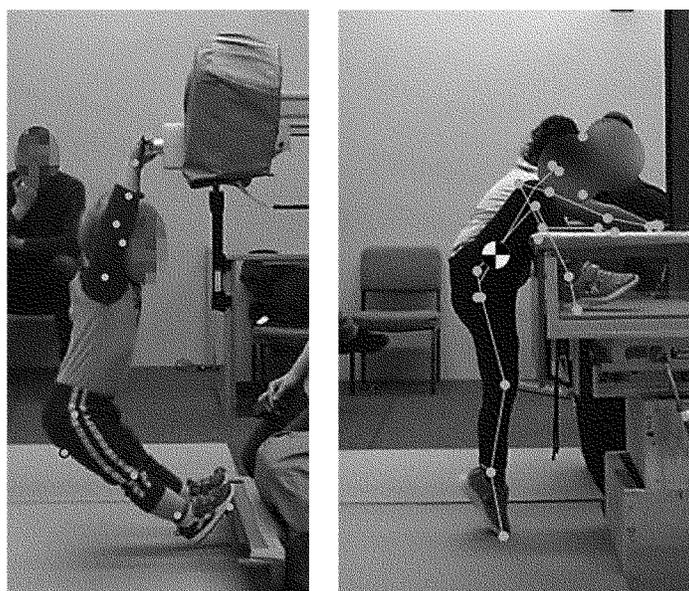


Figure 4: The photo on the left shows the right side of the body as it is digitized. The photo on the right shows the resulting body segments and the estimated location of the CM for a different child and test condition.

⁵⁷ Snyder, R.G., Schneider, L.W., Owings, C.L., Reynolds, H.M., Golomb, D.H., Schork, M.A.,

Anthropometry of Infants, Children and Youths to Age 18 for Product Safety Design (Report No. UM-

HSRI-77-17), prepared for the U.S. Consumer Product Safety Commission (1977).

The UMTRI researchers estimated the location of the child’s CM by examining the side-view images from the times of

maximum moment, as shown in Figure 5. Table 1 shows the average estimated CM location for each behavior.⁵⁸ The

children in the study extended their CM an average of about 6 inches from the handle/foothold while ascending.

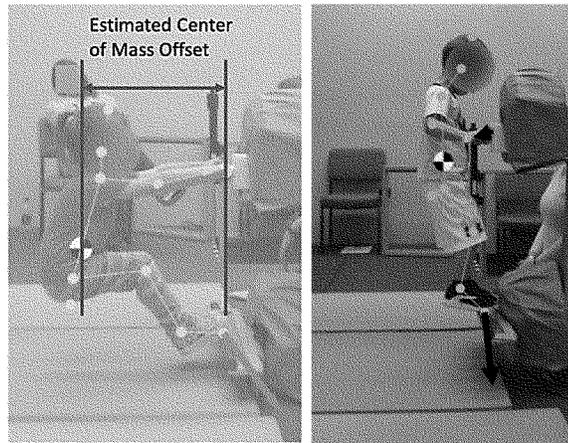


Figure 5. Example of digitized frame with estimated CM location and offset from upper handle. The lean behavior is shown on the left, and the ascend behavior is shown on the right. Forces at the hands and feet are shown with scaled arrows.

TABLE 1—ESTIMATED CM HORIZONTAL OFFSET FROM THE HANDLES FOR ALIGNED TRIALS
[Inches]

Behavior	N subjects	N trials	Mean	SD	10th percentile	50th percentile	90th percentile
Ascent	36	109	6.1	2.0	4.3	6.1	8.6
Bounce	32	80	6.0	2.5	4.0	5.8	9.1
Lean Back	30	81	11.3	3.4	8.5	11.6	15.9
Yank	25	53	10.9	3.4	7.3	11.5	15.9

5. Handle Trial Force Results

Figure 6 shows side-view images of examples of children interacting with the handle fixture. The frames were taken at the time of peak tip-over moment. Forces exerted by the child at the hands and feet are illustrated using

scaled vectors (longer lines indicate greater force magnitude; arrow direction indicates force direction). Digitized landmarks and estimated CM locations are shown. The images demonstrate that forces at both the hands and feet often have substantial horizontal components, and usually, but not always, the foot

forces are larger than the hand forces. The horizontal components at the hands and feet are also in opposite directions: The horizontal foot forces are forward (toward the test fixture), while the hand forces are rearward (toward the child).

⁵⁸ Graphs are available in Tab R of the NPR briefing package (page 59, Figure 54).

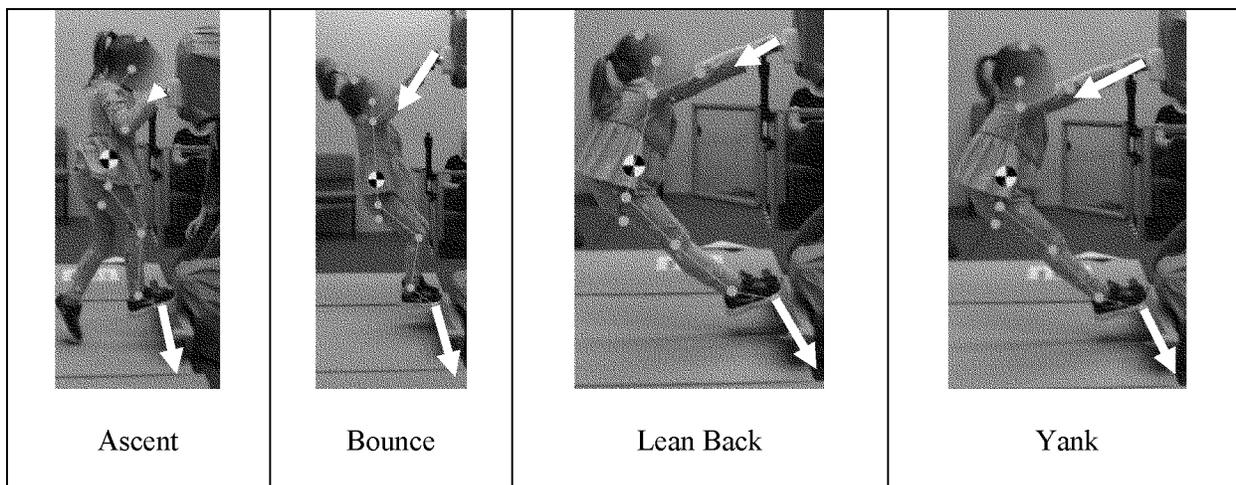


Figure 6: Depicts examples of interactions. Arrows illustrate the directions and relative magnitudes of forces at the hands and feet.

Figure 17 in Tab D of the NPR briefing package shows an exemplar time-history plot of the horizontal and vertical forces for the Ascent behavior of the depicted child. As that figure illustrates, the child’s body weight transitions from the force plate to the bars, with the lower bar bearing nearly all of the weight. The horizontal forces on the upper and lower bars are approximately equal in magnitude and opposite in direction, consistent with the posture being approximately static toward the end of

the test, where the child completed the ascend maneuver. Under these conditions, the behavior is no longer dynamic, and the vertical forces sum to body weight.

UMTRI researchers modeled a child interacting with a CSU with opened drawers, by measuring forces at instrumented bars representing a drawer front or handle. Figure 7 is the free-body diagram of the child climbing the CSU. The horizontal and vertical forces at the hands and feet correspond to the

positive direction of the measured forces. The CSU drawers were modeled using the top handle and bottom handle height, and the drawer extension was modeled from 0 inches to 12 inches.⁵⁹ The UMTRI researchers calculated the moment about the CSU’s front foot or fulcrum, using the measured forces, vertical location of the top and bottom handles, and the defined drawer extension length (Fulcrum X).

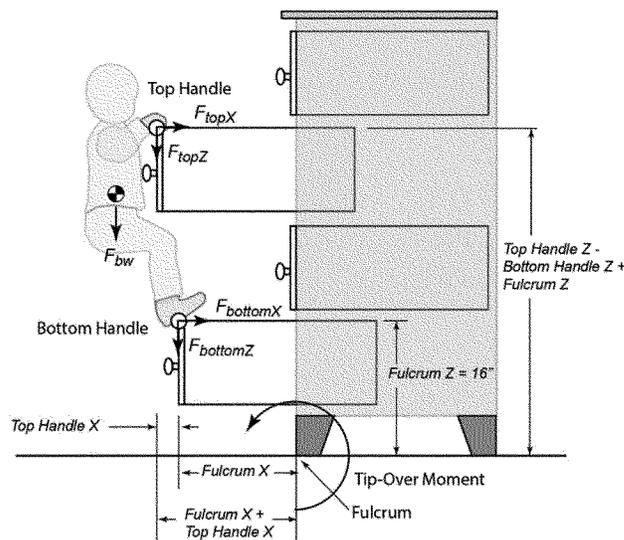


Figure 7. Free-body diagram of a child climbing a CSU.

Figure 7 shows that the child’s body weight will generally be distributed

between the two bars, but that the child’s CM location will also typically

be outboard of the bars (farther from the fulcrum than the bars). The quasi-static

⁵⁹ Here, 0 inches corresponds with a closed drawer when the fulcrum lines up with the

drawers. Additionally, 12 inches represents the

90th percentile drawer extension length in a dataset of approximately 180 CSUs.

climbing moment is approximately equal to the location of the child's CM (the horizontal distance of the CM to the fulcrum), multiplied by the child's weight. In reality, the moment created by dynamic forces generated by the child during the activities in the UMTRI study, such as during ascend, exceed the moment created by body weight alone as a result of the greater magnitude horizontal and vertical forces.

6. Moment About the Fulcrum

UMTRI researchers analyzed the force data as generating a moment around a tip-over fulcrum. The UMTRI researchers calculated the maximum moment about a virtual fulcrum, based on the measured force data for each test and the location of the force. Figure 8 shows the test setup and the forces measured. Note that the test setup mimics a CSU with the drawers closed and the $Fulcrum X = 0$. UMTRI researchers defined the horizontal

$Fulcrum X$ distance of 1-foot (based on the 90th percentile drawer extension) to simulate a 1-foot drawer extension. The bottom handle vertical $Fulcrum Z$ was set to 16 inches (based on the 90th percentile drawer height from the floor), and the $Top Handle Z$ varied, depending on the size of the child.⁶⁰ Researchers calculated the moment that would be generated for a child interacting on a 1-foot extended CSU drawer, as shown in Figure 8, where $Fulcrum X = 1$ foot.

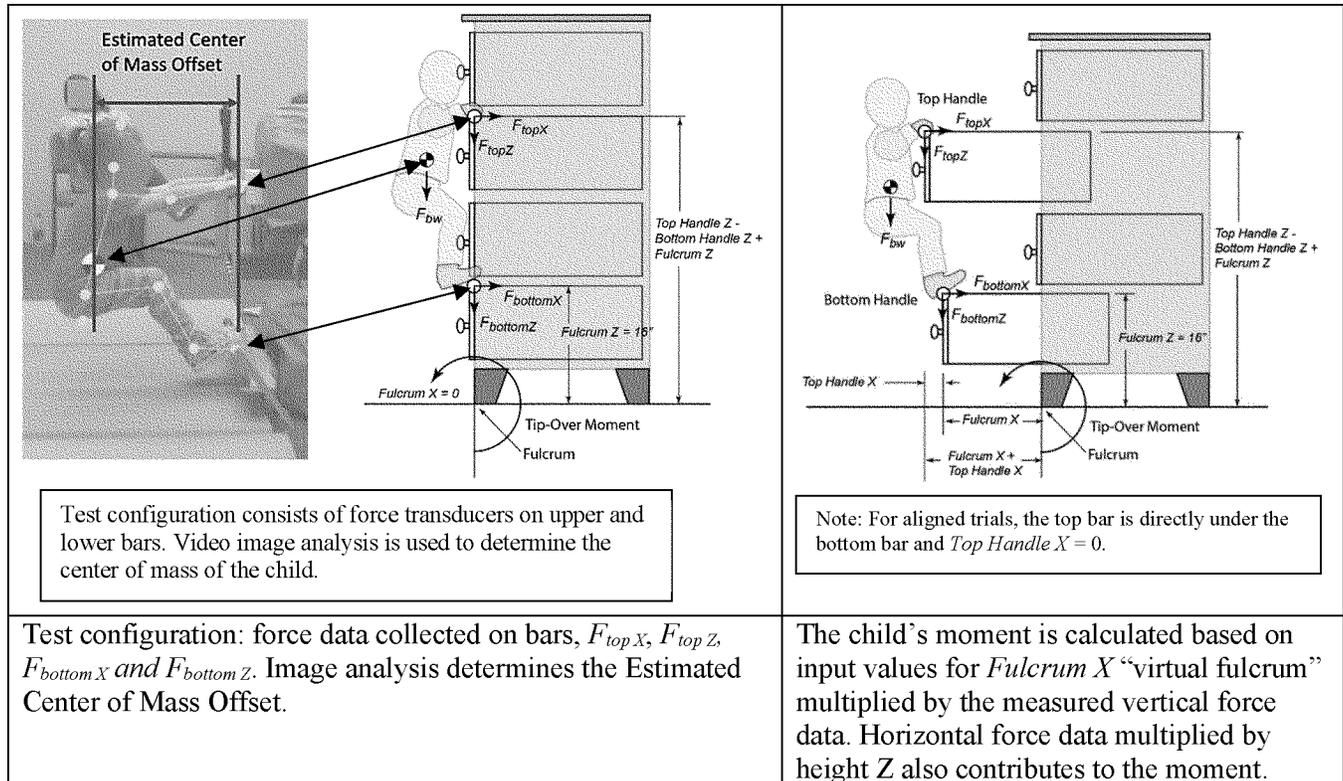


Figure 8. These diagrams illustrate how the test configuration was used to determine the child's moment acting on the CSU.

Figure 20 in Tab D of the NPR briefing package (also Figure 44 in Tab R) shows the calculated maximum moment for each interaction of interest versus the child's body weight, and shows that the maximum moment tends to increase with body weight. UMTRI researchers normalized the moment by dividing the calculated moment by the child's body weight to enable the effects of the behaviors to be examined independent of body weight, as shown in Figure 21 in Tab D of the NPR briefing package (also Figure 46 in Tab R). As the figure illustrates, the greatest moments were generated in the Yank interaction,

followed in descending order by Lean, Bounce, 1 Hand, and Ascend. As the weight of the child increased, so did the maximum moment. For all of the interactions, the maximum moment exceeded the weight of the child. For Ascend and Bounce, the slopes are close to zero, indicating that the difference in the moment generated for the Ascend and Bounce interaction is primarily due to the child's weight. A weak positive relationship can be seen for Lean and Yank. This suggests a difference in the Lean and Yank behavior for heavier children that is not accounted for by body weight. This difference for the

Lean and Yank behavior is consistent with the heavier children also having longer arms and legs that would allow them to shift their CM further away from the handles, as well as being relatively stronger, leading to greater magnitude dynamic forces.

The preceding analysis was based on a 12-inch (one foot) horizontal distance between the location of force exertion and the fulcrum. The following analysis shows the effects of varying the $Fulcrum X$ value, which is equivalent to a CSU's drawer extension from the fulcrum.

The net moment can be calculated using a $Fulcrum X = 0$ position, as

⁶⁰The top handle varied from 7.4 to 47.3 inches above the bottom handle.

shown in Figure 9, to bound the effects of drawer extension. Placing the fulcrum directly under the hands and

feet in the aligned conditions eliminates the effects of vertical forces on moment,

while amplifying the relative effects of horizontal forces.

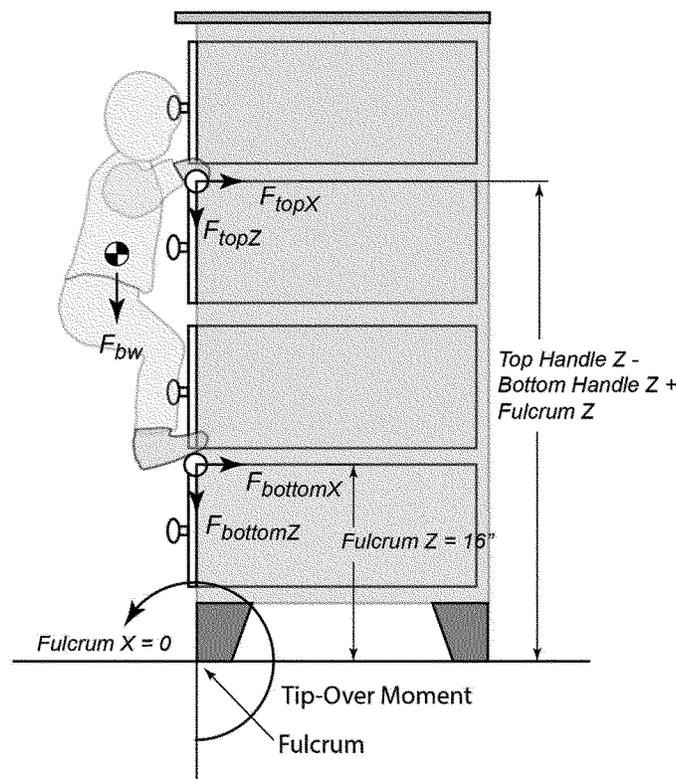


Figure 9. Depicts a schematic of effects of reducing *Fulcrum X* to zero (compare with Figure 7, which depicts a non-zero *Fulcrum X* distance).

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UMTRI researchers analyzed the effects of the *Fulcrum X* (which corresponds to the drawer extension)⁶¹ on the tip-over moment for the targeted behaviors. Since the moment about the fulcrum was calculated based on measured force data and input values for *Fulcrum X* distance, the authors were able to analyze the effects of the fulcrum position by varying the *Fulcrum X* value from 0 to 12 inches. UMTRI researcher used this virtual *Fulcrum X* value to calculate the corresponding maximum moment.

Figure 23 in Tab D of the NPR briefing package (also Figure 51 in Tab R) shows the maximum moments versus the *Fulcrum X* values of 0 and 12 inches across behaviors for aligned conditions. For example, the calculated moment for

Ascend at X=0 is about 17.5 pound-feet. The moment when X=0 is due entirely to horizontal forces. These horizontal forces exerted by the child on the top and bottom handles of the test apparatus are necessary to balance his/her outboard CM. UMTRI researchers concluded that the child's CM due to their postures have strong effects on the horizontal forces exerted and the calculated moments. Consequently, the location of the child's CM during the behavior is an important variable.

As previously discussed, the UMTRI researchers normalized the moment by dividing the calculated moment of each trial by the child's body weight to enable the effects of the behaviors to be examined independent of body weight. The graphs of Figure 23 in Tab D of the NPR briefing package show how the moments and the normalized moments increase with the fulcrum distance (which corresponds to the drawer extension). For the normalized moments shown in the bottom graph, this can be interpreted as the effective CM location outboard of the front foot of the CSU

(fulcrum), in feet. For example, a child climbing on a drawer extended 12 inches (1 foot) from the front foot fulcrum will have an effective CM that is about 19 inches (1.6 feet) from the fulcrum. At *Fulcrum X* = 0, the contribution of vertical forces to the moment are eliminated, and only the horizontal forces exerted at the hands and feet contribute to the moment. The horizontal forces exerted by the child on the top and bottom handles are necessary to balance his/her outboard CM. The effective moment where the fulcrum = 0 is about 6 inches (0.5 feet) for the Ascend behavior, and it is primarily due to the outboard CM position of the child about 6 inches (0.5 feet) from the fulcrum.⁶²

As the drawer is pulled out farther from the fulcrum, vertical forces have a greater impact on the total moment contribution. UMTRI researchers reported that at the time of peak

⁶¹Drawer extension data provided by CPSC staff to UMTRI researchers was measured from the extended drawer to the front of the CSU, and did not account for how the fulcrum position will vary with foot geometry and position. UMTRI researchers assumed that the fulcrum was aligned with the front of the CSU to simplify their analysis.

⁶²UMTRI researchers reported that the average CM offset was 6.1 inches (0.51 feet) during ascent at the time the maximum moment was measured.

moment during ascent, the average (median) vertical force, divided by the child's body weight, was close to 1 (staff estimates this value is approximately 1.08 for aligned handle trials).⁶³ This suggests child body weight is the most significant vertical force, although dynamic forces also contribute.

Based on the Normalized Moment for Ascend shown in the bottom graph of Figure 23 in Tab D of the NPR briefing package, CPSC staff estimated the Ascend line with the following equation 1:

$$\text{Equation 1. Normalized Moment for Ascend} = 1.08 \times [\text{Fulcrum } X \text{ (ft)}] + 0.52 \text{ ft.}$$

Equation 1 can be multiplied by a child's weight to estimate the moment M generated by the child ascending, as shown in Equation 2:

$$\text{Equation 2. } M = \{1.08 \times [\text{Fulcrum } X \text{ (ft)}] + 0.52 \text{ ft.}\} \times \text{child body weight (lb)}$$

For example: For a 50-pound child ascending the CSU with a 1-foot drawer extension, the moment at the fulcrum is:

$$M = \{1.08 \times [1 \text{ ft}] + 0.52 \text{ ft}\} \times 50 \text{ lb} = 54 \text{ lb-ft} + 26 \text{ lb-ft}$$

$$M = 80 \text{ lb-ft}$$

The child in the example above produces a total moment of 80 pound-feet about the fulcrum. The contribution to the total moment from vertical forces, such as body weight and vertical dynamic forces, is 54 pound-feet. The contribution to the total moment from horizontal forces, such as the quasi-static horizontal force used to balance the child's CM in front of the extended drawer and dynamic forces, is 26 pound-feet.

Similar climbing behaviors for drawer and table trials (e.g., climbing into the drawer or climbing onto the tabletop) generated lower moments than ascent. Therefore, the equation for ascend is expected to cover those behaviors as well.

7. Summary of Findings From the Interaction Portion of the Study

UMTRI researchers found that the moments caused by children climbing furniture exceed the effects of body weight alone. CPSC staff used the findings to develop an equation that could be used to calculate the moment generated by children ascending a CSU, based on the child's body weight and the drawer extension from the CSU fulcrum, shown in Equation 2. This equation, combined with the weight for the children involved in CSU tip-over incidents, is the basis for the moment requirements in the proposed rule.

⁶³ Refer to Figure 48 in the UMTRI report (Tab R of the NPR briefing package).

8. Focus Group Portion of UMTRI Study

In addition to examining the forces children generate when interacting with a CSU, in the UMTRI study, the researchers also asked participants and their caregivers questions about participants' typical climbing behaviors. This portion of the study identified many household items that children showed interest in climbing, including: CSUs, tables, desks, counters, cabinets, shelves, windows, sofas, chairs, and beds. In the same study, six children climbed dressers, based on caregivers' reports. Caregivers described various tactics the children used for climbing, such as "jumped up," "hands and feet," "ladder style," and "grab and pull up," but the most common strategy was stepping into or onto the lowest drawer. Caregivers also mentioned children using chairs, stools, and other objects to facilitate climbing, including pulling out dresser drawers.

C. Flooring⁶⁴

To examine the effect of flooring on the stability of CSUs, staff reviewed existing information and conducted testing. As background, staff considered a 2016 study on CSU stability, conducted by Kids in Danger (KID) and Shane's Foundation.⁶⁵ In that study, researchers tested the stability of 19 CSUs, using the stability tests in ASTM F2057-19 on both a hard, flat surface, and on carpeting. The results showed that some CSUs that passed on the hard surface, tipped over when tested on carpet.

To further examine the effect of carpeting on the stability of CSUs, staff tested 13 CSUs, with a variety of designs and stability, on a carpeted test surface. For this testing, staff used a section of wall-to-wall tufted polyester carpeting with polypropylene backing from a major home-supply retailer and typical of wall-to-wall carpeting, based on staff's review of carpeting on the market. Staff installed and secured the carpet, with a carpet pad, on a plywood platform, and conditioned the CSU and carpeting by weighting the unit for 15 minutes. Staff then tested the unit using the same methods and CSU configurations (i.e., number and position of open and filled drawers) as used with these units in the Multiple Open and Filled Drawers testing conducted on the hard surface (Tab O of the NPR briefing package).

⁶⁴ Details regarding staff's assessment of the effect of flooring on CSU stability is available in Tab D and Tab P of the NPR briefing package.

⁶⁵ *Furniture Stability: A Review of Data and Testing Results* (Kids in Danger and Shane's Foundation, August 2016).

Using the 1,221 pairs of tip weights (i.e., tip weight on the flat surface and on the carpet, with various configurations of multiple open and filled drawers), staff calculated the difference in tip weight when on the hard surface, compared to the carpeted surface for each CSU (tip weight difference). A CSU had a positive tip weight difference if the tip weight was higher on the hard surface than on the carpet, indicating that CSUs are less stable on carpet. The testing showed the CSUs tended to be more stable on the hard surface than they were on carpet. Of the 1,221 tip-over weight differences, the tip weight difference was positive for 1,149 (94 percent) of them; negative for 33 (3 percent) of them; and was zero (i.e., the tip-over weights were equal) for 39 (3 percent). For all 1,221 combinations, the mean tip weight difference was 7.6 pounds, but for individual units, the mean tip weight difference ranged from 4.1 to 16.0 pounds. For all 1,221 combinations, the median tip weight difference was 7 pounds, but for individual units, the median ranged from 2 to 16 pounds. The standard deviation for the entire 1,221 data set was 5.1 pounds, but was smaller for individual units, ranging from 1.8 to 4.7 pounds, indicating that most of the variability in tip weight differences was between units, as opposed to within units, which suggests that some units are affected more than others by carpeting.

Staff also analyzed the relationship between tip weight difference and open/closed drawers and filled/empty drawers. The mean tip weight difference was 7.6 pounds (median was 7 pounds) when most of the drawers on the unit were open, and 8.5 pounds (median was 8 pounds) when most of the drawers were closed, indicating that the units were more stable (required more weight to tip over) when more drawers were closed. The mean tip weight difference was 7.2 pounds (median was 6 pounds) when most of the drawers on the unit were empty, and 7.7 pounds (median was 7 pounds) when most of the drawers were filled.⁶⁶ This shows that, in general, CSUs are less stable on carpet. All units tested, under various conditions, tended to tip with less

⁶⁶ To further assess whether the effect of carpet changed based on the CSU's stability—that is, to determine if the results reflected the change in flooring, or the overall stability of the unit—staff calculated the percent tip weight difference, as: Percent tip weight difference = (hard surface tip weight – carpet tip weight)/hard surface tip weight. This revealed that, as the weight to tip the unit on a hard surface increased, shifting to a carpeted surface had less of an impact in terms of the percentage of the tip-over weight.

weight on the carpet than on the hard surface.

Staff used the results from this study to determine a test method that approximated the effect of carpet on CSU stability by tilting the unit forward (Tab D of the NPR briefing package). Using the CSUs that were involved in CSU tip-over incidents (Tab M of the NPR briefing package), staff compared 9 tip weights on carpet with tip weights for the same units in the same test configuration when tilted at 0, 1, 2, and 3 degrees in the forward direction on an otherwise hard, level, and flat surface.

The tip weight of CSUs on carpet corresponded with tilting the CSUs 0.8 to 3 degrees forward, depending on the CSU; the mean tilt angle that corresponded to the CSU tip weights on carpet was 1.48 degrees. This suggests that a forward tilt of 0.8 to 3 degrees replicated the test results on carpet. Staff also conducted a mechanical analysis of the carpet and pad used in the test assembly, and found a similar forward tilt of 1.5 to 2.0 degrees would replicate the effects of carpet for one CSU.

D. Incident Recreation and Modeling⁶⁷

CPSC staff analyzed incidents and tested products that were involved in CSU tip-over incidents to better understand the real-world factors that contribute to tip overs. Staff analyzed 7 CSU models, associated with 13 tip-over incidents. The CSUs ranged in height from 27 to 50 inches and weighed between 45 and 195 pounds. Two of these CSU models did not comply with the stability requirements in ASTM F2057–19; one complied with the requirements in section 7.1, but not section 7.2; two complied with both sections 7.1 and 7.2; and one was borderline.⁶⁸ Through testing and analysis, staff recreated the incident scenarios described in the investigations and determined the weight that caused the unit to tip over in a variety of use scenarios, such as a child climbing or pulling on the dresser, multiple open drawers, filled and unfilled drawers, and the flooring under the CSU.

Based on this analysis and testing, staff identified several factors that contributed to the tip-over incidents.

⁶⁷ Details about staff's incident recreation and modeling are in Tab D and Tab M of the NPR briefing package.

⁶⁸ Staff tested this model two separate times. In one case, the tip weight just exceeded the ASTM F2057–19 minimum acceptable test fixture weight. In another case, the model tipped over just below the minimum allowed test fixture weight. These results are consistent with earlier staff testing that found that the model tipped when tested with a 49.66-pound test fixture; but did comply when tested with a 48.54-pound test fixture.

One factor was whether multiple drawers were open simultaneously. Opening multiple drawers decreased the stability of the CSU. A related factor was whether the drawers of the CSU were filled, and to what extent. Staff's testing indicated that the weight of filled drawers increases the stability of a CSU when more drawers are closed, and reduces overall stability when more drawers are open. Generally, when more than half of filled drawers were open (by volume), the CSU was less stable.

Another factor was the child's interaction with the CSU at the time of the incident. In some incidents, the child was likely exerting both a horizontal and vertical force on the CSU. Staff found that, for some CSUs, either a vertical or horizontal force, alone, could cause the CSU to tip over, but that the presence of both forces significantly increased the tip-over moment acting on the CSU. These forces, in combination with the other factors staff identified, further contributed to the instability of CSUs. Some of the incident recreations indicated that the force on the edge of an open drawer associated with tipping the CSU was greater than the static weight of the child standing on the edge of an open drawer of the CSU. The equivalent force consists of the child's weight, the dynamic force on the edge of the drawer due to climbing, and the effects of the child's CG extending beyond the edge of the drawer. Some of the incident recreations indicated that a child pulling on a drawer could have contributed to the CSU tipping over.

Another factor that contributed to instability was flooring. Staff's testing indicated that the force needed to tip a unit over was less when the CSU was on carpet/padding than when it was on a hard, level floor.

E. Consumer Use Study⁶⁹

In 2019, the Fors Marsh Group (FMG), under contract with CPSC, conducted a study to assess factors that influence consumer attitudes, behaviors, and beliefs regarding CSUs. The study consisted of two components. In the first component, the researchers conducted six 90-minute in-home interviews (called ethnographies). Three of the participants had at least one child between 18 and 35 months old in the home, and three participants had at least one child between 36 and 72 months old in the home. In this phase of the study, the researchers collected

⁶⁹ The full report from FMG, *Consumer Product Safety Commission: Furniture Tipover Report* (Mar. 13, 2020), is available in Tab Q of the NPR briefing package.

information about family interactions with and use of CSUs in the home.

In the second component of the study, FMG conducted six 90-minute focus groups, using a total of 48 participants. Each focus group included eight participants with the same caregiver status (parents of a child between 1 and 5 years old, people who are visited regularly by a child between 1 and 5 years old, and people who plan to have children in the next 5 years) and homeowner status (people who own their home, and people who rent their home). Participants included parents of children 12 to 72 months old, people without young children in the home who were planning to have children in the next 5 years, and people without young children in the home who are visited regularly by children 12 to 72 months old. The focus groups assessed consumer perceptions of and interactions with CSUs, perceptions of warning information, and factors that influence product selection, classification, and placement.

In describing CSUs, participants mentioned freestanding products; products that hold clothing; features to organize or protect clothing (e.g., drawers, doors, and dividers); and named, as examples, dressers, armoires, wardrobes, or units with shelving or bins. Participants noted that whether storage components were large enough to fit clothing was relevant to whether a product was a CSU. However, participants also noted that they may use smaller, shorter products, with smaller storage components, as CSUs in children's rooms so that children can access the drawers, and because children's clothes are smaller. In distinguishing nightstands from CSUs, participants noted the size and number of drawers, and some reported storing clothing in them. Some participants reported that how products were displayed in stores or in online marketing did not influence how they used the unit in their homes, and indicated that although a product name may have some influence on their perception of the product, they would ultimately choose and use a product based on its function and ability to meet their needs.

Focus group participants were provided with images of various CSU-like products, and asked what they would call the product, what they would put in it, and where they would put it. Participants provided diverse answers for each product, with products participants identified as buffets, nightstands, entry/side/hall tables, or entertainment/TV/media units also being called dressers or armoires by

other participants. Products that participants were less likely to consider a CSU or use for clothing had glass doors, removable bins/baskets, or a small number of small drawers.

Participants primarily kept CSUs in bedrooms and used them to store clothing. However, they also noted that they had products that could be used as CSUs in other rooms to store non-clothing, and had changed the location and use of products over time, moving them between rooms and storing clothing or other items in them, depending on location.

Focusing on units that the participants' children interacted with the most, the researchers noted that CSUs in children's rooms held clothing and were 70 to 80 percent full of folded clothing. Participants reported that the children's primary interaction with CSUs was opening them to reach clothing, but also reported children climbing units to reach into a drawer or to reach something on top of the unit. A few participants reported having anchored a CSU. As reasons for not anchoring furniture, participants stated that they thought the unit was unlikely to tip over, particularly smaller and lighter units used in children's rooms, and they do not want to damage walls in a rental unit.

F. Tip Weight Testing⁷⁰

As discussed earlier in this preamble, in 2016 and 2018–2019, CPSC staff tested CSUs to assess compliance with requirements in ASTM F2057. As part of the 2018–2019 testing, staff also assessed whether CSUs could hold weights higher than the 50-pound weight required in ASTM F2057, testing the CSUs with both a 60-pound test weight, and to the maximum test weight they could hold before tipping over. For this testing, staff assessed 188 CSUs, including 167 CSUs selected from among the best sellers from major retailers, using a random number generator; 4 CSU models that were

⁷⁰ A full discussion of this testing and the results is available in Tab N of the NPR briefing package.

involved in incidents;⁷¹ and 17 units assessed as part of previous test data provided to CPSC.⁷² Appendix A to Tab N in the NPR briefing package describes the test procedure staff followed. To summarize, after recording information about the weight, dimensions, and design of the CSU, staff used a test procedure similar to section 7.2 in ASTM F2057–19 (loaded weight testing), but with a 60-pound test fixture, and with test fixtures that allowed staff to add additional weight, in 1-pound increments, up to a maximum of 134 pounds.

Of the 188 CSUs staff tested, 98 (52 percent) held the 60-pound weight without tipping over. The mean weight at which the CSUs tipped over was 61.7 pounds and the median was 62 pounds.⁷³ The lowest weight that caused a CSU to tip over was 12.5 pounds. The next lowest tip weights were 22.5 pounds (2 CSUs), 25 pounds (6 CSUs), and 27.5 pounds (3 CSUs). One CSU did not tip over when the maximum 134-pound test weight was applied. The next highest tip weights were 117.5 pounds (1 CSU), 112.5 pounds (1 CSU), 102.5 pounds (1 CSU), 97.5 pounds (1 CSU), 95 pounds (1 CSU), and 90 pounds (4 CSUs). Most CSUs tipped over with between 45 and 90 pounds of weight.

G. Warning Label Symbols⁷⁴

In 2019, CPSC contracted a study to evaluate a set of 20 graphical safety symbols for comprehension, in an effort to develop a family of graphical symbols that can be used in multiple standards to communicate safety-related

⁷¹ Staff tested exemplar units, using the model of CSU involved in the incident, but not the actual incident unit.

⁷² The CSUs were identified from the Consumer Reports study "Furniture Tip-Overs: A Hidden Hazard in Your Home" (Mar. 22, 2018), available at: <https://www.consumerreports.org/furniture/furniture-tip-overs-hidden-hazard-in-your-home/>.

⁷³ This is based on the results for 185 of the units; staff omitted the test weight for 3 of the CSUs because of data discrepancies.

⁷⁴ Further details regarding staff's analysis of warning label symbols are available in Tab C of the NPR briefing package.

information to diverse audiences.⁷⁵ The contractor developed 10 new symbols for the project, including one showing the CSU tip-over hazard and one showing the CSU tip-over hazard with a tip restraint; the remaining 10 symbols already existed. The contractor recruited 80 adults and used the open comprehension test procedures described in ANSI Z535.3, *American National Standard Criteria for Safety Symbols* (2011).

One of the existing symbols the contractor evaluated is the child climbing symbol from the warning label in ASTM F2057. The symbol showed poor comprehension (63.8 percent) with strict (*i.e.*, fully correct) scoring criteria, but passing comprehension (87.5 percent), when scored with lenient (*i.e.*, partially correct) scoring criteria. ANSI Z535.3 defines the criteria for "passing" as at least 85 percent correct interpretations (strict), with fewer than 5 percent critical confusions (*i.e.*, the opposite action is conveyed). There was no critical confusion with the symbol.

The contractor conducted focus groups consisting of 40 of the 80 individuals who went through the comprehension study. Based on the feedback received in the comprehension study and in focus groups, the contractor developed the two new symbol variants shown in Figure 10. CPSC staff is currently working with the contractor to test these new symbol variants using the same methodology applied in the previous study. CPSC staff plans to assess whether one of the two variants performed better in comprehension testing than the F2057 child climbing symbol, and thereafter, will determine whether any changes to the symbol proposed in this NPR should be modified for the final rule.

⁷⁵ Kalsher, M., CPSC Gather Consumer Feedback: Final Report (2019), available at: <https://www.cpsc.gov/s3fs-public/CPSC%20Gather%20Consumer%20Feedback%20-%20Final%20Report%20with%20CPSC%20Staff%20Statement%20-%20REDACTED%20and%20CLEARED.pdf?GTPK5CxxCRmftdywdDGXJyVIVq.GU2Tx>.

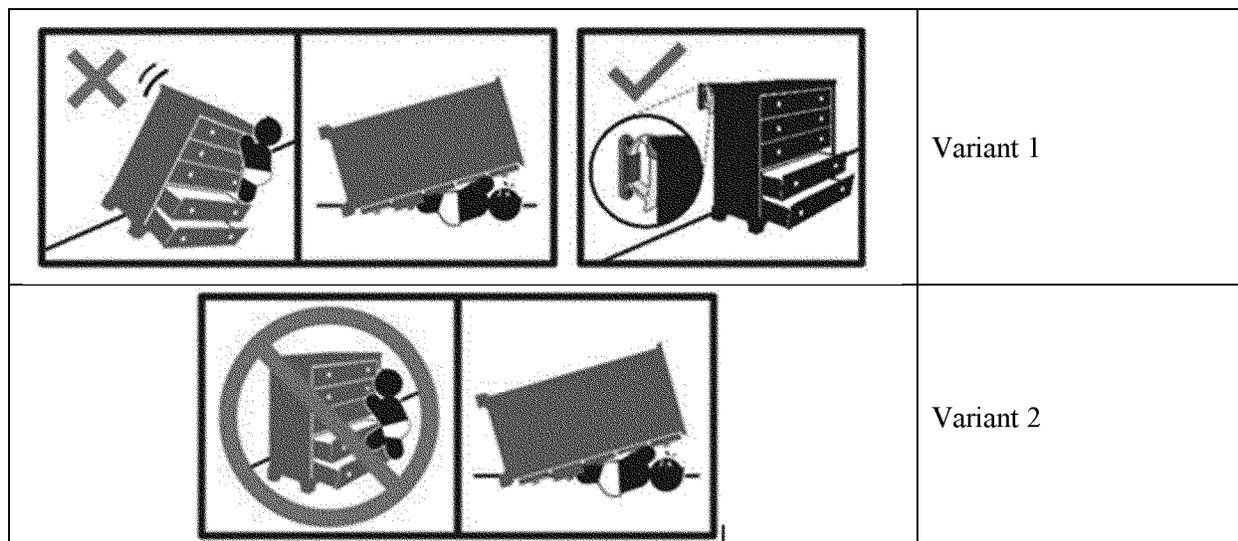


Figure 10: Two variant symbols being tested (one showing the importance of anchoring the CSU, the other demonstrating the tip-over hazard as a result of climbing). Note: the symbols are reproduced in grayscale here, but the color version includes a red “x” and prohibition symbol, and a green check mark.

H. Tip Restraints and Anchoring⁷⁶

CPSC considered several studies regarding consumer anchoring of furniture to evaluate the potential effectiveness of tip restraints to help address the tip-over hazard. These studies indicate that a large number of consumers do not anchor furniture, including CSUs, in their homes, and that there are several barriers to anchoring, including consumer beliefs, and lack of knowledge about what anchoring hardware to use or how to properly install it.

A CPSC Consumer Opinion Forum survey in 2010, with a convenience sample of 388 consumers, found that only 9 percent of those who responded to the question on whether they anchored the furniture under their television had done so (27 of 295).⁷⁷ Although a majority of respondents reported that the furniture under their television was an entertainment center, television stand, or cart, 7 percent of respondents who answered this question (22 of 294) reported using a CSU to hold their television.⁷⁸ The consumers who reported using a CSU to

hold their television had approximately the same rate of anchoring the CSU, 10 percent (2 of 21),⁷⁹ as the overall rate of anchoring furniture found in the study.

In 2018, Consumer Reports conducted a nationally representative survey⁸⁰ of 1,502 U.S. adults, and found that only 27 percent of consumers overall, and 40 percent of consumers with children under 6 years old at home, had anchored furniture in their homes. The study also found that 90 percent of consumers have a dresser in their homes, but only 10 percent of those with a dresser have anchored it. Similarly, although 50 percent of consumers have a tall chest or wardrobe in their homes, only 10 percent of those with a tall chest or wardrobe have anchored it. The most common reasons consumers provided for not anchoring furniture, in declining order, included that their children were not left alone around furniture; they perceived the furniture to be stable; they did not want to put holes in the walls; they did not want to put holes in the furniture; the furniture did not come with anchoring hardware; they did not know what hardware to use; and they had never heard of anchoring furniture.

As discussed earlier in this preamble, the Commission launched the education campaign—Anchor It!—in 2015 to promote consumer use of tip restraints to anchor furniture and televisions. In 2020, a CPSC-commissioned study assessed consumer awareness, recognition, and behavior change as a result of the Anchor It! campaign.⁸¹ The study included 410 parents and 292 caregivers of children 5 years or younger from various locations in the United States. The survey sought information about whether participants had ever anchored furniture in their homes, and their reasons for not anchoring furniture. The study found that 55 percent of respondents reported ever having anchored furniture, with a greater percentage of parents reporting anchoring furniture (59 percent) than other caregivers (50 percent), and a greater percentage of homeowners reporting ever having anchored furniture (57 percent) than renters (51 percent). For participants who did not report anchoring furniture or televisions, the most common reasons respondents gave for not anchoring, in declining order, were that they did not believe it was necessary, they watch their children, they have not gotten to it yet, it would damage walls, and they do not know what anchors to use.

⁷⁶ Further information about tip restraints and anchoring is in Tab C of the NPR briefing package.

⁷⁷ Butturini, R., Massale, J., Midgett, J., Snyder, S. Preliminary Evaluation of Anchoring Furniture and Televisions without Tools, Technical Report CPSC/EXHR/TR—15/001 (2015), available at: <https://www.cpsc.gov/s3fs-public/pdfs/Tipover-Prevention-Project-Anchors-without-Tools.pdf>.

⁷⁸ Three consumers identified the furniture as an “armoire,” and 19 consumers identified the furniture as a “dresser, chest of drawers, or bureau.”

⁷⁹ Although 22 respondents reported using a CSU under their television, one of these respondents answered “I don’t know” to the question about whether they anchored the furniture.

⁸⁰ Consumer Reports, Furniture Wall Anchors: A Nationally Representative Multi-Mode Survey (2018), available at: https://article.images.consumerreports.org/prod/content/dam/surveys/Consumer_Reports_Wall_Anchors_Survey_2018_Final.

⁸¹ The report for this study, Fors Marsh Group, CPSC Anchor It! Campaign: Main Report (July 10, 2020), is available at: https://www.cpsc.gov/s3fs-public/CPSC-Anchor-It-Campaign-Effectiveness-Survey-Main-Report_Final_9_2_2020....pdf?gC1No.oOO2FEXV9wmOtdJVAtacRLHIMK.

These results indicate that one of the primary reasons parents and caregivers of young children do not anchor furniture is a belief that it does not need to be anchored if children are supervised. However, research shows that 2- to 5-year-old children are out of view of a supervising parent for about 20 percent of the time that they are awake, and are left alone significantly longer in bedrooms, playrooms, and living room areas.⁸² CSUs are likely to be in bedrooms, where children are expected to have unsupervised time, including during naps and overnight. Many of the CSU tip-over incidents occurred in children's bedrooms during these unsupervised times. According to the Consumer Reports study, 76 percent of consumers with children under 6 years old reported that dressers are present in rooms where children sleep or play; and the UMTRI study found that nearly all (95 percent) of child participants had dressers in their bedrooms. Notably, among the 89 fatal incidents, 55 occurred in a child's bedroom, 11 occurred in a bedroom, 2 occurred in a parent's bedroom, and 2 occurred in a sibling's bedroom. None of the fatal incidents occurred when the child was under direct adult supervision. However, some nonfatal incidents occurred during supervised time when parents were in the room with the child. As this indicates, supervision is neither a practical, nor effective way to prevent tip-over incidents.

Another common reason caregivers provided for not anchoring furniture was the perception that the furniture was stable. CPSC staff testing and modeling found that there is a large difference in stability of CSUs, depending on the number of drawers open. Adults are likely to open only one or a couple of drawers at a time on a CSU; as such, adults may only have experience with the CSUs in their more stable configurations and may underestimate the tip-over hazard. In contrast, incident analysis shows that some children open multiple or all drawers on a CSU simultaneously, potentially putting the CSU in a much less stable configuration; and children contribute further to instability by climbing the CSU.

⁸² Morrongiello, B.A., Corbett, M., McCourt, M., Johnston, N. Understanding unintentional injury-risk in young children I. The nature and scope of caregiver supervision of children at home, *Journal of Pediatric Psychology*, 31(6): 529–539 (2006); Morrongiello, B.A., Ondejko, L., Littlejohn, A. Understanding Toddlers' In-Home Injuries: II. Examining Parental Strategies, and Their Efficacy, for Managing Child Injury Risk. *Journal of Pediatric Psychology*, 29(6), pp. 433–446 (2004).

CPSC staff also has concerns about the effectiveness of tip restraints and identified tip-over incidents in which tip restraints detached or broke. Overall, given the low rates of anchoring, the barriers to anchoring, and concerns about the effectiveness of tip restraints, CPSC concludes that tip restraints are not effective as the primary method of preventing CSU tip overs. Effective tip restraints may be useful as a secondary safety system to enhance stability, such as for interactions that generate particularly strong forces (e.g., bouncing, jumping), or to address interactions from older/heavier children. In addition, tip restraints may help reduce the risk of tip overs for CSUs that are already in homes, since a rule would only apply to CSUs manufactured and imported on or after the effective date. In future work, CPSC may evaluate appropriate requirements for tip restraints, and will continue to work with ASTM to update its tip restraint requirements.

VIII. Description of and Basis for the Proposed Rule

A. Scope and Definitions

1. Proposed Requirements

The proposed rule applies to CSUs, defined as a freestanding furniture item, with drawer(s) and/or door(s), that may be reasonably expected to be used for storing clothing, that is greater than or equal to 27 inches in height, and with a total functional volume of the closed storage greater than 1.3 cubic feet and greater than the sum of the total functional volume of the open storage and the total volume of the open space. Several terms in that definition, as well as additional terms in the proposed rule, are also defined in the proposed rule. For example, for purposes of the proposed stability testing, tip over is defined as the point at which a CSU pivots forward such that the rear feet or, if there are no feet, the edge of the CSU lifts at least 1/4 inch from the floor or is supported by a non-support element.

The proposed rule specifically states that whether a product is a CSU depends on whether it meets this definition. However, to demonstrate which products may meet the definition of a CSU, the proposed standard provides names of common CSU products, including chests, bureaus, dressers, armoires, wardrobes, chests of drawers, drawer chests, chifforobes, and door chests. Similarly, it names products that generally do not meet the criteria in the proposed CSU definition, including shelving units, office furniture, dining room furniture, laundry hampers, built-in closets, and

single-compartment closed rigid boxes (storage chests).

Additionally, the proposed rule exempts from its scope two products that would meet the proposed definition of a CSU—clothes lockers and portable storage closets. It defines clothes locker as a predominantly metal furniture item without exterior drawers and with one or more doors that either locks or accommodates an external lock; and defines portable storage closet as a freestanding furniture item with an open frame that encloses hanging clothing storage space and/or shelves, which may have a cloth case with a curtain(s), flap(s), or door(s) that obscures the contents from view.

2. Basis for Proposed Requirements

To determine the scope of products that the proposed rule should address, in order to adequately reduce the risk of injury from CSU tip overs, staff considered the nature of the hazard, assessed what products were involved in tip-over incidents, and assessed the characteristics of those products in relation to stability and children's interactions.

a. The Hazard

The CSU tip-over hazard relates to the function of CSUs, where they are used in the home, and their design features. A primary feature of CSUs is that typically they are used for clothing storage; however, putting clothing in a furniture item does not create the tip-over hazard on its own. Rather, the function of CSUs as furniture items that store clothing means that consumers and children are likely to have easy access to the unit and interact with it daily, resulting in increased exposure and familiarity. In addition, caregivers may encourage children to use a CSU on their own as part of developing independent skills. As a result, children are likely to know how to open drawers of a CSU, and are likely to be aware of their contents, which may motivate them to interact with the CSU. For this reason, one element of the proposed definition of CSUs is that they be reasonably expected to be used for storing clothing.

CSUs are commonly used in bedrooms, an area of the home where children are more likely to have unsupervised time. As stated, most CSU tip-over incidents occur in bedrooms: Among the 89 fatal tip-over incidents involving children and CSUs without televisions, 99 percent of the incidents with a reported location (70 of 71

incidents) occurred in a bedroom.⁸³ This use means that children have more opportunity to interact with the unit unsupervised, including in ways more likely to cause tip over (e.g., opening multiple drawers and climbing) that a caregiver may discourage.

Another primary feature of CSUs is closed storage, which is storage within drawers or behind doors. These drawers and doors are extension elements, which allow children to exert vertical force further from the tip point (fulcrum) than they would be able to without extension elements and that make it more likely that a child will tip the product during interactions. In addition, these features may make the product more appealing to children as a play item. Children can open and close the drawers and doors and use them to climb, bounce, jump, or hang; they can play with items in the drawers, or get inside the drawers or cabinet. Children can also use the CSU extension elements for functional purposes, such as climbing to reach an item on top of the CSU. Accordingly, the proposed definition of CSUs includes a minimum amount of closed storage and the presence of drawers and/or doors as an element. The element of the definition that indicates that a CSU has a total functional volume of the closed storage greater than 1.3 cubic feet and greater than the sum of the total functional volume of the open storage and the total volume of the open space is based on the total functional drawer volume for the shortest/lightest reported CSU involved in a nonfatal incident without a television. CPSC rounded the volume down, so that the CSU would be included in the proposed definition.

The proposed CSUs definition also states that the products are freestanding furniture items, which means that they remain upright, without requiring attachment to the wall, in their normal use position. The lack of permanent attachment to the building structure means that CSUs are more susceptible to tip over than built-in storage items in the home, such as kitchen cabinets and bathroom vanities.

b. Product Categories in Incident Data

For this rulemaking, staff focused on product categories that commonly meet the general elements of the definition of a CSU, in analyzing incident data; these included chests, bureaus, dressers, armoires, wardrobes, portable storage closets, and clothes lockers. As detailed

⁸³ Fifty-five incidents were in a child's bedroom; 11 were in a bedroom; 2 were in a parent's bedroom; 2 were in a sibling's bedroom; and 1 occurred in a hallway. The location in 18 incidents was not clear.

in the discussion of incident data, of the 89 fatal CPSRMS tip-over incidents involving children and CSUs without televisions, 87 involved chests, bureaus, or dressers, and 2 involved wardrobes; none involved an armoire, portable storage closet, or clothes locker. Of the 263 nonfatal CPSRMS incidents with children and CSUs without televisions, 259 involved chests, bureaus, or dressers, 1 involved an armoire, and 3 involved wardrobes. Of the estimated 40,700 ED-treated injuries to children from CSU tip overs (without a television) between January 1, 2006 and December 31, 2019, an estimated 40,200 involved "chests, bureaus, and dressers." There were not enough incidents involving armoires, wardrobes, portable storage closets, or clothes lockers to make estimates for these CSU categories.

Based on these data, the proposed definition of CSUs names chests, bureaus, dressers, wardrobes, and armoires as examples of CSUs that are subject to the standard. The proposed rule exempts clothes lockers and portable storage closets from the scope of the standard because there are no reported tip-over fatalities or injuries to children that involved those products. Compared to chests, bureaus, and dressers, wardrobes and armoires have been involved in fewer tip-over incidents. However, the proposed rule includes these products because there are some tip-over fatalities and injuries involving them, they are similar in design to the other CSUs included in the scope (unlike portable storage closets), and they are more likely to be used in homes than clothes lockers.

c. Product Height

ASTM F2057–19 applies to CSUs that are "27 in. (686 mm) and above in height." Previously, the ASTM standard had applied to CSUs taller than 30 inches. However, CPSC staff identified tip-over incidents involving CSUs that were 30 inches in height and shorter, and worked with the ASTM F15.42 Furniture Subcommittee to lower the minimum height of CSUs covered by the standard. This same 27-inch height is used in the proposed rule's definition of a CSU, consistent with this incident data and additional information regarding product heights.

The height of the CSU was reported for 53 fatal and 72 nonfatal CPSRMS tip-over incidents involving children and CSUs without televisions. The shortest reported CSU involved in a fatal incident without a television is a 27.5-inch-tall, 3-drawer chest, which tipped over onto a 2-year-old child. The shortest reported CSU involved in a

nonfatal CPSRMS tip-over incident without a television is a 26-inch-tall, 2-drawer chest.⁸⁴ NEISS data do not provide information about the height of CSUs involved in incidents.

Results from the FMG's CSU focus group (Tab Q of the NPR briefing package) suggest that consumers seek out low-height CSUs for use in children's rooms "because participants would like a unit that is an appropriate height (*i.e.*, short enough) for their children to easily access their clothes." The average shoulder height of a 2-year-old is about 27.4 to 28.9 inches.⁸⁵ In the in-home interviews, researchers observed that CSUs in children's rooms typically were low to the ground and wide. Based on this information, children may have more access and exposure to low-height CSUs than taller CSUs.

Additionally, staff is aware of shorter CSUs on the market, as short as 18 inches.⁸⁶ For example, a major furniture retailer currently sells more than 10 products marketed as "chests" or "dressers," ranging in height from 19.25 inches to 26.75 inches, including a 25.25-inch-tall, 3-drawer chest advertised for use in a child's room. ESHF staff believes that children may still be motivated to climb or otherwise interact with shorter units: Home interview participants in the FMG CSU use study said that children climbed short furniture items in the home, such as nightstands and ottomans. For these reasons, the Commission seeks comments on the 27-inch height specified in the proposed CSU definition.

d. Children's Products

As discussed in section III.A. Description of the Product, section 14(a) of the CPSA includes requirements for certifying that children's products and non-children's products comply with applicable mandatory standards, and additional requirements apply to children's products. That section also explains what constitutes a "children's product." To summarize, a "children's product" is a consumer product that is "designed or intended primarily for children 12 years of age or younger." 15 U.S.C. 2052(a)(2).

⁸⁴ The product is marketed as a "chest," but was called a "nightstand" in the consumer's report.

⁸⁵ The mean standing shoulder height of a 2-year-old male is 28.9 inches and 27.4 inches for a 2-year-old female. Pheasant, S., *Bodyspace Anthropometry, Ergonomics & Design*. London: Taylor & Francis (1986).

⁸⁶ Industrial Economics, Incorporated (2019). *Final Clothing Storage Units (CSUs) Market Research Report*. CPSC Contractor Report. Researchers analyzed the characteristics of 890 CSUs, and found a height range of 18 to 138 inches.

CPSC is aware of CSUs that are marketed, packaged, displayed, promoted, or advertised as being for children under 12 years old. These CSUs may be sold as part of matching nursery or children's bedroom furniture sets, or have features or themes that appeal to children, such as bright colors and cartoons. CSUs may be sold at children's retailers, or by manufacturers that specialize in children's furniture.

However, some children's furniture is similar in appearance to general-use furniture. In addition, some CSUs convert from a child-specific design, such as a CSU with an integrated changing table, to a more general-use design. Children's furniture with a more general-use design or with the ability to convert may be appealing to consumers who want furniture that they can continue to use as a child gets older.

CSUs that are children's products have been involved in fatal and nonfatal incidents, and are among recalled CSUs. However, CSUs that are general-use products make up more of the CSUs in the tip-over incident data. Additionally, the CSU study shows that CSUs that children interact with are not limited to CSUs intended for children. For these reasons, the proposed rule applies to both children's products and non-children's products.

e. Product Names and Marketed Use

The proposed definition of CSUs relies on characteristics of the unit to identify covered products, rather than product names or the manufacturer's marketed use of the product. This is because, as this preamble discusses, there are various products that consumers identify and use as CSUs, and that pose the same tip-over hazard, regardless of how the product is named or marketed.

In the FMG CSU use study (Tab Q of the NPR briefing package), participants showed flexibility in how they used CSUs and other similar furniture in the home, depending on their needs, aesthetics, and where the unit was placed within the home. For example, one participant put a large vintage dresser in their living room and used it for non-clothing storage; one participant said that their dresser was used as a changing station and held diapers, wipes, creams, and medical supplies, but is now used to store clothes; and a participant said that the dresser in their child's room was originally used to store dishes.

Some participants in the in-home interviews and focus groups used nightstands for clothing storage, including for shirts; socks; pajamas; slippers; underwear; smaller/lighter

items, such as tights or nightwear; seasonal items; and accessories. Some participants also reported storing clothing (*e.g.*, seasonal clothing items, underwear, pajamas, pants) in shelving units with removable bins (including those with cloth, canvas, or basket material). Consumers also had a wide variety of interpretations of the marketing term "accent piece," with some participants saying that they use accent pieces for clothing storage, and one identifying a specific accent piece in their home as a CSU.

As part of the study, researchers asked focus group participants to fill out a worksheet with pictures of unnamed furniture items with dimensions. Participants were asked to provide a product label (category of product) and answer the question: "What would you store in this piece of furniture?" "Where would you put this piece of furniture in your home?" Participants then discussed the items as a group. Results suggest that there is wide variety in how people perceive a unit. For example, one unit in the study was classified by participants as a cabinet, television stand, accent/occasional/entryway piece or table, side table/sideboard, nightstand, kitchen storage/hutch/drawer, and dresser. Another was classified as an accent piece, buffet/sideboard, dresser, entry/hall/side table, chest/chest of drawers, kitchen storage unit/cabinet, sofa table, bureau, and china cabinet. One interesting item of discussion was the glass doors on one of the worksheet furniture items. Participants came to a general consensus that glass doors are typically used to display items, and thus, an item with glass doors is not a CSU.

Overall, the results from the study suggest that there is not a distinct line between units that people will use for clothing storage, as opposed to other purposes; and even within a unit, the use can vary, depending on the consumer's needs at the time.

Moreover, staff is aware of products that are named and advertised as generic storage products with multiple uses around the house, or they are advertised without context suggesting a particular use. Many of these items clearly share the design features of CSUs, including closed storage behind drawers or doors. In addition, staff is aware of products that appear, based on design, to be CSUs, but are named and advertised for other purposes (*e.g.*, an "accent piece" with drawers staged in a foyer, and large multi-drawer "nightstands" over 27-inches tall). Staff is also aware of hybrid products that combine features of CSUs with features of other product categories; for example,

bookshelf storage products with shelving and closed storage behind drawers or doors; desks or tables with large amounts of attached closed storage; bedroom media furniture with an electronics slot and drawers for clothing; and beds with integrated CSU storage.

Using the criteria in the proposed definition of a CSU, products typical of shelving units, office furniture, dining room furniture, laundry hampers, built-in units, and single-compartment closed rigid boxes likely would not be CSUs. The proposed rule excludes these products, by including in the definition of "CSUs" that a CSU is freestanding; has a minimum closed storage functional volume greater than 1.3-cubic feet; and a closed storage functional volume greater than the sum of the open storage functional volume and open space volume; has drawer(s) and/or door(s); and is reasonably expected to be used for clothing. Staff assesses that some underbed drawer storage units, occasional/accent furniture, and nightstands could be CSUs. The criteria for identifying a CSU in the proposed rule would keep some of these products within scope, and exclude others, depending on their closed storage, reasonable expected use, and the presence of doors/drawers, such that those products that may be used as CSUs and present the same hazard, would be within the scope of the standard, while those that would not, would be excluded.

Because consumers select units for clothing storage based on their utility, not necessarily their marketing, and there are products that are not named or advertised as CSUs, but are indistinguishable from CSUs, based on their design, the proposed scope and CSU definition do not rely on how a product is named or advertised by a manufacturer.

f. Number of Drawers

CPSC also considered including, as an element of the proposed CSU definition, the number of drawers in the unit, but did not ultimately do so. The FMG CSU use study (Tab Q of the NPR briefing package) examined how consumers define CSUs and what they use to store clothing in their homes. Focus group participants defined CSUs as anything that can hold clothing; dressers, closets, and armoires were the most common example product categories that participants provided. Participants said that CSUs are used "for organization and the protection of clothing (*e.g.*, drawers of various sizes, dividers to help with organization, and doors to keep clothing out of sight)." Researchers

reported that “the majority of participants reported that they generally think of a CSU as having at least three drawers. However, a few participants noted that a CSU could have four drawers, whereas others mentioned that, to be considered a CSU, a unit only needed one drawer. Participants often considered a unit with two drawers or fewer to be a nightstand.” Because of the varied perceptions about the number of drawers for a unit to be considered or used as a CSU, CPSC did not include this as an element of the definition.

g. Overall Size and Storage Volume

Apart from the functional volume of closed storage, which is included in the proposed CSU definition, CPSC also considered the overall size of units as a potential element of the CSU definition, but did not ultimately include this.

In the FMG CSU focus groups (Tab Q of the NPR briefing package), participants discussed how the size of a unit influenced their perception of whether a unit is a CSU. Researchers found: “[t]he majority of participants noted that if a unit is too small, they will not store clothing in it, because the clothing will not fit”; however, participant’s perception of “too small” varied. Researchers found: “a few participants noted that CSUs in their children’s room are smaller than their typical definitions. The units are shorter so that their children can more easily access drawers, and drawers are smaller to fit smaller clothing.” Although there was no consensus on drawer size for a CSU, participants preferred “to have drawers that are large enough (e.g., bigger than a shirt) and deep enough to hold clothing.” They also showed flexibility on drawer volume: “[o]ne participant mentioned that there is a difference between what they would ideally like in terms of drawer size and what they will accept.” They said ideally, they would like drawers deep enough to easily store clothing; however, participants noted that the current dresser they have requires them to shove or stuff their clothing inside. Furthermore, the specific size of the drawers was reported to vary, based on the needs of each person and the size of the home.

The minimum drawer size that could reasonably accommodate clothing is fairly small. For example, the functional volume of each drawer of the shortest/lightest reported CSU involved in a nonfatal CSU tip-over incident without a television—a 26-inch-high by 15-inch-deep by 21.25-inch-wide, 2-drawer chest—is slightly less than 0.7 cubic

feet;⁸⁷ and the manufacturer states that the drawer holds about 5 pairs of folded pants or 10 t-shirts. Furthermore, except for the extremes (*i.e.*, very short, very narrow, very shallow), the shape of the drawer should not have an effect on the amount of clothing that can be stored in the drawer because clothing can be folded or stuffed to match the drawer dimensions.

Because small units and small drawers can be used to hold clothing, the proposed CSU definition does not include additional requirements for overall size and storage volume.

h. Product Weight

CPSC also considered whether to include a weight criterion in the proposed CSU definition, but did not do so. The weight of the CSU was reported for 17 fatal and 25 nonfatal CPSRMS tip-over incidents with a child and no television. The lightest-weight reported CSU involved in a fatal tip-over incident without a television was a 5-drawer CSU with the bottom 3 drawers missing, which tipped over on a 2-year-old child. The unit weighed 34 pounds without the 3 drawers, the configuration at the time of the incident. The lightest weight reported, non-modified CSU involved in a fatal tip-over incident without a television was a 57 pound, 3-drawer chest, which tipped over onto a 2-year-old child.⁸⁸ Other fatal incidents involving light-weight CSUs include a 57.5 pound, 4-drawer wicker dresser without a television that tipped over onto an 18-month-old child and a 68-pound, 3-drawer chest that tipped over in three separate fatal incidents without televisions, resulting in the death of a 23-month-old child, and two 2-year-old children.

The reported lightest weight CSU involved in a nonfatal incident without a television is a 31-pound, 2-drawer chest, which tipped over and pinned a 13-month-old child.⁸⁹ In another nonfatal incident with no television, a 45-pound, 3-drawer chest tipped onto a 3-year-old child.

Staff is aware of some lightweight plastic units marketed and used as

⁸⁷ The drawers of the current model of the product are 12½ inches deep x 13¾-inch-wide, and the clearance height is 7¼ inches. The functional drawer volume of each drawer is 0.69 cubic feet, using the equation in Tab L of the NPR briefing package; the total functional drawer volume for the 2-drawer CSU is 1.38 cubic feet.

⁸⁸ This is the same unit as the shortest known CSU involved in a fatal tip-over incident involving a child and CSU without a television.

⁸⁹ This is the same unit, identified by the consumer as a “nightstand,” but marketed as a “chest,” as the shortest known CSU involved in a nonfatal tip-over incident involving a child and CSU without a television.

CSUs.⁹⁰ Staff found many lightweight frame and drawer units marketed online as CSUs. Staff also found many online videos showing consumers using lightweight plastic units to store children’s clothing. In addition, one of the participants in the CSU use study said they used a plastic stackable drawer unit to store children’s clothing. Based on this information, consumers will perceive and use lightweight units as CSUs.

With an assumed clothing load of 8.5 pounds per cubic foot of storage volume, many lightweight units could be filled to the same weight as the incident-involved units. The 34-pound unit referenced above had minimal clothing in it, and the 57-pound unit was reportedly empty at the time of the fatal incident. Staff did not identify any tip-over incidents involving plastic units in the fatal and nonfatal CPSRMS data involving children without a television; however, staff cautions that in 64 fatal and 20 nonfatal incidents, model names were not obtained and could have included plastic units.

Because consumers will perceive and use lightweight units as CSUs, and it is possible to fill lightweight units with clothing loads that exceed the lowest product weights seen in the incident data, these units are included in the proposed rule.

B. Stability Requirements

1. Proposed Requirements

The proposed requirements for stability of CSUs consist of configuring the CSU for testing, performing testing using a prescribed procedure, and determining whether the performance results comply with the criteria for passing the standard.

To configure the CSU for testing, the proposed rule requires the CSU to be placed on a hard, level, flat surface, which the standard defines. If the CSU has a levelling device, the device is adjusted to the lowest level and then according to the manufacturer’s instructions. The CSU is then tipped forward 1.5 degrees, and if there is a levelling device intended for a carpeted surface, the device is adjusted in accordance with the manufacturer’s instructions for a carpeted surface.

All doors (as defined in the standard) are then open to a specified position and fill weights are placed in drawers and pull-out shelves, depending on

⁹⁰ For this analysis, staff only considered lightweight units with drawers and/or doors. Staff is also aware that consumers use storage bins with lids to store clothing; however, staff does not consider these to be CSUs, based on the proposed definition.

whether there are interlocks on the unit. Because the test configuration differs, depending on the presence of interlocks, the proposed rule requires testing the interlocks before conducting the stability testing.

The interlock testing consists of placing the CSU on a hard, level, flat surface (as defined in the standard), levelling according to manufacturer instructions, securing the unit to prevent sliding or tip over, and opening the number of drawers necessary to engage the interlock. A 30-pound horizontal pull force is then applied on each locked drawer, one at a time, over a period of 5 seconds, and held for at least 10 seconds. This pull test is repeated until all possible combinations of drawers have been tested. If any locked drawer opens or the interlock is damaged, during this testing, then the interlock is to be disabled or bypassed for the stability testing.

For the stability testing, for units without an interlock or that did not pass the interlock test, all drawers and pull-out shelves are open to their maximum extension (as defined in the standard), and a fill weight of 8.5 pounds per cubic foot times the functional volume (in cubic feet) is placed in the center of each drawer or pull-out shelf. For units with an interlock that passed the interlock test, all drawers that are not locked by the interlock are open to the maximum extension (as defined in the standard), in the configuration most likely to cause a tip over (typically the largest drawers in the highest position open). If 50 percent or more of the drawers and pull-out shelves by functional volume are open, a fill weight is placed in the center of each drawer or pull-out shelf, including those that remain closed. The fill weight is 8.5 pounds per cubic foot times the functional volume (cubic feet). If less than 50 percent of the drawers and pull-out shelves by functional volume are open, no fill weight is placed in any drawers or pull-out shelves.

The proposed rule provides two test methods for the tip-over test. Test Method 1 is most appropriate for CSUs with drawers or pull-out shelves. It involves applying a vertical force to the face of the uppermost extended drawer or pull-out shelf to cause the unit to tip over (defined as the point at which a CSU pivots forward such that the rear feet (or edge) lifts at least ¼ inch from the floor or is supported by a non-support element). At that point, the tip-over moment of the unit is calculated by multiplying the tip-over force (as defined in the standard) by the horizontal distance from the force application point to the fulcrum (as

defined in the standard). If a drawer breaks during the test due to the force, Test Method 2 should be used or the drawer can be secured or reinforced, as long as the modifications do not increase the tip-over moment.

Test Method 2 is appropriate for any CSU. It involves applying a horizontal force to the back of the CSU orthogonal (*i.e.*, at a right angle) to the fulcrum to cause the unit to tip over. The tip-over moment is then calculated by multiplying the tip-over force by the vertical distance from the force application point to the fulcrum.

Once the tip-over moment for the CSU has been determined, that value must be greater than several comparison moments, as applicable, depending on the design of the CSU. The first comparison moment applies to CSUs with drawers or pull-out shelves and is 55.3 pounds times the drawer or pull-out shelf extension from the fulcrum distance (as defined in the standard), plus 26.6 pounds feet. The second comparison moment is for units with doors and is 51.2 pounds times the door extension from fulcrum distance (as defined in the standard, in feet), minus 12.8. The third comparison moment applies to all CSUs and is 17.2 pounds times the maximum handhold height (as defined in the standard, in feet). The greatest of these three comparison tip-over moments is considered the threshold moment, which the tested CSU's tip-over moment must exceed.

2. Basis for Proposed Requirements

As described in this preamble and the NPR briefing package, there are several factors that are commonly involved in CSU tip-over incidents that contribute to the instability of CSUs, and a number of these factors often occur simultaneously. These include multiple open and filled drawers, carpeting, and forces generated by children's interactions with the CSU (such as climbing and opening/pulling on drawers). The proposed rule includes requirements to simulate or account for all of these factors, in order to accurately assess the stability of CSUs during real-world use.

The stability testing in the proposed rule simulates these factors simultaneously (*e.g.*, all drawers open and filled, on carpet, and accounting for child interaction forces). This is because incident data indicate that these factors commonly exist at the same time. For example, incidents include children climbing on open drawers, filled with clothing.

a. Multiple Open and Filled Drawers

As discussed in section IV.C. Hazard Characteristics, opening drawers of a CSU was a common interaction in CSU tip overs involving children and only a CSU. It was the most common reported interaction (63 percent) in nonfatal CPSRMS incidents; it was the second most common reported interaction (8 percent) in nonfatal NEISS incidents; and it was the third most common reported interaction (9 percent) in fatal CPSRMS incidents. Children as young as 11 months were involved in incidents where the child was opening one or more drawers of the CSU, and the incidents commonly involved 2- and 3-year-olds. In numerous incidents, the children opened multiple or all of the drawers. The youngest child reported to have opened all drawers was 13 months old.

The incident analysis also indicates that, of the CSU tip overs involving children and only CSUs for which the reports indicated the contents of the CSU, 96 percent of fatal CPSRMS incidents involved partially filled or full drawers; and 90 percent of the nonfatal CPSRMS incidents involved partially filled or full drawers. Most items in the drawers were clothing.

As this preamble explains, opening extendable elements (drawers, doors, pull-out shelves) shifts the CG towards the front of the CSU, and the closer the CG is to the front leg, the easier it is to tip forward if a force is applied to the drawer. Therefore, CSUs will tip more easily as more drawers are opened. The CG of a CSU will also change depending on the position and amount of clothing in each drawer. Closed drawers filled with clothing tend to stabilize a CSU, but as each filled drawer is pulled out, the CG of the CSU will further shift towards the front. Staff's testing demonstrates this principle, finding that multiple open drawers decrease the stability of a CSU, and filled drawers further decrease stability when more than half of the drawers by volume are open, but increase stability when more than half of the drawers by volume are closed.

Taken together, this information indicates that children commonly open multiple filled drawers simultaneously during CSU tip-over incidents, and that doing so decreases the stability of the CSU if half or more of the drawers by volume are open. Accordingly, the proposed rule includes multiple open and filled drawers as part of the unit configuration for stability testing, and varies whether drawers are filled depending on how many of the drawers

and pull-out shelves can open, as determined by an interlock system.

As staff testing showed, when all CSU drawers are pulled out and filled, the unit is more unstable. However, when CSU drawers have interlocks or other means that prevent more than half the drawers by volume from being pulled out simultaneously, the CSU tips more easily with all drawers empty. Accordingly, when an interlock or other means prevents more than half the drawers and pull-out shelves by interior volume from being opened simultaneously, the proposed rule requires that no fill weight be placed in the drawers.

Although fewer incidents involved CSUs with doors, those incidents indicate that children opened the doors of the CSU. Moreover, in many CSUs with doors, the doors must be open to access the drawers. Given these considerations, and that opening doors makes a CSU less stable, the proposed rule also requires doors to be open during stability testing.

i. Fill Density

As discussed in section VII.A. Multiple Open and Filled Drawers, staff assessed the appropriate method for simulating CSU drawers that are partially filled or fully filled (Tab L of the NPR briefing package). To do this, staff looked at the standard that ASTM considered (8.5 pounds per cubic foot) and the results of the Kids in Danger and Shane's Foundation study⁹¹ (which found an average density of 8.9 pounds per cubic foot). To assess whether the 8.5 pounds per-cubic-foot measure reasonably represents the weight of clothing in a drawer, CPSC staff conducted testing with folded and unfolded children's clothing on drawers of different sizes. For all three drawer sizes, staff was able to fit 8.5 pounds per cubic foot of unfolded and folded clothing fill in the drawers. When the clothing was folded and unfolded, the clothing fully filled the drawers, but still allowed the drawer to close. The maximum unfolded clothing fill density was slightly higher than 8.5 pounds per cubic foot for all tested drawers; and the maximum unfolded clothing fill density ranged from 8.56 to 8.87 pounds per cubic foot, depending on the drawer. The maximum folded clothing fill density ranged from 9.40 to 10.16 pounds per cubic foot, depending on the drawer.

Based on this testing, staff found that 8.5 pounds per cubic foot of clothing

will fill a drawer. This amount of clothing is less than the absolute maximum amount of clothing that can be put into a drawer, especially if the clothing is folded, however, the maximum amount of unfolded clothing that could be put into the tested drawers was only slightly higher than 8.5 pounds per cubic foot. Although staff achieved a clothing density as high as 10.16 pounds per cubic foot with folded clothing, consumers may be unlikely to fill a drawer to this level because it requires careful folding, and it is difficult to remove and replace individual pieces of clothing. On balance, CPSC considers 8.5 pounds per cubic foot of functional drawer volume a reasonable approximation of the weight of clothing in a fully filled drawer.

Because CSUs are reasonably likely to be used to store clothing, and incident data indicates that CSUs involved in tip-over incidents commonly include drawers filled with clothing, the proposed rule requires 8.5 pounds per cubic foot as fill weight when more than half of the drawers by volume are open.

ii. Interlocks

Because the fill level, as well as the stability of a CSU, depends on how many drawers can open, the standard also includes a requirement that the interlock system withstand a 30-pound horizontal pull force. Without such a requirement, consumers may be able to disengage the interlock, or the interlock may break, resulting in more filled drawers being open during real-world use, and less stability, than assessed during stability testing.

Staff assessed the pull strength of children to determine an appropriate pull force requirement for the interlock test (and the comparison moment for pulling open a CSU), and found that the mean pulling strength of 2- to 5-year-old children on a convex knob (diameter 40 mm) at their elbow height is 59.65 Newton (13.4 pound-force) for males and 76.43 Newton (17.2 pound-force) for females.⁹² In the study from which staff drew these values, participants were asked to exert their maximum strength at all times, described as the highest force they could exert without causing injury. Participants were instructed to build up to their maximum strength in the first few seconds, and to maintain maximum strength for an additional few seconds. Participants were instructed to use their dominant hand. Based on this, children between

2 and 5 years old can achieve a mean pull force of 17.2 pounds. ANSI/SOHO S6.5 includes a slightly higher horizontal pull force of 30-pounds in its stability requirements. To ensure that the standard adequately assesses the integrity of interlock systems, the proposed rule includes a 30-pound horizontal pull force.

iii. Maximum Extension

The proposed rule requires that all extension elements—including drawers, doors, and pull-out shelves—be opened to the maximum extension and least-stable configuration. The proposed rule defines maximum extension. The general conceptual framework is that all drawers are opened fully, or if there is an interlock, the worst-case drawers that can be opened at the same time are opened fully. Maximum extension for drawers and pull-out shelves is the furthest manufacturer recommended use position, as indicated by way of a stop; if there are multiple stops, they are open to the stop that allows the furthest extension; if there is no stop, they are open to $\frac{2}{3}$ of the shortest internal length of the drawer or $\frac{2}{3}$ of the length of the pull-out shelf.

b. Carpeting

As discussed in section IV.C. Hazard Characteristics, of the fatal CPSRMS tip-over incidents involving children and only CSUs that reported the type of flooring the CSU was on, 82 percent involved carpeting. Of the incidents that provided photos, the carpet was typical wall-to-wall carpet, with most being cut pile, and a few being looped pile. Of the nonfatal CPSRMS tip-over incidents involving children and only CSUs that reported the type of flooring, 80 percent involved carpeting. Thus, for incidents where flooring type was reported, carpet was by far the most prevalent flooring type.

As discussed earlier, staff testing showed that CSUs with a variety of designs and stability levels were more stable on a hard flooring surface than they were on carpeting. Consistent with incident data, staff used wall-to-wall carpet for this testing and tested the CSU stability with various configurations of open and filled drawers. For 94 percent of the comparison weights (including multiple variations of open and filled drawers), the units were more stable on the hard surface than on carpet, with a mean difference in tip weight of 7.6 pounds.

Therefore, based on incident data and testing, CSUs are commonly on carpet during CSU tip-over incidents, and carpet increases the instability of the CSU. Accordingly, the proposed rule

⁹¹ Kids in Danger and Shane's Foundation (2016). Dresser Testing Protocol and Data. Data set provided to CPSC staff by Kids in Danger, January 29, 2021.

⁹² DTI (2000). Strength Data for Design Safety—Phase 1 (DTI/URN 00/1070). London: Department of Trade and Industry.

includes a requirement that simulates the effect of carpet in order to accurately mimic real-world factors that contribute to CSU instability. To determine how to simulate the effect of carpet, section VII.C. Flooring explains that staff compared the tip weights of CSUs on carpet with the tip weights for the same units when tilted forward to various degrees on a hard, level, flat surface. Staff found that the tip weight of CSUs on carpet corresponded with tilting the CSUs forward 0.8 to 3 degrees, depending on the CSU, with the mean tilt angle that corresponded to the CSU tip weights on carpet being 1.48 degrees. Therefore, a forward tilt of 1.5 degrees replicates the effect of carpet on CSU stability, and this is included in the CSU configuration requirements for the stability testing in the proposed rule.

c. Test Methods

The proposed rule provides two test methods for applying force to a CSU to determine its tip-over moment. The first test method involves applying a vertical load to the top surface of a fully extended drawer on the CSU; the second test method involves applying a horizontal load to the rear of the CSU, causing it to tip forward. Based on staff's testing (Tab M of the NPR briefing package), these methods produce approximately equal tip-over moments. For this reason, the proposed rule allows either test method to be used. However, because the first test method requires the use of a drawer, the proposed rule specifies that the first test method is appropriate for such products. The second test involves applying force to the back of a CSU and, as such, it can be used for any design.

Both test methods require the location of the fulcrum to be determined and the distance from the open drawer face to the fulcrum to be measured. Intuitively, the fulcrum is located at the front of the bottom-most surface of the CSU.⁹³ This is the point or line about which the CSU pivots when it tips forward. Therefore, the proposed rule defines the fulcrum as the bottom point or line of the CSU touching the ground about which the CSU pivots when a tip-over force is applied. The fulcrum is typically located at the line connecting the front feet. However, for CSUs without feet, or for CSUs with an irregular pattern of

feet, the fulcrum may be in a different location. Some CSUs may have multiple fulcrums that will vary, depending on the direction the tip-over force is applied. The fulcrum that results in the smallest tip-over moment should be determined. If testers choose to use a horizontal load, the load should be applied such that the tip-over moment is minimized (typically orthogonal to the fulcrum). For this reason, the proposed rule requires the horizontal force to be applied to the back of the unit orthogonal to the fulcrum.

d. Performance Requirements

i. Pass-Fail Criteria

Once the tip-over moment has been calculated using one of the methods above, the proposed rule specifies that the tip-over moment of the CSU must be greater than several comparison tip-over moments (the greatest of which is considered the threshold moment). These comparison tip-over moments determine whether the tip-over moment of the CSU is sufficient to withstand tipping over when child interactions identified in incidents and measured by UMTRI occur. Staff developed three pass-fail criteria based on three child interactions that can lead to CSU tip-over incidents. The first interaction is a child climbing (ascending) a CSU; the second is a child pulling on a handhold of a CSU while opening or attempting to open a drawer; and the third is a child climbing (hanging) on the door of a CSU.

Staff expects that the comparison tip-over moment for ascending the CSU will be the most onerous requirement for most CSUs. However, some CSUs with particular geometric features, or without drawers, may have greater tip-over moments associated with the alternative criteria, based on children's interactions with the CSU.

ii. Climbing

As described earlier in this preamble, of the fatal CPSRMS tip-over incidents involving children and only a CSU that reported the type of interaction, 74 percent involved a child climbing on the CSU. Climbing was the most common reported interaction for children 3 years old and younger. Of the nonfatal CPSRMS tip-over incidents involving children and only a CSU that reported the type of interaction, 20 percent involved a child climbing on the CSU. Of the nonfatal NEISS CSU tip-over incidents involving children and only CSUs that reported the type of interaction the child was engaged in, 77 percent involved climbing on the CSU. For children 3 years old or younger,

climbing constituted almost 80 percent of reported interactions. Overall, 81 percent of the reported interactions in the nonfatal NEISS tip-over incidents involving children and only CSUs are those in which the child's weight was supported by the CSU (e.g., climbing, in drawer, jump, on top, swinging). Thus, in fatal and nonfatal incidents, a child climbing on the CSU was one of the most common reported interactions.

Of climbing incidents with a reported age, the children were 3 years old or younger in 94 percent of the fatal CPSRMS incidents; 73 percent of the nonfatal NEISS incidents; and 60 percent of the nonfatal CPSRMS incidents. Climbing behavior is consistent with expected motor development of children this age.

CPSC staff's analyses of tip-over incidents in Tab M of the NPR briefing package outline several scenarios where children climbing or interacting with the front of a CSU caused the CSU to tip over. In some of the scenarios, the force on the edge of an open drawer associated with tipping the CSU was greater than the static weight of a child standing on the edge of an open drawer of the CSU. The equivalent force consists of the child's weight, the dynamic force on the edge of the drawer due to climbing, and the effects of the child's CG extending beyond the edge of the drawer. Based on the UMTRI study, staff estimated the equivalent force to be more than 1.6 times the weight of the child for typical drawer extensions. Therefore, these tip-over incidents occurred because the forces and moments associated with children climbing on a CSU exceeded the static body weight of a child standing on the edge of an open drawer.

Staff determined that the ascend interaction from the UMTRI child climbing study was the most representative of a child climbing interaction seen in the incident data. As discussed in Tab D of the NPR briefing package, based on the UMTRI study of child climbing behaviors (Tab R of the NPR briefing package), ascent can be described by the following equation:

$$M = \{1.08 [\text{Fulcrum } X \text{ (ft)}] + 0.52 \text{ ft}\} \times \text{Weight of Child (lb)}$$

In this equation, Fulcrum X is the horizontal distance from the front of the extended drawer to the fulcrum.

In the UMTRI study, other measured climbing interactions involving climbing into drawers and climbing onto the tabletop generated lower moments than ascent; thus, they are included within performance requirements based on ascent.

Because most climbing incidents involved children 3 years old and

⁹³ For CSUs with circular pads on the feet, CPSC staff typically found higher numerical correlation between test results and numerical analysis when the tip-over fulcrum in the calculation was placed at the center of the pads on the front feet (rather than the front of the pads). The difference between the two results was small. Staff does not consider foot pad geometry a significant factor in determining the tip-over moment of a CSU.

younger, the proposed rule uses the 95th percentile weight of 3-year-old children (51.2 pounds) in this equation to generate the first comparison tip-over moment. The 95th percentile weight of 3-year-old boys is 51.2 pounds and the 95th percentile weight of 3-year-old girls is 42.5 pounds.⁹⁴ To address the heaviest of these children, the proposed rule uses 51.2 pounds. Moreover, as described earlier in this preamble, this is consistent with the weight of children involved in tip-over incidents, particularly for climbing incidents, when known, or when estimated by their age.

Based on these considerations, to pass the moment requirement for a child ascending a CSU, the tip-over moment (M_{tip}) of the CSU must meet the following criterion: $M_{tip} \text{ (lb-ft)} > 51.2 \text{ (1.08X + 0.52)}$, where X is the horizontal distance (in feet) from the front of the extended drawer to the fulcrum.⁹⁵ Simplified, this is $M_{tip} \text{ (lb-ft)} > 55.3X + 26.6$.

CPSC staff calculates that CSUs that meet a requirement based on the climbing force generated by a 51.2-pound child, and that considers the effects of all drawers (or doors) open and drawers filled, plus the effect of carpet on stability, likely will protect 95 percent of 3-year-old boys by weight and more than 95 percent of 3-year-old girls, and virtually all younger children. For example, with the proposed test requirements, virtually all climbing incidents are presumably addressable involving 2-year-old children because they are all well under 51.2 pounds (95th percentile 2-year-old boys weigh 38.8 pounds and girls weigh 34.7 pounds). This requirement would also protect more than 90 percent of 4-year-old boys and 95 percent of 4-year-old girls who also engaged in this climbing scenario. This testing would protect 75 percent of 5-year-old boys and more than 50 percent of 5-year-old girls. It would also protect 50 percent of 6-year-old children; 25 percent of 7-year-old children; and 7.1 percent of 8-year-old children.

Overall, staff calculates that 91.2 percent of all nonfatal NEISS incidents involving climbing interactions are likely to be addressed with the proposed rule. Staff notes that this number is a

low estimate, because it assumes that all climbing incidents occurred with all open and filled drawers on CSUs located on a carpeted surface, which is a worst-case stability condition.

iii. Opening Drawers

As described in this preamble, of the fatal CPSRMS tip-over incidents involving children and only a CSU that reported the type of interaction, 17 percent involved a child sitting, laying, or standing in an open drawer, and 9 percent involved a child opening drawers. Of the nonfatal CPSRMS tip-over incidents involving children and only a CSU that reported the type of interaction, 63 percent involved opening drawers, 6 percent involved putting items in/taking them out of a drawer; 6 percent involved pulling on the CSU; and 3 percent involved leaning or pushing down on an open drawer. Opening drawers was the most common reported interaction for children six years old and younger.

Of the nonfatal NEISS CSU tip-over incidents involving children and only CSUs that reported the type of interaction the child was engaged in, 8 percent involved opening drawers, and 15 percent involved a child in the drawer, pulling on the CSU, putting items in or taking items out of a drawer, reaching, hitting, jumping, a child on top of the CSU, playing in a drawer, pulling up, and swinging. Overall, 12 percent of the reported interactions in the nonfatal NEISS tip-over incidents involving children and only CSUs are those in which the child's strength determines the force (e.g., hit, opening drawers, pulled on, pulled up). Thus, in nonfatal incidents, opening drawers was one of the most common reported interactions.

Moreover, looking at both fatal and nonfatal CPSRMS tip overs involving children and only CSUs, where the interaction involved opening drawers, overall, about 53 percent involved children opening one drawer, 10 percent involved opening two drawers, and almost 17 percent involved opening "multiple" drawers. Children as young as 11 months were involved in incidents where the child was opening one or more drawers of the CSU, and the youngest child reported to have opened all drawers was 13 months old. Incidents involving opening drawers most commonly involved children 3 years old and younger.

As discussed earlier, it is possible for CSUs to tip over from the forces generated by open drawers and their contents, alone, without additional interaction forces. However, pulling on a drawer to open it applies an increased

force that contributes to instability. The moment generated with a horizontal force is higher as the location of the force application gets farther from the floor. Therefore, the proposed rule includes as the second required comparison tip-over moment, the moment associated with a child pulling horizontally on the CSU at the top reachable extension element handhold within the overhead reach dimension of a 95th percentile 3-year-old. This is because children 3 years old and younger are most commonly involved in these incidents.

The proposed rule applies the horizontal pull force to the top of an extended drawer in the top row of drawers, or to another potential handhold, that is less than or equal to 4.12 feet high (49.44 inches). The 4.12-foot height limit is based on the overhead reach height for a 95th percentile 3-year-old male; the proposed rule uses the overhead reach height of 3-year-olds because most children involved in opening drawer incidents were 3 years old or younger.⁹⁶ Consistent with this overhead reach height, staff's analysis of 15 incidents shows that the highest pull location was 46 inches from the floor.⁹⁷

The proposed rule includes a 17.2 pound-force of horizontal pull force. This pull force is based on the mean pull strength of 2- to 5-year-old females exerted at elbow level on a convex knob. The mean pulling strength of 2- to 5-year-old females is 76.43 Newton (17.2 pound-force), and 59.65 Newton (13.4 pound-force) for males.⁹⁸ In the study that provided these pull strengths, participants were 2 to 5 years old, and the mean participant weight was 16.3 kilograms (36 pounds). Participants were asked to exert their maximum strength at all times, described as the highest force they could exert without causing injury, using their dominant hand. Participants were instructed to build up to their maximum strength in the first few seconds, and to maintain maximum strength for an additional few seconds.

The proposed rule uses this 17.2 pound-force pull strength because, in the study, females had a higher mean strength than males, and these incidents

⁹⁶ Pheasant, S. (1986). *Bodyspace Anthropometry, Ergonomics & Design*. London: Taylor & Francis.

⁹⁷ Staff assessed 15 child incidents in which the height of the force application could be calculated based on descriptions of the incidents. Force application heights ranged from less than one foot to almost four feet (46.5 inches), and children pulled on the lowest, highest, and drawers in between.

⁹⁸ DTI, *Strength Data for Design Safety—Phase 1* (DTI/URN 00/1070). London: Department of Trade and Industry. (2000).

⁹⁴ Fryar, C.D., Carroll, M.D., Gu, Q., Afful, J., Ogden, C.L. (2021). *Anthropometric reference data for children and adults: United States, 2015–2018*. National Center for Health Statistics. *Vital Health Stat 3*(46). Three years of age covers children who are at least 36 months old and under 48 months old.

⁹⁵ For a CSU without drawers, X is measured from the fulcrum to the front edge of the farthest extended element, excluding doors. If the CSU has no extension elements (other than doors), X is measured from the fulcrum to the front of the CSU.

most commonly involve children 3 years old and younger. The weight of children in the study (36 pounds) is over the 50th percentile weight of 3-year-old children. Therefore, the pull force test requirement will address drawer opening and pulling on CSU incidents for 50 percent of 3-year-olds, 95 percent of 2-year-olds, 100 percent of children under 2 years, 25 percent of 4-year-olds, 10 percent of 5-year-olds, and will not address these incidents for children 6 years old and older.

Based on this 17.2-pound horizontal force on a handhold at a height of up to 4.12 feet, the moment created by this interaction can be described with the equation M (lb-ft) = 17.2 (lb) × Z (ft), where Z is the vertical distance (in feet) from the fulcrum to the highest handhold that is less than or equal to 4.12 feet high. Using this equation, the tip-over moment of the CSU in the second comparison value in the proposed rule is M_{tip} (lb-ft) > 17.2 Z .

iv. Climbing on Doors

As discussed in IV. Risk of Injury, two fatal CPSRMS and four nonfatal CPSRMS tip-over incidents involved wardrobes and armoires, which include doors. In most of these incidents, children were interacting with things inside the CSU, indicating that the doors were open. The ages of the children in these incidents ranged from 3 to 11 years, although opening doors is easily within the physical and cognitive abilities of younger children. Once CSU doors are open, children are capable of putting their body weight on the open doors (*i.e.*, open and climbing/hanging), provided the child has a sufficient hand hold. For this reason, the third comparison tip-over moment in the proposed rule represents the force from a 95th percentile 3-year-old child hanging on an open door of the CSU.

UMTRI researchers found that the vertical forces associated with children hanging by the hands were close to the body weight of the child (Figure 48 in Tab R of the NPR briefing package). For this reason, the third comparison tip-over moment, representing a child hanging on an open door, uses the weight of a 95th percentile 3-year-old child, or 51.2 pounds. Staff considers the weight placement location for testing doors in ASTM F2057–19 (section 7.2) reasonable. Therefore, the proposed rule uses the test location from the voluntary standard, which is approximately half the width of the test fixture, or 3 inches, from the edge of the door, to obtain the equation describing a 95th percentile weight 3-year-old child hanging from an open door of a CSU: M (lb-ft) = 51.2 (lb) × [$Y - 0.25$ (ft)],

where Y is the horizontal distance (in feet) from the fulcrum to the edge of the door in its most extended position. Based on this equation, the tip-over moment of a CSU with doors must meet the following criterion: M_{tip} (lb-ft) > 51.2($Y - 0.25$). Simplified, this is M_{tip} (lb-ft) > 51.2 $Y - 12.8$.

v. Additional Interactions

For the reasons described above, the proposed rule focuses on the interactions of children climbing on and opening CSUs. Although other plausible climbing-associated behaviors (*e.g.*, yank, lean, bounce, one hand) included in the UMTRI study generated higher moments, there was no direct evidence of these interactions in the incident data. However, depending on the child's age, weight, and strength, some of these interactions could be addressable with the proposed performance requirements. Other measured climbing interactions, for example, including hop up, hang, in drawer, and climbing onto the tabletop, generated lower moments than ascent. Similarly, staff expects that putting items in/taking items out of a drawer, reaching, pulling up, and hitting the CSU (all indicated in the incident data) would also generate lower moments than those included in the proposed rule. As such, these additional interactions are addressed by the proposed performance requirements. In addition, staff evaluated each of the seven incidents involving children jumping, falling from the top of the CSU, or swinging, considering the possible moment and reported age of the child and determined that five of the seven would be addressed by the proposed rule.

Although the proposed rule focuses on addressing the CSU tip-over hazard to children, improving the stability of CSUs should also reduce a substantial portion of the incidents involving adults. This is because a majority of the incidents involved consumers interacting with the CSU by opening drawers and/or getting items in and out of drawers, or leaning on the CSU, all scenarios that are expected to be less than or equally severe compared to incidents of children climbing with all drawers filled and opened.

C. Marking and Labeling

1. Proposed Requirements

The proposed rule includes requirements for a warning label. The proposed warning label requirements address the size, content, symbol, and format of the label. The proposed warning statements address the CSU tip-over hazard, and how to avoid it. They

indicate that children have died from furniture tipping over, and direct consumers how to reduce the risk of tip overs, by securing furniture to the wall; not allowing children to stand, climb, or hang on units; not defeating interlock systems (if the unit has them); placing heavier items in lower drawers; and not putting a television on CSUs (when the manufacturer indicates they are not designed for that purpose). The proposed format, font, font size, and color requirements incorporate by reference the provisions in ASTM F2057–19. The proposed rule also includes requirements for the location of the warning label, addressing placement in drawers or doors, and the height of the label in the unit. The proposed rule also requires the warning label to be legible and attached after it is tested using the methods specified in ASTM F2057–19.

The proposed rule also includes requirements for an informational label. It requires the label to include the name and address of the manufacturer, distributor, or retailer; the model number; the month and year of manufacture; and state that the product complies with the proposed rule. There are size, content, format, location, and permanency requirements as well. The label must be visible from the back of the unit when the unit is fully assembled, and must be legible and attached after it is tested using the methods specified in ASTM F2057–19.

2. Basis for Proposed Requirements

a. Warning Requirements, Generally

The proposed rule requires a warning label to inform consumers of the hazard and motivate them to install tip restraints as a secondary safety mechanism. However, there are limitations to the effectiveness of warning labels to address the risk of CSU tip overs. Risk perception is greatly influenced by product familiarity, hazardousness of the product, likelihood of injury, and severity of injury. Risk perception is also influenced by people's beliefs about their ability to control the hazard and whether they believe the warning message. An inherent problem with CSUs and the tip-over hazard is that people are less likely to recognize potential hazards associated with products that they use more frequently. CSUs are products with high familiarity because they are found in most households, and consumers are likely to interact with them daily.

Therefore, even well-designed warnings have limited effectiveness in changing a CSU user's behavior. In

addition, although the warning may impact adult behavior, children would not read or comprehend the warnings.

b. Warning Label Placement

In the FMG CSU use study (Tab Q of the NPR briefing package), researchers evaluated warning labels in in-home interviews and focus groups. They found that participants indicated that they had not paid attention to or noticed warning labels on the units in their children's rooms, even when the researchers noted they were present. Participants also indicated that, even if they had seen a warning label on a CSU, they probably would not pay attention to it. Focus group participants identified the following as potential locations where a warning label could be seen easily and be more likely to grab their attention: top of the unit in the corner, on the handle of a unit, inside the top drawer of a unit, and in the instruction manual. Participants said the back of the unit was not an acceptable place for the warning label because it would not be visible. Participants also expressed that they would remove labels that were too conspicuous (*e.g.*, on the outside or top of a unit).

An effective warning label must be visible and noticeable, and it must capture and maintain consumers' attention. The proposed rule requires the warning label to be placed in the uppermost clothing storage drawer or in one drawer in the uppermost row that is entirely below 56 inches, which is the 5th percentile standing eye height of women in the United States.⁹⁹ This is consistent with the information CPSC obtained from the FMG study, regarding placement of warnings.

c. Warning Label Content

After noticing a warning label, consumers must read the message, comprehend the message, and decide whether the message is consistent with their beliefs and attitudes. In addition, consumers must be motivated enough to spend the effort to comply with the warning-directed safe behavior. Warnings should allow for customization of hazard avoidance statements based on unit design, to reflect incident data (*e.g.*, television use). Similarly, the warning text should be understandable, not contradict typical CSU use, and be expressed in a

way that motivates consumers to comply.

In the FMG CSU use study, focus group participants evaluated the ASTM F2057–19 warning label text. Participants had mixed opinions about the statement: “Children have died from furniture tip over.” Some participants found it motivating, others believed that it was hyperbole and seemed likely to disregard it. The majority of participants said that they do not follow the instruction to install a tip restraint, especially if the tip restraint is not included with the CSU. Participants wanted more information about why they should not put a television on a CSU, and some thought consumers would disregard the warning if putting a television on top of a CSU fit their needs. A majority of participants said that they open more than one drawer at a time, and that children typically open one or two drawers. Participants believed that placing the heaviest items in the lowest drawers was common sense, and was a warning they would follow.

Based on this information, the proposed warning label includes warnings about the hazard, television use (where appropriate for the product), and placing heavier items in lower drawers, but does not include a statement to not open multiple drawers because that is inconsistent with consumer use. In addition, the proposed tip-restraint warning explicitly directs the consumer to secure the CSU to the wall and uses a term for tip restraint that consumers will likely understand. “Tipover restraint,” used in ASTM F2057–19, might confuse some consumers because restraints generally describe what they contain (*e.g.*, child restraint), rather than what they prevent. Terminology such as “anti-tip device” is clearer.

a. Warning Label Format and Style

The proposed rule requires the warning label to be at least 2 inches wide by 2 inches tall. This size is consistent with the required content and format for the label, and it ensures that the label is not too narrow or short.

The proposed rule also requires the child climbing symbol that is ASTM F2057–19. However, as discussed in section VII.G. Warning Label Symbols, if one of the two variants being considered performs better in comprehension testing than the ASTM F2057–19 child climbing symbol, the Commission may consider requiring one of those variants in the final rule. The proposed rule also requires the ASTM F2057–19 no television symbol for CSUs that are not designed to hold a television.

CPSC staff regularly uses ANSI Z535.4, *American National Standard for Product Safety Signs and Labels*—the primary U.S. voluntary consensus standard for the design, application, use, and placement of on-product warning labels—when developing or assessing the adequacy of warning labels. The proposed rule uses the warning format in ASTM F2057–19, which is consistent with ANSI Z535.4.

To be effective, a warning label must remain present. Label permanency requirements are intended to prevent the warning label from being removed inadvertently and to provide resistance to purposeful removal by the consumer. CPSC staff evaluated the ASTM F2057–19 label permanency requirements (Tab F of the NPR briefing package) and concluded that they are adequate. Accordingly, the proposed rule includes the permanency testing prescribed in ASTM F2057–19.

b. Informational Label

Staff was able to identify the manufacturer and model of CSU associated with only 22 of the 89 fatal CPSRMS incidents involving children and CSUs without televisions¹⁰⁰ and 230 of the 263 nonfatal CPSRMS incidents involving children and CSUs without televisions. In the case of recalls, consumers must be able to identify whether their CSU is subject to the recall and is potentially unsafe. Accordingly, an identification label that provides the model, manufacturer information, date of manufacture, and a statement of compliance with the proposed rule is important to facilitate identification and removal of potentially unsafe CSUs. This label would also allow for easier identification of compliant and noncompliant CSUs by consumers and CPSC, and would provide information that would assist in identifying the CSU, allowing staff to assess more easily hazards associated with specific designs.

The proposed rule requires the informational label to be at least 2-inches wide by 1-inch tall, which is consistent with the required content and format, and ensures that the label is not too narrow or short. The proposed rule requires text size that is consistent with ANSI Z535.4. The proposed rule requires the identification label to be visible from the back of the unit when the unit is fully assembled because it is not necessary for the label to be visible to the consumer during normal use, but it should be visible to anyone inspecting the unit. In addition, the proposed rule

¹⁰⁰ An additional CSU was identified as handmade.

⁹⁹ Nesteruk, H.E.J. (2017). Human Factors Analysis of Clothing Storage Unit Tipover Incidents and Hazard Communication. In Staff Briefing Package Advance Notice of Proposed Rulemaking: Clothing Storage Units. Available at: <https://www.cpsc.gov/s3fs-public/ANPR%20-%20Clothing%20Storage%20Unit%20Tip%20Overs%20-%20November%2015%202017.pdf>.

requires permanency testing prescribed in ASTM F2057–19 to increase the likelihood that the label remains attached to the CSU.

D. Hang Tags

1. Proposed Requirements

As discussed above, section 27(e) of the CPSA authorizes the Commission to issue a rule to require manufacturers of consumer products to provide “such performance and technical data related to performance and safety as may be required to carry out the purposes of [the CPSA].” 15 U.S.C. 2076(e). The Commission may require manufacturers to provide this information to the Commission or, at the time of original purchase, to prospective purchasers and the first purchaser for purposes other than resale, as necessary to carry out the purposes of the CPSA. *Id.*

The proposed rule sets out requirements for providing performance and technical data related to performance and safety to consumers at the time of original purchase and to the first purchaser of the CSU (other than resale) in the form of a hang tag. The hang tag provides a stability rating, displayed on a scale of 0 to 5, that is based on the ratio of tip-over moment (as determined in the testing required in the proposed rule) to the minimally allowed tip-over moment (provided in the proposed rule). The proposed rule includes size, content, icon, and format requirements for the hang tag. It also includes a requirement that the hang tag be attached to the CSU and clearly visible to a person standing in front of the unit; that lost or damaged hang tags must be replaced such that they are attached and provided, as required by the rule; and that the hang tags may be removed only by the first purchaser. In addition, the proposed rule includes placement requirements that the hang tag appear on the product and the immediate container of the product in which the product is normally offered for sale at retail; that for ready-to-assemble furniture, the hang tag must appear on the main panel of consumer-level packaging; and that any units shipped directly to consumers shall contain the hang tag on the immediate container of the product. For a detailed description of the proposed regulatory text.

2. Basis for Proposed Requirements

a. Purpose

Consistent with the requirements in section 27(e) of the CPSA, the proposed hang tag requirements help carry out the purpose of the CPSA by “assisting

consumers in evaluating the comparative safety of consumer products.” 15 U.S.C. 2051(b)(2). The proposed rule would require CSUs to meet a minimum level of stability (*i.e.*, exceed a threshold tip-over moment). However, above that minimum level, CSUs may have varying levels of stability. A hang tag provided on the CSU would offer consumers comparative information about the stability of products, based on the tip-testing protocol in the proposed rule. By providing product information at the point of purchase, the hang tag would inform consumers who are evaluating the comparative safety of different CSUs and making buying decisions. This information may also improve consumer safety by incentivizing manufacturers to produce CSUs with higher levels of stability, to better compete in the market, thereby increasing the overall stability of CSUs on the market.

b. Background

CPSC based the formatting and information requirements in the proposed hang tag on work CPSC has done previously to develop performance and technical data requirements,¹⁰¹ as well as the work of other federal agencies that require comparative safety information on products.¹⁰² As part of CPSC’s development of a similar requirement for recreational off-highway vehicles (ROVs), CPSC issued a contract for cognitive interviews and focus group evaluation to refine the proposed ROV hang tag. The contractor developed recommendations regarding the content, format, size, style, and rating scale, based on consumer feedback during this work.¹⁰³

Studies on the usefulness and comprehension of point-of-sale product information intended to help consumers evaluate products and make buying decisions support the effectiveness of hang tags, and linear scale graphs, in particular. For example, a study on the EnergyGuide label for appliances, which also uses a linear scale, indicated that the label increased consumer awareness

¹⁰¹ *E.g.*, 16 CFR 1401.5, 1402.4, 1404.4, 1406.4, 1407.3, and 1420.3.

¹⁰² *E.g.*, the Federal Trade Commission’s EnergyGuide label for appliances in 16 CFR part 305, requiring information about capacity and estimated annual operating costs; and the National Highway Traffic Safety Administration’s New Car Assessment Program star-rating for automobiles, providing comparative information on vehicle crashworthiness.

¹⁰³ EurekaFacts, LLC, *Evaluation of Recreational Off-Highway (ROV) Vehicle Hangtag: Cognitive Interview and Focus Group Testing Final Report* (Aug. 31, 2015), available at: <https://www.cpsc.gov/s3fs-public/pdfs/ROVHangtagEvaluationReport.pdf>.

of energy efficiency as an important purchasing criterion.¹⁰⁴

c. Specific Elements of the Proposed Requirements

One element of the proposed hang tag is a symbol depicting a CSU tipping over. This symbol identifies the product and hazard. Research studies have found that warning labels with pictorial symbols are more noticeable to consumers.¹⁰⁵ To allow consumers to identify exactly what product the label describes, the proposed hang tag requires the manufacturer’s name and the model number of the unit. The proposed requirement also includes text to explain the importance of the graph, and the significance and meaning of the tip-over resistance value of the CSU. The proposed graph indicates the minimally acceptable tip rating, which is 1,¹⁰⁶ so that consumers can evaluate the extent to which the rating of a particular CSU meets or exceeds the minimal permissible rating. In addition, the proposal requires the front of the hang tag to be yellow, to increase the likelihood consumers attend to the tag, and also consistent with EurekaFacts research recommendations (discussed below) and the EnergyGuide hang tag for household appliances, which is “process yellow.”

The performance criteria in the proposed stability requirement requires the tested moment of a CSU to be greater than a calculated threshold moment requirement. The tip rating number on the hang tag is the ratio of tested moment to threshold requirement. This provides a simple calculation that results in a number greater than 1,¹⁰⁷ which can be easily represented on a scale. Additionally, due to the nature of a ratio, a rating of 2 means the unit can withstand twice the threshold moment, a rating of 3 is three times the threshold moment, and so forth. As an example: Unit A has an acceptable moment of 10 ft-lbs. When A is tested, the test engineer finds it tips at 25 ft-lbs. Unit

¹⁰⁴ National Research Council. *Shopping for Safety: Providing Consumer Automotive Safety Information—Special Report 248*. Washington, DC: The National Academies Press (1996).

¹⁰⁵ Wogalter, M., Dejoy, D., Laughery, K., *Warnings and Risk Communication*. Philadelphia, PA: Taylor & Francis, Inc. (1999).

¹⁰⁶ The minimally acceptable rating is just above 1 because the tested moment of a CSU must be greater than the threshold moment, however, for simplicity, the proposed hang tag marks the minimally acceptable rating as 1.

¹⁰⁷ The equation is $\text{Moment}_{\text{tested}} / \text{Moment}_{\text{threshold}}$. If $\text{Moment}_{\text{tested}} = \text{Moment}_{\text{threshold}}$, then $\text{Moment}_{\text{tested}} / \text{Moment}_{\text{threshold}} = 1$. But the proposed performance requirement is that $\text{Moment}_{\text{tested}} > \text{Moment}_{\text{threshold}}$. Therefore, all units must have a ratio greater than 1, although it may be only a small fraction over 1.

A's ratio is 25:10, for a rating of 2.5. Unit B also has an acceptable moment of 10 ft-lbs. Testing on Unit B found it tipped at 50 ft-lbs. Unit B's ratio is 50:10, or a rating of 5. Unit C has an acceptable moment of 5 ft-lbs. Testing on Unit C found it tipped at 20 ft-lbs. Its ratio is 20:5, or a rating of 4. Therefore, Unit A is 2.5 times more stable than required; Unit B is 5 times more stable than required; and Unit C is 4 times more stable than required. Also, unit B is twice as stable as unit A. Unit C lies between units A and B in terms of stability.

Because the linear scale on the proposed hang tag is a graphical representation of the stability information, it is important to include labels so that consumers understand the data on the tag. To make clear the meaning of the information on the linear scale, CPSC staff placed the label "high" at the right side of the scale to identify for the consumer that the higher value equates to better stability or higher tip-over resistance. The proposed hang tag also includes a technical explanation of the graph and rating to explain how to interpret and use the graphic and number.

When EurekaFacts conducted research on CPSC's proposed ROV hang tag, focus group participants preferred to have whole numbers anchoring the scale, such as 1 to 10, to communicate comparative information. CPSC staff testing suggests that, although few CSUs currently meet the proposed requirement, many CSUs on the market today would achieve ratings between 1 and 2, with appropriate modifications. Therefore, using a 10-point scale may be difficult for consumers to differentiate between units. To minimize this difficulty, the proposed requirement uses a 5-point scale. CPSC expects that, over time, there may be units with a broader range of scores (beyond the current 1 and 2), as consumers desire more stable units, and manufacturers build more stable units. Although some units theoretically could have a normalized value over 5, representing this as a 5, or the highest point on the scale, would be reasonably interpreted by consumers as a high stability. If, in the future, many CSUs exceed 5, the Commission can revisit the scale.

In the proposed rule, the scale begins at 0. EurekaFacts found focus group participants preferred whole numbers as anchor points on the scale range and expressed confusion with decimals. Zero is lower than the minimal acceptable rating of 1 to provide a common anchor point in consumers' mental models of a scale, and the whole numbers allow for better relative

comparisons. In addition, allowing the display of a rating lower than the requirement allows simple identification that CSUs at least meet the minimum requirement.

Research has shown that pictorial symbols and icons make warnings more noticeable and easier to detect than warnings without such symbols and icons.¹⁰⁸ Additionally, including a graphic before introducing text may serve as a valuable reference for consumers, by maintaining attention and encouraging further reading.¹⁰⁹ For these reasons, the proposed hang tag requirement includes a symbol of a CSU at a slight angle to identify the product and tipping characteristics. In addition, presenting information both graphically and textually offers a better chance of comprehension by a wide range of users, such as non-English-literate users.

The size, placement, and attachment specifications in the proposed hang tag requirement are consistent with the recommendations by EurekaFacts and similar requirements in other standards. The EurekaFacts report found that participants preferred hang tags to be large because they were more noticeable and easier to read. In addition, participants preferred a vertical orientation. Based on this information, the proposed hang tag must be 5-inches wide by 7-inches tall.

Consistent with similar standards, the proposed hang tag provision requires the tag to be provided at the time of original purchase, that it be replaced if lost or damaged, that it appear on the product and packaging, that it be clearly visible to a person standing in front of the unit, and that it be removable only with deliberate effort. These requirements facilitate the tag staying on the product so that consumers see and use the information on the hang tag when making purchasing decisions.

Because the proposed stability performance criteria are based on moments, which are not easily understood forces, CPSC expects that some consumers may wish to better understand the information provided. For this reason, the reverse side of the hang tag provides additional information about the test used to calculate the stability rating on the front of the hang tag and what the rating means. The required font sizes are intended to facilitate ease of reading.

¹⁰⁸ Wogalter, M., Dejoy, D., Laughery, K. (1999). *Warnings and Risk Communication*. Philadelphia, PA: Taylor & Francis, Inc.

¹⁰⁹ Smith, T.P. (2003). *Developing consumer product instructions*. Washington, DC: U.S. Consumer Product Safety Commission.

E. Prohibited Stockpiling

1. Proposed Requirements

As explained earlier in this preamble, section 9(g)(2) of the CPSA allows the Commission to prohibit manufacturers of a consumer product from stockpiling products subject to a consumer product safety rule to prevent manufacturers from circumventing the purpose of the rule. 15 U.S.C. 2058(g)(2). The proposed rule prohibits manufacturers and importers of CSUs from manufacturing or importing CSUs that do not comply with the requirements of the proposed rule in any 1-month period between the date a rule is promulgated and the effective date of the rule at a rate that is greater than 105 percent of the rate at which they manufactured or imported CSUs during the base period for the manufacturer. The proposed rule defines the base period as the calendar month with the median manufacturing or import volume within the last 13 months immediately preceding the month of promulgation of the final rule.

2. Basis for Proposed Requirements

The proposed stockpiling limit is intended to allow manufacturers and importers sufficient flexibility to meet normal levels and fluctuations in demand for CSUs, while limiting their ability to stockpile large quantities of CSUs that do not comply with the rule for sale after the effective date. Because most firms will need to modify their CSUs to comply with the proposed requirements, and the modifications may be costly, CPSC believes it is appropriate to prevent stockpiling of noncompliant products.

IX. Preliminary Regulatory Analysis¹¹⁰

The Commission is proposing to issue a rule under sections 7 and 9 of the CPSA. The CPSA requires that the Commission prepare a preliminary regulatory analysis and that the preliminary regulatory analysis be published with the text of the proposed rule. 15 U.S.C. 2058(c). The following discussion is extracted from staff's memorandum, "Draft Preliminary Regulatory Analysis of the Proposed Clothing Storage Unit Stability Rule," available in Tab H of the NPR briefing package.

A. Preliminary Description of Potential Costs and Benefits of the Proposed Rule

The preliminary regulatory analysis must include a description of the potential benefits and potential costs of the proposed rule. The benefits of the

¹¹⁰ Further detail regarding the preliminary regulatory analysis is available in Tab H of the NPR briefing package.

rule are measured as the expected reduction in the societal costs of deaths and injuries that would result from adoption of the proposed rule and any benefits that cannot be quantified. The costs of the rule are defined as the added costs associated with modifying CSUs to comply with the requirements of the rule, including any impacts on the utility of the CSUs for consumers, as well as any costs that cannot be quantified.

Deaths and Injuries Related to Tip Overs of CSUs. CPSC identified 179 deaths related to CSU tip-over incidents involving children that occurred from 2001 through 2016.¹¹¹ This results in an average of 11.2 deaths per year over this 16-year period. These are the deaths associated with CSU tip-over incidents of which CPSC staff is aware. The actual number of deaths from CSU tip-over deaths during this period could be higher.

Ninety-seven of the 179 deaths also involved television sets that had been placed on top of the CSU. Of the 97 deaths involving televisions, 80 (82 percent) involved older, heavy CRT televisions, and only one of the deaths is known to have involved a flat-screen television. The older CRT televisions are usually substantially heavier than the newer flat-screen televisions, which may pose more serious injuries during a tip over, and may shift the center of gravity of the CSU forward, making it less stable. Based on this, as the number of CRT televisions in use decreases, staff expects the number of tip-over incidents and their severity to decrease. In 2010, about 55 percent of all televisions in use were CRT televisions. By 2020, that percentage was expected to be about 9 percent; and it is expected to decline to less than 1 percent by 2030. Thus, incidents involving CRT televisions are not considered in the main analysis. Considering only those cases for which staff know that a CRT television was not involved, there were 99 fatalities (179 deaths less 80 that involved a CRT television) during the 16-year period, or an average of 6.2 per year.

Although the proposed standard is intended to address CSU fatalities involving children, during the same period from 2001 through 2016, there were 29 fatalities involving adults and CSUs tipping over, or an average of 1.8 a year. Fourteen of these victims were

age 80 years or older, and none were younger than 40. It is possible that some of these or similar deaths could have been prevented had the CSUs involved met the stability requirements of the proposed rule.

Based on NEISS, there were an estimated 14,900 nonfatal injuries to children involving CSU tip overs during the 5-year period from 2015 through 2019 that were treated in hospital EDs. About 2,300 of these estimated injuries (16 percent) involved televisions that had been placed on top of the CSUs. However, staff is not making any adjustments for nonfatal injuries that also involved a television set because there is generally less information available about the nonfatal injuries than for the fatality cases, making it more difficult to determine if the television involved was a CRT or a flat screen.

In addition to injuries initially treated in hospital EDs, many product-related injuries are treated in other medical settings, such as physicians' offices, clinics, and ambulatory surgery centers. Some injuries also result in direct hospital admission, bypassing the hospital ED entirely. The number of CSU-related injuries treated outside of hospital EDs can be estimated with the CPSC's Injury Cost Model (ICM), which uses empirical relationships between the characteristics of injuries (diagnosis and body part) and victims (age and sex) initially treated in hospital EDs and the characteristics of those initially treated in other settings.

The ICM estimate of injuries treated outside of hospitals or hospital EDs (e.g., in doctors' offices, clinics) is based on data from the Medical Expenditure Panel Survey (MEPS). The MEPS is a nationally representative survey of the civilian, non-institutionalized population that quantifies individuals' use of health services and corresponding medical expenditures. To project the number of direct hospital admissions that bypass hospital EDs, the ICM uses data from the Nationwide Inpatient Sample of the Healthcare Cost and Utilization Project (HCUP-NIS). HCUP is a family of healthcare databases and related software tools and products developed through a federal-state-industry partnership and sponsored by the Agency for Healthcare Research and Quality (part of the U.S. Department of Health and Human Services). The HCUP-NIS provides information annually on approximately 3 million to 4 million in-patient stays from about 1,000 hospitals.

Based on the NEISS estimate of 14,900 ED-treated injuries in 2015 through 2019, the ICM projects

approximately 19,300 CSU tip-over injuries treated in other settings during the same 5-year period, or an average of 3,900 per year. Combining the NEISS estimate of injuries treated in hospital EDs with the ICM estimate of medically attended injuries treated in other settings brings the estimate of all nonfatal, medically attended CSU tip-over injuries to children under the age of 18 years to 34,100 during the years 2015 through 2019.

During the same 2015 to 2019 period, there were an estimated 7,000 adults and seniors that were treated in EDs because of injuries received when CSUs tipped over. Although the proposed rule is intended to reduce injuries to children, some portion of the injuries to adults would probably have been prevented had the CSUs involved met the stability requirements of the proposed rule. Based on the NEISS estimate of 7,000 injuries to adults treated in EDs, the ICM projects that there were 15,700 injuries treated in other medical settings, for a total of 22,700 medically attended injuries to adults involving CSU tip overs.

Societal Costs of Deaths and Injuries. To estimate the societal costs of CSU-related deaths, staff applied an estimate of the value of statistical life (VSL), an estimate used in benefit-cost analysis to place a value on reductions in the likelihood of premature deaths. For this analysis, staff applied estimates of the VSL developed by the U.S. Environmental Protection Agency (EPA). In 2018 dollars, the EPA estimate of the VSL is about \$9.2 million, suggesting the societal cost of the fatalities is about \$57.0 million annually, if only those deaths to children reported not to involve a CRT television are included ($6.2 \times \$9.2$ million). If all deaths are included, the societal costs of the fatalities would be \$103.0 million annually ($\9.2 million \times 11.2 deaths per year). The societal cost of the adult fatalities would be \$16.6 million a year (1.8 deaths \times $\$9.2$ million).

The societal costs of the nonfatal CSU injuries are quantified with the ICM. The ICM is fully integrated with NEISS, and in addition to providing estimates of the societal costs of injuries reported through NEISS, the ICM also estimates the costs of medically treated injuries that are initially treated outside of hospital EDs. The aggregated societal cost components provided by the ICM include medical costs, work losses, and the intangible costs associated with lost quality of life, or pain and suffering.

Information on the societal costs associated with nonfatal CSU injuries to children are presented in Table 2, and

¹¹¹ For this preliminary regulatory analysis, staff used the data for 2001 to 2016, rather than the more recent data provided in the full incident data, in order to calculate an annual average. Data collection is ongoing for more recent years. If the data included the years for which data collection is ongoing, the calculated annual average would be low.

the societal costs of the nonfatal injuries to adults are presented in Table 3. The estimates are the average annual costs for the 5-year period from 2015 through 2019. The national estimates of medically attended injuries described above are presented in column 2, and include not only the 3,000 injuries to children initially treated in hospital EDs (1,400 in the case of adults), but also the 3,900 other medically attended injuries

initially treated outside of hospital EDs (3,100 in the case of adults). The estimated injury costs range from about \$15,015 per injury treated in physicians' offices, to about \$34,522 for injuries to patients treated and released from a hospital ED, to about \$323,296 for hospital admitted injuries (averaging the costs associated with those admitted from the ED and those admitted to the hospital bypassing the ED). The average

cost of injuries to adults was slightly lower than the average cost of injuries to children: \$28,344 vs. \$31,757. Altogether, the societal costs of nonfatal injuries to children involving CSUs averaged \$216,747,160 annually, from 2015 through 2019. The cost of injuries to adults averaged \$128,710,471 annually over the same period.

TABLE 2—AVERAGE ANNUAL NONFATAL INJURY COSTS ASSOCIATED WITH CSU TIP OVERS TO CHILDREN UNDER THE AGE OF 18 (2015–2019)

Place of treatment	National estimate	Medical cost	Work loss	Pain and suffering	Average total cost	Total cost
Doctor/Clinic	3,804	\$653	\$1,521	\$12,842	\$15,015	\$57,112,589
Emergency Department	2,830	2,886	1,767	29,899	34,552	97,786,129
Hospital-Adm Direct	53	31,157	105,672	160,347	297,176	15,654,763
Hospital-Adm via ED	139	34,371	116,072	182,813	333,256	46,193,679
Average .....	.....	2,499	4,753	24,505	31,757	.....
Total	6,825	17,057,479	32,438,983	167,250,698	.....	216,747,160

Source: CPSC Injury Cost Model and NEISS cases involving CSU tip overs for the years 2015 through 2019.

TABLE 3—AVERAGE ANNUAL NONFATAL INJURY COSTS ASSOCIATED WITH CSU TIP OVERS TO ADULTS 18 YEARS OF AGE AND OLDER (2015–2019)

Place of treatment	National estimate	Medical cost	Work loss	Pain and suffering	Average total cost	Total cost
Doctor/Clinic	3,094	\$837	\$2,692	\$13,800	\$17,329	\$53,613,046
Emergency Department	1,284	2,519	2,516	21,247	26,281	33,731,304
Hospital-Adm Direct	37	38,728	72,391	139,589	250,707	9,396,404
Hospital-Adm via ED	126	40,739	69,784	142,870	253,393	31,969,717
Average .....	.....	2,734	5,081	20,529	28,344	.....
Total	4,541	12,412,977	23,074,265	93,223,230	.....	128,710,471

Source: CPSC Injury Cost Model and NEISS cases involving CSU tip overs for the years 2015 through 2019.

Potential Benefits of Stability Requirements for CSUs. The proposed rule would require that the tip-over moment of a CSU, as determined by the method in the proposed standard, exceed the moment that would be produced by a 51.2-pound child climbing up a drawer or hanging on a door, or a child pulling on drawers and doors of the CSU. The following discussion estimates the projected reduction in the societal costs of deaths and injuries under the proposed rule.

Table 4 summarizes the annual societal costs of deaths and injuries by age of the victims. Staff used this information to estimate the anticipated reduction in the societal costs of injuries that can be anticipated if the proposed regulation is finalized. The costs associated with fatalities are based on the fatalities known to CPSC staff that

occurred from 2001 through 2016, and excludes those fatalities in which CRT televisions were known to be involved. Incidents known to involve a CRT television were excluded for the reasons described above, however, cases for which the type of television involved could not be determined were included because some of these incidents might have involved a flat-screen television. The societal costs of nonfatal injuries are based on NEISS cases occurring from 2015 through 2019. No adjustment for the potential involvement of CRT televisions has been made in the nonfatal estimates for the reasons described above.

Given the multiple real-world factors that contribute to tip overs that the proposed rule accounts for, CPSC staff concludes that the proposed rule should prevent CSU tip-over incidents caused

by children climbing up, hanging on, or pulling on drawers and doors of the CSU, provided that the child weighs 51.2 pounds or less. The proposed rule is also expected to prevent other common, but less severe scenarios such as opening drawers without climbing, putting items in and out of drawers, or playing in a drawer. CPSC staff believes that the proposed rule could prevent virtually all of these tip-over incidents involving children who are most at risk and probably many similar incidents involving older children and adult victims. The proposed rule would be less effective in reducing tip overs in some severe, but less common scenarios, such as bouncing and yanking; however, these scenarios were not directly observed in the incident data.

TABLE 4—ANNUAL SOCIETAL COSTS OF INJURIES AND DEATHS BY AGE (MILLIONS OF DOLLARS)

Age (in years)	Fatalities*	Societal cost fatalities	Injuries	Societal cost of nonfatal injuries	Societal costs of injuries and deaths
Less Than 2	2.4	\$22.1	1,039	\$29.3	\$51.4
2	1.9	17.5	1,498	58.7	76.2
3	1.4	12.9	1,346	43.5	56.4
4	0.1	0.9	980	41.1	42.0
5	0.1	0.9	582	13.9	14.8
6	0.1	0.9	532	13.7	14.6
7	0.1	0.9	172	5.7	6.6
8	0.1	0.9	244	2.9	3.8
9 to 17 .....	.....	.....	431	8.1	8.1
Total Children	6.2	57.0	6,824	216.9	273.9
18 and Over	1.8	16.6	4,541	128.7	145.3
Total	8.0	73.6	11,366	345.6	419.2

* Average fatalities per year from 2001 through 2016.

** Average number of medically attended injuries from 2015 through 2019.

Benefits from Reduced Fatalities. A review of the fatal CSU tip-over incidents involving children and used in this analysis found that all of the victims weighed less than 51.2 pounds. Given staff’s conclusion that the proposed requirements would prevent nearly all tip overs involving children who weigh less than 51.2 pounds, staff believes that all of these fatalities could have been prevented if the CSUs involved had complied with these requirements. More than 90 percent of the child fatalities involved children 3 years old or younger. The vast majority of children of this age weigh less than 51.2 pounds. However, there were a few fatalities, an average of about 1 every other year, to older children who could weigh more than 51.2 pounds. Therefore, for purposes of projecting the benefits of the proposed rule, although staff predicts that almost all fatalities involving children 3 years old and younger could be prevented,¹¹² staff estimates that only about 48 percent of the deaths to children 4 through 8 years old would be prevented. These calculations are based on analysis by the Division of Human Factors staff concerning the potential of the proposed rule to prevent tip-over deaths by age. Therefore, based on the fatalities between 2001 and 2016, staff estimates that, had all CSUs met the requirements of the proposed rule, about 94 percent of the deaths to children could have been prevented, or an average of 5.8 deaths could have been prevented each year. Assuming a VSL of \$9.2 million, the benefit of the proposed rule in terms

¹¹² Staff assumes that all deaths involving children 2 years old and younger would be prevented and about 95 percent of the deaths involving 3-year-old children would be prevented.

of reduced child deaths could be \$53.4 million annually.

As noted above, there are also an average of 1.8 fatalities to adults each year from CSU tip-over incidents. There is less information available regarding the tip-over incidents involving adults. Many of the available narratives of these incidents suggest that victims were losing their balance and grabbed the CSU in an effort to balance themselves. Although adults weigh more than 51.2 pounds, because the adults were not attempting to climb the CSUs, the full weight of the adult victim was probably not on the CSU when the incident occurred. Moreover, many of the nonfatal cases involved adults interacting with the CSU, by opening drawers, getting items in and out of drawers, or leaning on the CSU. In many cases, these scenarios are expected to be less or equally severe scenarios, compared to children climbing with all drawers filled and opened. Therefore, CPSC staff has concluded that a substantial portion of the CSU tip-over incidents involving adults would be prevented if the stability of the CSUs was improved. Although staff cannot estimate the exact portion of the incidents involving adults that would be prevented, for purposes of attempting to quantify the benefits of the proposed rule, this analysis assumes that the proposed rule would prevent adult tip-over incidents at about one-half the rate that it prevents child tip-over incidents. On average, this is approximately 0.8 adult fatalities prevented annually or a societal benefit of about \$7.4 million annually.¹¹³

¹¹³ Staff estimates that the proposed rule prevent about 94 percent of the fatalities involving children (5.5 deaths prevented/6.2 total deaths). If the proposed rule prevents adult fatalities at one-

Together, the potential benefits of the proposed rule from reducing fatal tip-over incidents to both adults and children is estimated to be \$60.8 million annually, if all CSUs were to comply with the requirements. This consists of an estimated \$53.4 million from reducing approximately 5.8 child fatalities a year and \$7.4 million from reducing an average of 0.8 adult fatalities a year. Staff emphasizes that the annual benefits would not actually reach this level until most CSUs in use meet the requirements of the proposed rule. Using the historical sales estimates and an estimated average product life of 15 years, CPSC staff estimates that about 463.5 million CSUs were in use in 2017 and 466 million CSUs were in use in 2018. Given that staff estimates there are approximately 460 million CSUs in use, annual sales are about 44 million units, and the average useful life of CSUs is 15 years, it would likely be more than 10 years after such a requirement goes into effect before the annual benefits approach this level.

Benefits from Reduced Injuries. To evaluate the effectiveness of the proposed rule in reducing nonfatal injuries, CPSC staff examined 1,463 NEISS records to determine what the child was doing when the tip-over incident occurred. In 925 incidents, it was not possible to determine the interaction involved in the incident. The remaining 538 incidents were reviewed to determine whether it was likely that the proposed rule would have prevented the incident. A summary of staff’s conclusions regarding these incidents is available in Tab H of the NPR briefing package (Table 3), but the following provides key insights.

half this rate, then about 47 percent of the 1.8 annual deaths to adults might be prevented.

Most of the incidents involved a child climbing the CSU—this interaction accounted for 412 incidents (74 percent). Because the proposed rule is intended to prevent furniture tip overs involving children 51.2 pounds or less climbing on CSUs, staff assumed that all of these incidents would be prevented if the victim weighed less than 51.2 pounds. The NEISS record does not include the weight of the victim, so staff used the age of the victims and data on the distribution of weight by age and sex to estimate the number of incidents that the proposed rule might have prevented.

Staff assumed that all incidents involving children 2 years old and younger that involved climbing a CSU would have been prevented by the proposed rule because the 95th percentile weight for boys is only about 75 percent of 51.2 pounds. Therefore, it is safe to conclude that virtually all children 2 years old and younger weigh less than 51.2 pounds and would be protected by the proposed rule. For 3-year-old children, the 95th percentile weight for boys is 51.2 pounds, which means that an estimated 5 percent of 3-year-old boys weigh more than 51.2 pounds and might not be protected by the proposed rule. To account for this, staff assumed that only 95 percent of the incidents involving 3-year-old children would have been prevented by the proposed rule. For 4-year-old children, based on the percentile weights from the CDC, the 90th percentile weight for boys is 49.1 pounds and the 95th percentile weight is greater than 51.2 pounds. For 4-year-old girls, the 95th percentile weight is 50.1 pounds. Based on these percentile weights, staff assumed that 92.5 percent of the climbing-related incidents involving 4-year-old children would have been prevented. Staff followed the same procedure to estimate the percentage of incidents to children ages 5 years through 8 years. For example, for children 6 years old, the 75th percentile weight for both boys and girls is greater than 51.2 pounds. The 50th percentile weights for boys and girls are 50.3 and 48.6 pounds, respectively. Based on these weights, staff estimated that the proposed rule would have prevented 50 percent of the climbing incidents that involved 6-year-old children. Based on the percentile

weights from the CDC, virtually all children 9 years old and older would be expected to weigh more than 51.2 pounds. Therefore, staff cannot be confident that any of the climbing incidents involving children older than 8 years would have been prevented by the proposed rule.

Another 49 tip-over incidents involved children who were reaching into the CSU, or placing items in, or retrieving items from, the CSU. In a few cases, the victim was playing in the bottom drawer of the CSU, or was hit by the CSU when it tipped over. None of these scenarios would be expected to cause as much rotational force on a CSU as climbing a CSU. Staff believes that CSUs that meet the requirements of the proposed rule, which is intended to prevent tip overs in more severe circumstances, would not tip over in these incidents. Therefore, staff believes that all of these incidents would have been prevented by the proposed rule.

A total of 58 incidents involved children pulling on the CSU, or opening drawers. Staff analyzed these incidents based on children’s pull strength ability and determined that 62 percent of these incidents would be prevented by the proposed rule.

Finally, there were 19 incidents that involved activities such as the victim “swinging” on the CSU, jumping from the CSU, and being on top of the CSU. Based on staff’s analysis, staff assumed that 47 percent of these incidents would be prevented by the proposed rule.

Staff considered 22 incidents in which some “other person” caused the tip over as part of the unknown scenarios, because details on “other person” are not available to make an estimate.

In total, staff believes that the proposed rule would have prevented about 87 percent of NEISS tip-over injuries involving children 17 years of age and under, including about 91 percent of the tip-over incidents involving children climbing on CSUs. As Table 2 in Tab H of the NPR briefing package indicates, the average annual societal cost of nonfatal injuries to children from CSU tip-over incidents is about \$216.9 million. If the proposed rule can prevent 87 percent of these injuries, the annual benefit from the

reduction of nonfatal injuries to children would be \$188.7 million.

As with the adult fatality victims, there is less information available on the activities of the adult victims in the nonfatal incidents. In many cases, the narrative in the NEISS record simply contains a statement such as “dresser fell onto hand,” with no description of the interaction. Some narratives indicate that the victim might have grabbed onto the CSU for balance, was falling and hit the CSU, or may have been attempting to move the CSU. Staff also assumes that some CSUs tipped over when the adult was opening drawers to place items in or remove items from the unit, given that these interactions were in some incidents involving children. Given the very limited information on the activities of the adult victims at the time of the tip-over incident, staff does not have a basis for making strong estimates of the number of incidents that would have been prevented by the proposed rule. However, it is reasonable to expect that a rule that requires CSUs to be more stable would reduce nonfatal injuries to adults. In this analysis, staff assumes that nonfatal incidents involving adults would be reduced by half the percentage that nonfatal incidents to children would be reduced. Because staff believes that the proposed rule will reduce nonfatal tip-over injuries to children by 87 percent, staff assumes that nonfatal adult tip-over injuries will decline by 43.5 percent. Because the average annual societal cost of nonfatal tip-over injuries to adults is estimated to be \$128.7, if all CSUs comply with the proposed rule, the societal cost of the injuries would be reduced by \$56.0 million annually.

Summary of Expected Benefits. In summary, if the proposed rule is finalized, once all CSUs in use comply with the requirements, staff expects that there will be virtually no fatal tip-over injuries to children 8 years old and under and fatal injuries to adults will be reduced by one half. Staff expects nonfatal injuries to children to be reduced by 83 percent and nonfatal injuries to adults to be reduced by 41.5 percent. The total reduction in societal costs (or benefit from the proposed rule) would be \$305.5 million annually and is summarized in Table 5.

TABLE 5—SUMMARY OF EXPECTED ANNUAL BENEFITS

Description	Current annual number of incidents	Current societal cost (millions)	Expected reduction in incidents	Expected annual benefit (millions)
Child Fatalities	6.2	\$57.0	5.8	\$53.4
Adult Fatalities	1.8	16.6	0.8	7.4

TABLE 5—SUMMARY OF EXPECTED ANNUAL BENEFITS—Continued

Description	Current annual number of incidents	Current societal cost (millions)	Expected reduction in incidents	Expected annual benefit (millions)
Non-Fatal Child Injuries	6,824	216.9	5,937	188.7
Non-Fatal Adult Injuries	4,541	128.7	1,975	56.0
Total .....	.....	419.2	.....	305.5

Benefits Per CSU in Use. Generally, it is useful to discuss the benefits of a rule on a per-unit basis. This facilitates the comparison of the benefits of a rule to the costs when the costs are also expressed on a per-unit basis. To calculate the benefits of a standard on a per-unit basis, staff divided the estimated annual benefit by the number of units in use during the year. The result is the benefit per unit per year. The present values of expected annual benefits over the expected life of the product are summed to obtain the per-unit benefit. In general, this should include only those injuries that occurred on products that do not meet the requirements of the standard, and divide that number by the units in use that do not meet the standard. In this analysis, however, given that staff has only identified one CSU that would

meet the requirements of the proposed rule without some modifications, staff assumes that all injuries and deaths to children occurred with CSUs that did not meet the requirements of the proposed rule.

Staff estimates that there were 463.5 million CSUs in use in 2017, which because staff is using the NEISS data from 2015 through 2019 to calculate the societal cost of injuries, this is approximately the average number of CSUs in use during the period. Using these estimates, the estimated annual benefit per unit of the proposed rule would be \$0.66. As noted, staff has assumed that the average product life of a CSU is 15 years. However, this includes the generally less expensive ready-to-assemble (RTA) CSUs that might have expected useful lives that are less than 15 years and the generally

more expensive factory-assembled CSUs that could have expected lives greater than 15 years. Assuming the average CSU has a product life of 15 years, benefit per unit of the proposed rule is the present value of the annual benefits per unit summed over the expected 15-year life of a CSU. Table 6 gives the estimated benefits per unit of the proposed rule using the 3 percent and 7 percent discount rates recommended by the Office of Management and Budget in Circular A-4: Regulatory Analysis (Sep. 17, 2003). However, because interest rates have declined significantly since Circular A-4 was issued in 2003, staff also included the undiscounted values. As shown in Table 6, the benefits per unit of the proposed rule range from \$6.01 to \$9.90, depending on the discount rate considered appropriate.

TABLE 6—BENEFITS PER UNIT BY DISCOUNT RATE

Discount rate	Annual benefit/unit	Benefit/unit over the 15-year life of the CSU
Undiscounted	\$0.66	\$9.90
3 Percent	0.66	7.88
7 Percent	0.66	6.01

Costs Associated with the Proposed Rule. This section discusses the costs the proposed rule would impose on society. The costs include the costs that would be incurred to redesign and modify CSUs so that they meet the requirements of each of the standards. These costs include the increased cost to manufacture and distribute compliant CSUs. The costs also include the costs and impacts on consumers. These include the cost of additional time to assemble RTA furniture and the loss of utility if certain desired characteristics or styles are no longer available, or if compliant CSUs are less convenient to use. The costs of designing, manufacturing, and distributing compliant CSUs would be initially incurred by the manufacturers and suppliers, but most of these costs would likely be passed on to the consumers via

higher prices. The costs involving the added assembly time for RTA CSUs or the loss of utility because CSUs with certain features or characteristics are no longer available would be borne directly by those consumers who desired CSUs with those characteristics or features.

To ensure that they comply with a mandatory standard, furniture manufacturers must first determine whether their models comply with the standard. This would involve testing their models for compliance. Because a voluntary standard exists, with which staff believes that most CSUs on the market already comply, most manufacturers are probably already conducting stability testing similar to the testing in the proposed rule. Manufacturers would replace their current test methods with the requirements of the proposed rule. Even

though the new tests would include additional steps (e.g., weighting drawers, pull tests on interlock mechanisms, and testing the CSU on a 1.5-degree angle), on a per-unit basis, any increase in the cost of testing due to the proposed rule is likely to be very small, and therefore, the cost of compliance testing will not be considered further in this analysis. Manufacturers would also need to add a stability rating to a hang tag that would be included on each CSU, which would be derived from the testing. Staff expects that the cost of deriving the stability rating and adding the hang tag to each unit would also be small on a per-unit basis and will not be considered further in this analysis.

Additionally, the cost of providing the certificates of conformity would be very low on a per-unit basis. In the case of

CSUs that are children's products, which are thought to constitute a very small portion of the market for CSUs, the cost of the certification testing could be somewhat higher because an accredited third-party testing laboratory would be required to conduct the certification testing.

The number of CSU models currently on the market that would comply with the requirements of the proposed rule is very low. CPSC staff collected and examined 186 CSU models intended to be a representative sample of the available CSUs, and only identified one model that would meet the requirements of the proposed rule without modification. For each model that does not comply with a mandatory standard, manufacturers must decide whether to stop offering that model or modify the model so that it would comply with the standard. If the manufacturer ceases to offer a noncomplying model, the cost of this decision would be the lost utility to the consumer. This cost cannot be quantified, but it would be mitigated to the extent that other CSUs with similar characteristics and features are available that comply with the standard.

*Costs of Potential Modifications to Increase CSU Stability.*¹¹⁴ CPSC staff tested and analyzed CSUs to identify several ways units could be modified to increase their stability.¹¹⁵ The modifications staff assessed were: (1) Adding drawer interlock mechanisms to limit the number of drawers that can be opened at one time; (2) reducing the maximum drawer extensions; (3) extending the feet or front edge of the CSU forward; (4) raising the front of the unit; and (5) adding additional counterweight to the CSU. Manufacturers can use combinations of more than one method to increase the stability of a single CSU model.

One potential modification staff evaluated was drawer interlock systems. A drawer interlock system prevents multiple drawers from being open simultaneously. Typically, an interlock allows one drawer in a column of

drawers to be open at a time, while locking or blocking the other drawers from opening, although some interlock systems allow more than one drawer to open at a time. Interlock systems are common in file cabinets, and they are included in some CSUs. An interlock system can improve the stability of a CSU because a CSU is less stable as more of the drawers are opened, causing the weight of the CSU to move forward. By preventing multiple drawers from opening, the CG of the drawers remains behind the tip point and shifts the CSU's CG back, improving its stability.

Based on staff's testing, a drawer interlock system is one of the most effective options to improve stability, raising the tip-over moment of the CSU more than any other modification that staff evaluated. Interlocks were particularly effective at improving instability when paired with other modifications. However, the benefit of interlocks assumes that they are effective and cannot be bypassed.

The cost of a drawer interlock mechanism includes the cost of design, materials, and labor required to manufacture the mechanism. It would also include the cost of warehousing the parts, the logistics involved in getting the parts to the factory floor, and the cost of incorporating the mechanism into the CSU. In the case of an RTA CSU, some of these costs could fall directly on the consumer. The value of the extra time that might be required of a consumer to assemble a CSU with a drawer interlock is another cost of adding a drawer interlock mechanism. Based on information provided by a manufacturer, the cost of adding a drawer interlock mechanism to a CSU would be around \$12. On the assumption that a manufacturer does not have an incentive to provide CPSC with a low estimate, in this analysis, staff are assuming that this could be a high estimate. Nevertheless, if adding an interlock mechanism requires an additional 5 minutes in labor time to assemble the mechanism and incorporate it into the CSU, then the cost could be \$3.34 in labor costs alone. Considering the added cost of materials and the fact that some CSUs could require two mechanisms, or may need new mechanisms to meet their particular needs, a minimum cost for adding a single interlock mechanism could be \$6.00.¹¹⁶ The cost could be \$12

or more, especially if more than one mechanism were required, or a new design were required.¹¹⁷

Another potential modification is to reduce the travel length of drawer extensions, such as with new drawer slides. Reducing the drawer travel decreases the moment arm, which increases stability. When comparing two drawers on the same unit, the force required to tip over the CSU is more for drawers with shorter extensions.

The manufacturing costs of reducing the maximum drawer extensions is low because it does not necessarily require additional parts or labor time. Perhaps the largest cost is the potential impact on consumer utility if it is less convenient to use CSUs with drawers that cannot open as widely. Staff cannot quantify this cost with the information available.

Another potential modification is to extend the front feet of the CSU forward to extend the fulcrum towards the edge of the drawer. This could be done by extending the front feet forward with an attachment or replacement foot, or by attaching a platform to the bottom of the CSU. However, based on staff's testing, for CSUs with poor stability, the extension or platform may need to be long enough that it could introduce a tripping hazard.

The cost of extending the feet or the front edge of the CSU forward can be very low. In some cases, no additional parts would be required, and the only cost would be the time it takes for the manufacturer to make the change in the manufacturing procedure. This would be the case where already-present feet or glides are simply shifted forward an inch or so. In these cases, the cost of shifting the front edge forward could be less than \$1 per unit. In other cases, feet might need to be added or redesigned. If these feet or glides could be used on multiple CSU models, the costs could be up to \$5 per CSU unit.¹¹⁸ The cost of adding a base to the unit could be more expensive. In addition to the cost of the materials, there would be manufacturing costs to form the material used for the base and attach it to the unit. For RTA manufacturers, adding a base could involve additional costs to redesign the shipping packages to accommodate the base, and could impact the shipping

for private industry manufacturing workers in goods producing industries, published by the Bureau of Labor Statistics (December 2020).

¹¹⁷ One manufacturer estimated that an interlocking drawer could add \$12 to the cost of a CSU and increase the retail price by as much as \$39.

¹¹⁸ Cost based on observed prices for furniture feet available on the internet.

¹¹⁴ Tab D of the NPR briefing package discusses staff's testing and analysis of potential modifications to CSUs to improve stability and comply with the proposed rule.

¹¹⁵ The purpose of this testing was to assess options manufacturers would have for modifying CSUs to meet the performance requirements in the proposed rule; none of these potential modifications would be requirements. Some of these modifications could be applied to existing CSUs without extensive design changes. Staff did not evaluate structural design changes, such as increasing the depth of the CSU or using lighter materials for drawers because staff could not easily modify existing CSUs to implement these changes. However, such design modifications could also help increase the stability of CSUs.

¹¹⁶ Staff does not have direct estimates of the additional labor time that would be required to manufacture and add one or two interlock mechanisms to a CSU, but 5 minutes seems like a reasonably low estimate, if much of the work is manual. The cost of 5 minutes of labor is based on the total employer cost for employee compensation

costs. This could add costs significantly over the \$1 to \$5 estimated here.

Another potential option is to raise the front of the CSU to tilt the unit back, thereby making it less likely to tip forward. Tilting the CSU and drawers back increases the distance from the CSU CG location to the fulcrum, and reduces the distance from the fulcrum to the location where the tip force is applied to the CSU. Several existing CSU designs have adjustable front feet to allow for these level adjustments. Currently, manufacturers typically instruct consumers to adjust the feet as necessary to become level on an unlevel surface. Manufacturers could instruct consumers to tilt the CSU back further on carpet, or other surfaces, such that the CSU is not level, but has more resistance to tipping forward. Similar outcomes could be achieved by replacing the front legs with longer legs, or placing an object under them.

However, there are potential issues with this option. While raising the front feet makes tipping the CSU forward more difficult, it also makes tipping the CSU backward less difficult. Additionally, any manual foot adjustment system requires action by consumers to determine the appropriate level, and it risks the CSU not being used as intended by the manufacturer. Raised front legs also may not be practical on CSUs that are intended to have a level top surface.

According to one manufacturer, leveling devices could cost \$5 per CSU. Observed retail prices for leveling devices can be as little as 30 cents each (at least two would be required for a CSU). If the front of a CSU must be raised a significant amount, other changes might be required to the CSU to keep the top and drawers of the CSU relatively level. The full cost of such changes cannot be quantified with the information available.

The final potential modification staff evaluated was adding additional weight to the CSU. Currently, the back of many CSUs is a thin sheet of fiberboard or other light material. A heavier material could be substituted. Alternatively, manufacturers could add weights to the back or other sections of the CSU to increase stability. Depending on the amount of weight added, there could be an unquantifiable cost to consumers, due to the added weight that they must manage in assembling and moving the CSU. Based on retail prices observed on July 2, 2020, medium-density fiberboard costs approximately \$0.24 per pound, which is a starting point for estimating the additional cost of adding weight to

the back of a CSU.¹¹⁹ If the additional weight required is low, it could be the only additional cost, because the heavier material would replace a lighter material, and the manufacturing process would require minimal changes. In the case where the added weight that would be required is significant, the costs could be higher, because attaching the back to the CSU could require different hardware, the reinforcement of the sides of the CSU, or different manufacturing procedures might be required to manipulate the heavier weight (*e.g.*, an additional worker or machine to handle the heavier board). In the case of RTA furniture, the cost of packaging and shipping could increase, and there would be an unquantifiable cost to the consumer in the form of the need to handle more weight. Potentially, manufacturers could offset the additional weight by using lower-density or thinner materials for other components, such as drawer fronts or cabinet tops. The Commission requests comments on the cost and other impacts of adding weight to the rear of the CSU to meet the requirements of the proposed rule.

Annual Cost of the Proposed Rule. Of the potential modifications for which staff was able to estimate the potential cost, the lowest costs were about \$5.80 per unit. Several were significantly higher. Even assuming the low cost of about \$5.80 per unit, assuming annual sales of at least 43 million units, the annual cost of the proposed rule would be around \$250 million.

Other Impacts on Consumers. The costs discussed above are the costs to manufacture CSUs that could comply with the proposed rule. Even where staff has used retail prices to estimate the costs, the retail price was used in an attempt to capture other costs that would be incurred by manufacturers, including the logistics of acquiring the parts, getting them to the factory floor, and the labor involved in installing them; or in the case of RTA CSUs, the costs of packaging the added parts and the cost to consumers, in time and trouble, of installing the added parts. The change in retail prices due to these costs could be greater if manufacturers, wholesalers, and retailers add a markup to their costs. Markups can vary among manufacturers and subsets of the

market, but can be 2 to 4 times the cost to the manufacturer. However, it is not certain that the retail prices would increase from the proposed rule by the same factor. It is possible that competition among manufacturers and different models could prevent retail prices from rising by the usual mark-up over cost.

Some manufacturers may withdraw some CSU models from the market if the cost or difficulty of modifying the models to meet the requirements of the proposed rule are too great in relation to their expected sales. For a small and light CSU, the modifications required could be so substantial that the model no longer has the character of the original model and is simply withdrawn from the market. Consumers who desired those particular models would suffer an unquantifiable loss, which is mitigated to the extent that other CSUs exist that are reasonable substitutes. If the CSU models that are withdrawn are disproportionately the lower-cost models, which are likely to include many lighter and RTA models, the proposed rule could disproportionately impact lower-income consumers or those seeking low-cost models. These consumers might keep using their older, non-compliant CSUs, purchase a previously owned CSU, or even choose other products for clothes storage in place of CSUs, such as shelving, boxes, or storage bins. Although these impacts would be costs associated with the proposed rule, they are not quantifiable.

General Conclusions. Staff found that the societal costs of deaths and injuries from CSU tip-over incidents is about \$419.2 million annually. This includes injuries to children and adults and is based on known fatalities from 2001 through 2016, and NEISS injuries from 2015 through 2019. If all CSUs had met the requirements of the proposed rule, however, the societal cost of these incidents would have been reduced by \$305.5 million annually. This then would be the estimated benefit of the proposed rule. On a per-CSU-in-use basis, the benefit estimate is \$0.66 cents per unit annually. Assuming CSUs have an expected useful life of 15 years, the average benefit of the proposed rule would be \$6.01 per unit, assuming a 7 percent discount rate, \$7.88 assuming a 3 percent discount rate, and \$9.90 without discounting.

The costs of the proposed rule highly depend on the actual modifications that are required for CSUs to comply with the rule. The costs would be higher for some models than for others. In some cases, the required modifications could change the character of a CSU model to

¹¹⁹Furniture manufacturers presumably would be able to obtain materials at less than retail prices. However, staff used retail prices in this analysis because, as noted above, there would be costs involved, for which staff does not have estimates, in forming and handling the heavier material. In the absence of estimates for these costs, staff believes that using the retail prices would provide a better estimate of the cost to manufacturers of using heavier materials.

the extent that it is not viable and will be withdrawn from the market.

In its analysis, staff used the cost to modify existing CSUs in ways that would allow them to comply with the proposed rule as a measure of the cost of manufacturing CSUs that would comply with the proposed rule. The estimates used in the analysis are reasonable approximations of the costs involved, but in some instances, they could be underestimates because they do not include all of the expected monetary costs (e.g., the costs that would be associated with an interlock system that has not yet been developed), and they do not consider the nonmonetary cost to consumers of the added weight, the decreased maximum drawer extensions, or similar losses associated with the other modifications. Potentially, there could be lower cost options for modifying CSUs to meet the requirements not considered in the analysis. CPSC welcomes comments on any other potential options for modifying or manufacturing CSUs to meet the requirements of the proposed rule.

Sensitivity Analysis. Staff's analysis depends on certain estimates and assumptions. In conducting the analysis, staff used values that it believed best reflected reality. However, in many cases, the basis was weak or lacked strong empirical evidence. To address this, staff examined how other reasonable assumptions could affect the results of the analysis. A description of staff's sensitivity analysis is available in Tab H of the NPR briefing package.

B. Reasons for Not Relying on a Voluntary Standard

No standard, or statement of intention to modify or develop a standard, was submitted to the Commission in response to the ANPR. However, staff did evaluate existing standards relevant to CSU tip overs and determined that these standards would not adequately reduce the risk of injury associated with CSU tip overs because they do not account for the real-world factors staff identified in CSU tip-over incidents that contribute to instability, including multiple open and filled drawers, children's interactions with the CSU (such as climbing and opening drawers), or carpeting. A detailed discussion of these standards, and why staff considers them inadequate, is in section V. Relevant Existing Standards.

With respect to the primary standard in the United States that addresses CSU tip overs—ASTM F2057—CPSC staff has worked with ASTM on this standard since its inception in 2000, but has not been successful, to date, in revising the

standard to account for the relevant factors. For these reasons, the Commission is not relying on an existing standard.

C. Alternatives to the Proposed Rule

CPSC considered several alternatives to the proposed rule. These alternatives, their potential costs and benefits, and the reasons CPSC did not select them, are described in detail in section XI. Alternatives to the Proposed Rule, below, and Tab H of the NPR briefing package.

X. Response to Comments¹²⁰

This section describes the comments CPSC received on the ANPR, and responds to them. CPSC received 18 comments during the ANPR comment period, as well as 5 additional correspondences after the comment period, which staff also considered. The comments are available on: www.regulations.gov, by searching under docket number CPSC-2017-0044.

A. Voluntary Standards

Comment: Several commenters expressed support for ASTM F2057 and felt the voluntary standard process would create a robust standard. Other commenters stated that a mandatory standard is necessary to address the hazard, citing incident data and numerous flaws with ASTM F2057 and ASTM F3096.

Response: ASTM F2057 does not account for forces associated with the weight of clothing in filled drawers, the impact of multiple open and filled drawers, children's interactions with CSUs (such as climbing), or CSUs placed on carpet, all of which contribute to instability. Incident reports show that incidents often combine these variables (e.g., a child opening multiple filled drawers and climbing, or a child standing on an open drawer of a unit placed on carpet). The UMTRI child climbing study shows that children climbing can impart rotational forces (tip moments) on CSUs beyond the forces of the child's weight alone. CPSC staff has worked closely with the ASTM F15.42 committee to improve the voluntary standard; staff has attempted and continues to attempt to help revise the ASTM standard to reflect these additional factors that contribute to instability, but, to date, has been unsuccessful.

The proposed rule focuses on inherent stability of CSUs, rather than tip restraints, because the current rate of

tip restraint use is low, and staff has identified several factors that make it unlikely that consumers will use tip restraints. Given this, staff did not evaluate ASTM F3096 in detail for this proposed rule because, even if it was effective at ensuring the strength of tip restraints, low rates of consumer use make tip restraints an ineffective way to address the hazard. However, based on a limited review of ASTM F3096, staff shares the commenters' concerns that ASTM F3096-14 may not be adequate because: (1) The assumed forces may be too low to represent forces from children's interactions, and (2) the standard does not address the whole tip-restraint system, which includes the connection to the CSU and the connection to the wall.

Comments: Some commenters provided test data regarding compliance with ASTM F2057, or commented on these reports. One commenter submitted data sets indicating that about 20 to 23 percent of the CSUs it tested did not comply with the voluntary standard.¹²¹ Another commenter's report contained test data for dressers and chests, indicating that more than half of the tested units did not comply with the voluntary standard.¹²²

Response: CPSC staff conducted a market survey of 188 CSUs purchased in 2018 and found that 91 percent met the stability requirements in ASTM F2057-17, which has the same stability requirements and test methods as F2057-19 (Tab N of the NPR briefing package). Since publication of the ANPR, CPSC has issued 20 recalls for CSUs that did not comply with the ASTM F2057 stability requirements. However, regardless of compliance levels, CPSC considers ASTM F2057-19 inadequate to address the hazard of CSU tip overs.

B. Hazard Communication: Warnings and Public Awareness

Comments: Several commenters supported the use of hazard communication, including the labeling requirement in ASTM F2057, displaying the warning as a handout at furniture stores, and mandating labeling

¹²¹ This testing assessed compliance with then-current ASTM F2057-17. ASTM F2057-17 included the same stability requirements as ASTM F2057-19, except that F2057-17 applied to units more than 30 inches in height; whereas, F2057-19 applies to units 27 inches or taller. Some of the tested units were 27 to 30 inches tall.

¹²² This testing assessed compliance with ASTM F2057-14. ASTM F2057-14 included the same stability requirements as ASTM F2057-19, except that F2057-14 applied to units more than 30 inches in height; whereas, F2057-19 applies to units 27 inches or taller. One of the tested units was 27 to 30 inches tall.

¹²⁰ For more details about the comments CPSC received on the ANPR, and CPSC's response to them, see Tab K of the NPR briefing package.

provisions that are “effective, seen, understood, reflect real world use,” and “accurately and clearly describe hazard patterns.” One commenter advocated for education campaigns to educate parents about the hazard and promote the use of tip restraints. Other commenters indicated that warning labels and education campaigns are insufficient to address the hazard because children do not comprehend warning labels; incidents occur when children are unattended (e.g., while left alone to nap); and renters may not be allowed to anchor products.

Response: Warnings, on their own, are unlikely to adequately address the hazard because they are unlikely to prevent a child from opening multiple drawers or climbing on a CSU, and consumers are unlikely to heed warnings, including warnings to anchor CSUs. Nevertheless, warning labels may have some benefit. Accordingly, the proposed rule requires a warning label on CSUs to inform consumers about the tip-over hazard; encourage the use of tip restraints as a secondary safety mechanism; and provide other safety information. The proposed warning label requirement addresses the child climbing hazard, tip restraint use, interlocks (if the product includes them), drawer loading (place the heaviest items in the lowest drawers), and CSU use with a television.

In addition, the proposed rule requires a hang tag label to provide consumers with meaningful information on the stability of a particular CSU, using a graphical representation of tip-over resistance, combined with an icon and text explanation, to allow consumers to make more informed purchasing decisions. This hang tag would provide a rating of the stability of the specific CSU that consumers could use to compare CSUs.

CPSC staff agrees that education campaigns could increase consumer knowledge of the CSU tip-over hazard and increase rates of anchoring. In June 2015, the Commission launched the Anchor It! campaign to educate consumers about the risk of injury or death from furniture, television, and appliance tip overs, and to promote the use of tip restraints to anchor furniture and televisions. However, educational campaigns, alone, have not adequately reduced the CSU tip-over hazard. As incident data demonstrates, there has not been a statistically significant decline in CSU tip-over incidents without televisions while these efforts have been in place. In addition, CPSC commissioned a study to assess consumer awareness, recognition, and behavior change as a result of the

Anchor It! Campaign. The 2020 report providing the results of this study indicates that the survey included 600 parents and caregivers of children 5 years old or younger and showed that only 55 percent of participants reported ever having anchored furniture.

C. Scope and Definitions

Comments: Comments about the scope of a rule varied. Several commenters suggested including in the scope furniture less than 30 inches in height, and others supported limiting the scope to furniture more than 30 inches in height. One commenter recommended limiting the scope of a rule to chests, bureaus, and dressers, because the CPSC annual tip-over and instability reports indicate that most incidents involve those products. One commenter recommended covering “freestanding chests, bureaus & dressers intended for clothing storage in a bedroom, with height dimensions over 30 inches (762 mm), consisting of a solid top and side panels and containing at least one drawer,” and suggested definitions for chests, bureaus, and dressers.

Response: In August 2019, ASTM published F2057–19, which revised the scope from including CSUs above 30 inches in height, to including CSUs equal to or above 27 inches in height. This change was based on incidents involving units 30 inches in height and under, including a fatal incident with a 27.5-inch-high unit. However, CPSC is aware of products that are marketed as CSUs and are under 27 inches high, and is aware of a fatal incident involving a 24-inch-high CSU with a television. On balance, staff considers it reasonable to include in the scope CSUs that are 27-inches high or more, and seeks comments on this issue.

Although most CSU tip-over incidents involve chests, bureaus, and dressers, additional furniture items, with the same/similar design and function as chests, bureaus, and dressers present the same hazard because the tip-over hazard relates to the design and use of the products. Similar products include wardrobes and armoires, as well as other products that consumers commonly recognize as CSUs, regardless of marketing. The FMG study (Tab Q of the NPR briefing package) indicates that consumers consider a variety of products suitable for use as CSUs. The ASTM F2057 definition of CSUs may exclude items that consumers use as CSUs. For this reason, the scope of the proposed rule uses criteria to distinguish between in-scope and out-of-scope products.

D. Test Parameters

Comments: Several commenters recommended using a test weight of at least 60 pounds to address children younger than 6 years old. Commenters noted that covering children up to 6 years old would be consistent with the age and weight of victims in incidents and account for developmentally expected behaviors for children that age that are associated with incidents (e.g., climbing). Several comments also noted that victims as old as 8 years have been killed by falling furniture. One commenter urged CPSC to consider the 90th percentile child at their 6th and 8th birthdays “to better understand the risks posed to children older than 5.” One commenter supported the ASTM test weight of 50 pounds, stating: “the most at-risk age group are children 1 to 4 years old” and the 50-pound test weight “appropriately reflects the age and weight of the most at-risk children based on the reported IDI data.”

Response: Staff agrees that the 50-pound test weight in ASTM F2057 is inadequate; however, the data and staff’s assessment have evolved since the ANPR. The ANPR discussed increasing the test weight to 60 pounds to represent the weight of “children up to and including age five,” which is the age group that ASTM F2057 aims to cover. After the ANPR, staff worked with the F15.42 Furniture Subcommittee to provide evidence to increase the test weight to 60 pounds, based on updated 95th percentile weight data. ASTM balloted the weight increase, but it did not pass. The primary data source for the 60-pound weight recommendation was the 2000 Centers for Disease Control and Prevention (CDC) Growth Charts.¹²³ In the updated 2021 CDC Anthropometric Reference, children’s weights tend to be higher than those in the 2000 CDC Growth Charts.

After the ANPR, the UMTRI child climbing study (Tab R of the NPR briefing package) quantified forces and moments children generate when interacting with a simulated CSU. Staff focused on the ascent forces because CSU tip-over incident data indicates that children climbing CSUs is the most common hazard scenario in these incidents, and ascent is an integral climbing interaction. For the ascent interaction and an average drawer extension,¹²⁴ staff determined that a 50-

¹²³ Sixty pounds is the approximate 95th percentile weight of a 72-month-old male or 72-month-old female (the 95th percentile weight of a child just before his or her 6th birthday).

¹²⁴ The average drawer extension was 9.75 inches, for the purpose of this estimate, this extension was

pound child climbing could exert forces equivalent to those from an 80-pound test weight on the face of a drawer opened 12 inches. These results show that the 50-pound test weight in F2057 or even a 60-pound test weight would be inadequate to replicate the forces of a 50-pound child climbing.

For this NPR, staff also evaluated the ages and weights of children in CSU tip-over incidents. Most tip-over incidents involving children and CSUs without televisions involve 1, 2, and 3-year-old children. These are also the ages of children who are most involved in climbing incidents (the dominant hazard pattern). The 95th percentile weight of 3-year-old children is 51.2 pounds.¹²⁵ The children involved in fatal incidents with CSUs and no televisions weighed 45 pounds and under.¹²⁶

Based on this information, the proposed rule simulates a 95th percentile 3-year-old (51.2 pounds) climbing on a CSU and generating associated dynamic and horizontal forces, rather than the 60-pound 5-year-old. When the relevant forces are considered, the 51.2-pound child weight is approximately equivalent to an 82-pound test weight on the face of a drawer opened 12 inches.¹²⁷ In addition, the proposed requirements simulate real-world conditions, such as multiple open and filled drawers, a carpeted surface, and a child pulling on the CSU. These factors are present in many tip-over incidents and contribute to the instability of a CSU. Staff determined that the proposed requirements would address all of the fatal incidents and the majority of the nonfatal incidents involving children and CSUs without televisions. The proposed requirements should also reduce incidents involving CSUs with televisions and incidents involving adults.

Comments: One commenter suggested a tiered test weight system, based on the height of the product, recommending that products less than 40 inches in

assumed to be the same as the distance of the extended drawer to the fulcrum.

¹²⁵ This weight is based on the 2021 CDC Anthropometric Reference for a 95th percentile 3-year-old male. The 95th percentile weight for a 3-year-old female is 42.5 pounds. A stability requirement based on the 51.2-pound male would also cover the 95th percentile 3-year-old female.

¹²⁶ Two fatal incidents involved 45-pound children, one involving a 2-year-old child, and one involving a 7-year-old child (the oldest CSU tip-over fatality without a television).

¹²⁷ The proposed requirements distinguish between child weight and test weight. The child weight is used in an equation, along with the distance from the fulcrum, that estimates the moment (rotational force) that a child will exert on a CSU while climbing.

height be tested with 50 pounds of weight, and products more than 40 inches in height be tested with 60 pounds of weight. The commenter reasoned that older children (who weigh more) are less likely to climb shorter products because they can reach the top without climbing.” One comment supported a tolerance of ± 1 pound for the test weight, consistent with the ASTM standard.

Response: Regarding a tiered test weight protocol, staff does not support using different tip forces for different height units because incident analysis indicates that there is not a strong relationship between unit height and child weight for fatal tip-over incidents.¹²⁸

For test weight tolerance, CPSC staff considers a tolerance of ± 1 pound for each of the two test weight blocks required in ASTM F2057–19 to be too large. Based on the tolerance, the total weight of the test blocks can range from 48–52 pounds, an 8 percent variability between the lowest and highest allowed test weights. Staff has previously worked with the ASTM F15.42 Furniture Subcommittee to propose tighter tolerances for each test weight and for the total test weight. However, the proposed rule does not require a fixed test weight—rather, it consists of a tip-over moment measurement—making it unnecessary to specify a test weight tolerance.

Comments: Two commenters stated that more specificity is needed in the voluntary standard regarding the time frame to apply and maintain the test weight and contact of the test fixture with the drawer bottom.

Response: ASTM F2057–19 does not specify a time requirement to apply the 50-pound test weight or a specific amount of time that the CSU must support the weight without tipping over. Test methods in other ASTM standards (e.g., F963–17, *Standard Consumer Safety Specification for Toy Safety*, F2236–16a, *Standard Consumer Safety Specification for Soft Infant and Toddler Carriers*, and F2194–16^{e1}, *Standard Consumer Safety Specification for Bassinets and Cradles*) state to apply a weight or force over a specific period to avoid imparting an impulse force on the product. To address this, the proposed rule specifies that the force must be applied gradually over a period of at least 5 seconds to avoid a potential impulse force.

¹²⁸ See CPSC staff letter to ASTM from Nesteruk, H.E.J., Re: Update to CPSC Staff letter dated August 24, 2018 (Oct. 12, 2018), available at: <https://cpsc.gov/s3fs-public/TipoverASTMLetter%20October18%20Update.pdf>.

Comment: Several commenters addressed open drawers during testing. Commenters emphasized that testing should reflect real-world conditions, and that opening one empty drawer at a time, as the ASTM standard requires, does not do this. Suggestions included multiple drawers being open simultaneously, loaded drawers, and testing drawers “at all stages of open.”

Response: CPSC agrees that stability testing should reflect real-world use, which includes opening more than one drawer at a time (unless the CSU prevents this, such as with an interlock system) and drawers filled with clothing. Staff tested a number of different types and sizes of CSUs with various configurations of open and filled drawers, and modeled CSUs involved in tip-over incidents. Staff concluded that having multiple open drawers decreases stability, and having filled drawers has a variable effect on stability, depending on whether the filled drawers are open or closed. Filled drawers make a CSU less stable if the drawers are open; whereas, filled drawers make the CSU more stable if the drawers are closed. Thus, the least stable configuration is when all drawers are filled and open. If less than half of the drawers are open, the least stable configuration (assuming that the drawer fill is consistent across drawers) is when all drawers are empty. The test method in the proposed rule includes all drawers open and filled to reflect the worst-case configuration. The test method also accounts for interlock systems that would prevent multiple drawers from being opened simultaneously and allows for a modified test configuration for these units. If the interlock allows fewer than half of the drawers to open, the proposed requirements involve the CSU being tested with all drawers empty, which reflects a worst-case configuration for these units. These recommendations reflect incident data, which include children opening all of the drawers in CSUs and incidents involving empty and filled CSU drawers.

Comment: Several commenters recommended that testing involve carpeting or a surface that mimics the effects of carpet, to reflect real-world use conditions and common incident conditions, and because this may decrease stability. Some commenters suggested using a standardized material, or some other way of ensuring carpet testing would be reliable and repeatable. One commenter submitted a report containing test data for dressers and chests tipping that found that CSUs were less stable on carpet than on hard

floors. Another commenter asked for a clear definition of “a hard, level, flat surface,” specified in ASTM F2057, and suggested evaluating floor materials, including carpet, but recommended using a standardized material.

Response: Incident data indicates that consumers commonly place CSUs on carpet, and testing indicates that carpet decreases CSU stability. CPSC staff tested CSUs on carpet to learn what effect a flooring surface can have on the stability of CSUs (Tab P of the NPR briefing package). Staff found that, in general, CSUs were less stable on carpet. Accordingly, the proposed rule includes an element to simulate the effect of carpet as part of the stability testing. Staff agrees with the concern that testing on actual carpet may present challenges and may not be repeatable. Staff testing (Tab D of the NPR briefing package) indicates that an incline of 1.5 degrees was the average angle that replicated tip weight on carpet. Accordingly, to provide a repeatable method, the proposed rule includes a 1.5-degree incline to simulate the effect of carpet during stability testing. For the testing on a “hard, flat, and level” surface, the proposed rule provides a definition of this phrase.

Comments: Several commenters mentioned operational sliding length with regard to how far to extend drawers during stability testing. One commenter provided specific suggestions for testing three different types of drawer slides: (1) Drawers without an outstop should be tested at $\frac{2}{3}$ of the drawer extension; (2) drawers with an outstop should be tested with the drawer extended to the “valid outstop” (meaning an outstop that meets certain pull force and timing criteria); and (3) drawers with a self-closing feature should be tested with the drawer extended to the “static outstop” (meaning a position where the drawer remains in a static open position for a set time). Another commenter suggested clarifying the requirement in the voluntary standard that drawers are to be extended to $\frac{2}{3}$ of the operational sliding length if there is no outstop because, with no minimum operational sliding length specified, the procedure for testing products with multiple outstops is unclear.

Response: Drawer extension is a key component of a tip event because the distance from the force application site to the fulcrum (pivot point) determines the moment (rotational forces) on a CSU. The proposed test method uses a moment calculation based on full drawer extension for drawers with an outstop, and requires $\frac{2}{3}$ extension for drawers without an outstop. The

proposed rule requires that, for stability testing, drawers be open to the “maximum extension,” which is defined as:

Maximum extension means a condition when a drawer or pull-out shelf is open to the furthest manufacturer recommended use position, as indicated by way of a stop. In the case of slides with multiple intermediate stops, this is the stop that allows the drawer or pull-out shelf to extend the furthest. In the case of slides with a multi-part stop, such as a stop that extends the drawer or pull-out shelf to the furthest manufacturer recommended use position with an additional stop that retains the drawer or pull-out shelf in the case, this is the stop that extends the drawer or pull-out shelf to the manufacturer recommended use position. If the manufacturer does not provide a recommended use position by way of a stop, this is $\frac{2}{3}$ the shortest internal length of the drawer measured from the inside face of the drawer front to the inside face of the drawer back or $\frac{2}{3}$ the length of the pull-out shelf.

This definition addresses the issue of multiple outstops. The Commission requests comments on self-closing drawers.

E. Tip Restraints

Comments: Comments about anchoring systems generally supported the position that furniture should be stable on its own, without the need for tip restraints. Reasons included: Consumers may not have the option to anchor products (e.g., rentals that do not allow holes in walls, or brick/concrete walls); consumers may not have the skills to anchor furniture correctly; some consumers are not aware of the need to anchor furniture; and the burden should not be placed on consumers to make products safe. However, commenters noted that anchors could be useful for used or older furniture, but that consumers need to be informed about proper installation. In addition, commenters noted that ASTM F3096–14 is inadequate because requirements for anchors should “adequately assess the strength of all designs of anchoring devices and the components of such devices in real world use conditions” with clear pass/fail tests.

Response: Staff agrees that tip restraints should not be the primary method of preventing CSU tip overs and that CSUs should be inherently stable. Several research studies show that a large number of consumers do not anchor furniture, including CSUs. A 2010 CPSC Consumer Opinion Forum survey found that only 9 percent of participants had anchored the furniture under their televisions; for participants that had a CSU under their televisions, the anchoring rate was 10 percent of

participants.¹²⁹ A 2018 Consumer Reports nationally representative survey found that only 27 percent of consumers overall, and 40 percent of consumers with children under 6 years old at home, have an anchored piece of furniture in their homes.¹³⁰ A 2020 CPSC study on the Anchor It! campaign found that 55 percent of respondents reported ever having anchored furniture.¹³¹ As the 2020 FMG study on furniture tip overs indicates (Tab Q of the NPR briefing package), reasons that consumers do not anchor furniture include: The belief that furniture does not need to be anchored if children are supervised; a perception that the furniture was stable enough; potential damage to walls; lack of knowledge about products; and difficulty installing tip restraints. For these reasons, the proposed rule does not include requirements for tip restraints, and focuses, instead, on inherent stability.

However, tip restraints may be useful as a secondary safety system, to improve the stability of existing CSUs or address additional child interactions. In future work, outside of this rulemaking effort, CPSC may evaluate appropriate requirements for tip restraints, and may work with ASTM to update its tip-restraint requirements. Based on a preliminary analysis, CPSC staff agrees that ASTM F3096–14 does not adequately address tip restraints in real-world use conditions. Staff believes that an appropriate test should assess the strength of the connection between the CSU and the wall, the attachment to the CSU and the wall, and test the tip restraint with common wall surfaces. In addition, as with ASTM F2057–19, ASTM F3096–14 uses a 50-pound static force to test the strength of the tip restraint, which may not represent the force on the tip restraint from a child and the CSU, especially for interactions that can generate dynamic forces, including those from older children.

¹²⁹ CPSC report on *Preliminary Evaluation of Anchoring Furniture and Televisions without Tools* (Technical Report CPSC/EXHR/TR—15/001), Butturini, R., Massale, J., Midgett, J., Snyder, S. (May 2015), available at: <https://www.cpsc.gov/s3fs-public/pdfs/Tipover-Prevention-Project-Anchors-without-Tools.pdf>.

¹³⁰ Peachman, R.R. Furniture Anchors Not an Easy Fix, as Child Tip-Over Deaths Persist (Nov. 5, 2018), available at: <https://www.consumerreports.org/furniture/furniture-anchors-not-an-easy-fix-as-child-tip-over-deaths-persist/>.

¹³¹ CPSC *Anchor It! Campaign: Main Report*, FMG (Sep. 2, 2020), available at: https://www.cpsc.gov/s3fs-public/CPSC-Anchor-It-Campaign-Effectiveness-Survey-Main-Report_Final_9_2_2020....pdf?gclid=Cj0O2FEXV9wm0tdJVAtacRLHIMK.

F. Televisions

Comments: Several commenters addressed the involvement of CRT televisions in CSU tip-over incidents. Commenters stated that manufacturers stopped producing CRT televisions around 2008–2010. One commenter provided information regarding the transition from CRT televisions to flat screens, and suggested that this transition “has significantly reduced the potential hazard posed by TVs being placed on CSUs.” In addition, the commenter stated that “99 percent of TVs are taken out of service after 16 years, meaning the number of CRTs in consumers’ homes should be nearing zero by 2027.” Commenters also noted that the discontinued production of CRT televisions means that CPSC would be unable to regulate these products, making it difficult to address the hazard they present. One commenter stated that television involvement in tip-over incidents should not undermine CPSC’s efforts to focus on CSUs because the common denominator in incidents is a CSU.

Response: CPSC agrees that manufacturers’ widespread shift from CRT televisions to flat-panel televisions is likely to result in decreased use in homes and an associated decrease in tip-over incidents involving CSUs with CRT televisions. NEISS data indicates that, for 2010 through 2019, there is a statistically significant linear decline in child injuries involving all CSUs (including televisions); however, there is no linear trend detected in injuries to children involving CSU tip-over incidents without televisions. Therefore, the decline in estimated CSU tip-over injuries during that period was driven by a decrease in ED-treated tip-over injuries involving CSUs with televisions. It is important to note that the CPSC tip-over data include incidents with a variety of television types, including CRT televisions and flat-panel televisions. Because flat-panel televisions are generally much lighter than CRT televisions, staff believes they are less likely to cause severe injury. Staff also agrees that television involvement in CSU tip-over incidents should not undermine CPSC’s efforts to focus on CSUs.

The proposed rule focuses on tip-over hazards involving CSUs without televisions. However, increasing CSU stability should also decrease deaths and injuries from tip-over incidents involving CSUs with televisions.

G. Incidents/Risk

Comments: One comment compared the deaths due to CSU tip overs to the

number of children who drown, suggesting that deaths due to CSU tip overs were relatively low, by comparison. Another comment provided a lengthy discussion of incident data, suggesting that incidents were declining, televisions are the primary hazard, and that the majority of incidents affect children younger than 5 years old, rather than less than 6 years of age. This commenter stated: “for children 13 to 59-months, there has been a 34% reduction in reported IDIs for the 4-year period between 2011–2015.” Another commenter stated that CSU tip overs present a particular risk to children under 6 years old, due to physical and mental abilities and behaviors at these ages, noting that children under 6 years old are involved in 95 percent of deaths and 83 percent of injuries to children.

Response: The existence of other hazards, such as drowning deaths, does not diminish the need to address tip-over hazards. There were 193 reported CSU tip-over fatalities involving children and CSUs that occurred between January 1, 2000 and December 31, 2020. With the exception of 2010, there were at least three reported fatal tip-over incidents involving children and CSUs without televisions, each year from 2001 through 2017 (the last year for which death reporting is considered complete). Based on data from NEISS, CPSC staff estimates that there were 78,200 injuries from CSU tip overs (an estimated annual average of 5,600 injuries) treated in EDs from January 1, 2006 to December 31, 2019. Of these, an estimated 72 percent (an estimated 56,400 total and an estimated annual average of 4,000) were injuries to children. The estimated number of ED-treated injuries to children involving CSU tip overs was between about 2,500 and 5,900 injuries for each year from 2006 through 2019.

Incident data indicates that younger children are the most affected age group. In 91 percent of the tip-over fatalities involving children and CSUs without televisions (81 of 89), the victim was 1, 2, or 3 years old. An estimated 76 percent of ED-treated injuries to children involving CSU tip overs without televisions were to children 1 through 4 years old (an estimated 31,100 of 40,700), and an estimated 64 percent were to children 1 through 3 years old (an estimated 26,100 of 40,700). The oldest child in a tip-over fatality involving a CSU without a television was 7 years old; the oldest child with a reported ED-treated tip-over injury

involving a CSU without a television was 17 years old.¹³²

With respect to the comment stating that CSU incidents are declining, CPSC staff found a statistically significant linear decline in ED-treated CSU tip-over injuries to children from 2010 to 2019. However, this trend is driven by the decline in CSU tip-over incidents that involve televisions; there was no detected decline in tip-over injuries to children involving CSUs without televisions during the same time frame.

With respect to the comment that there has been a 34 percent reduction in reported IDIs, CPSC notes that IDIs are not reported, but are based on staff assignments; that is, when CPSC receives a report of an incident, staff can request an IDI. Therefore, the raw number of IDIs is not a meaningful number for comparison; it only represents example scenarios for which staff has sought and compiled additional information through an investigation, and is not a representative number of annual incidents. Any increase or decrease in the number of IDIs is a function of various factors and not necessarily a reflection of the seriousness of the hazard or rate of incidents. Moreover, IDIs are based on many types of source documents, and it is not clear to which IDIs the commenter is referring.

H. Costs and Small Business Impacts

Comments: One commenter stated that increasing test weights would create costs because many CSUs do not comply with the existing test weight requirement in the ASTM standard. Another commenter stated that it is possible to alter designs to improve stability in an affordable way. The Small Business Administration (SBA) met with CPSC staff regarding the ANPR on February 7, 2018. The SBA expressed that its small business contacts are comfortable with the existing ASTM standard, but are concerned about a mandatory rule that differs from or is more stringent than the voluntary standard. Those concerns include the impacts a rule would have on existing inventories and when compliance with the mandatory standard would be required.

Response: CPSC believes that the proposed rule would require modifications or redesign of most CSUs on the market. To estimate the cost of modifying CSUs to comply with the proposed requirements, CPSC staff examined five CSU models (Tab H of the NPR briefing package). In some

¹³² The oldest child in a tip-over fatality involving a CSU with a television was 8 years old.

cases, the cost to modify a particular CSU could be around \$5.80 per unit; but in other cases, the costs could exceed \$25 per unit. The cost of modifying lighter or taller CSUs could be greater than for heavier CSUs. Changes in the design of CSUs could impose other costs on consumers in the form of altered utility or convenience, including increased weight, reductions in the maximum drawer extensions, changes in the storage capacity of the CSU, or changes in the footprint of the CSU.

The initial regulatory flexibility analysis (IRFA) for this rule (Tab I of the NPR briefing package) specifically considers the impact of the proposed rule on small businesses. The analysis concludes that the proposed rule would likely have a significant impact on a substantial number of small entities.

I. Technical Feasibility

Comments: Several commenters addressed the technical feasibility of designing CSUs that could reduce stability issues. Comments regarding feasibility primarily consisted of: (1) Comments that used test data showing a proportion of CSUs could pass certain tests as proof that it was feasible, and (2) comments that proposed specific solutions to address furniture tipping over. Suggestions included drawer slides that automatically close drawers or that require users to apply force continually to keep a drawer open; reducing the maximum extension length of drawers; wider CSU bases; bins in place of bottom drawers; and interlock systems that limit how many drawers can be open simultaneously. One commenter recommended that test requirements account for interlock systems.

Response: CPSC staff is aware of one CSU that meets the stability requirements in the proposed rule without modification. To address CSUs that do not already meet the proposed requirements, staff examined five CSUs to determine what modifications would allow them to meet the proposed requirements. Several modifications, including in combination, may improve the stability of CSUs, such as adding drawer interlocks, adding weight to the rear of the unit, decreasing the maximum drawer extensions, and shifting the front edge or feet (the fulcrum) of the CSU forward. Of the potential modifications for which staff was able to estimate the potential cost, the lowest costs were about \$5.80 per unit, but in other cases, the costs may exceed \$25. However, the extent of the modifications required would depend upon the characteristics of the CSU,

such as its weight, dimensions, and center of gravity.

Regarding the comments that provide specific design solutions, under section 7 of the CPSA, the Commission may issue performance requirements, or requirements for warnings and instructions; the Commission may not issue design requirements. Accordingly, the Commission cannot require the use of particular designs. However, these suggestions demonstrate that it is feasible to design more stable CSUs, and these or other design changes may be useful in modifying CSUs to comply with performance requirements.

J. Stories of Loss

Comments: Three commenters shared their personal experiences with tragic incidents where a CSU tipped over and killed a child. These comments included valuable information about the activities and conditions involved in the tip-over incidents they described, including the loading of drawers, flooring, and how the child was interacting with the CSU. These comments also provided useful information about user knowledge of the risk, and the presence of warning labels and tip restraints.

These commenters expressed that safety needs to be built into the design of CSUs, rather than relying on consumer knowledge of the hazard, consumer installation of anchors, or warning labels. The commenters noted several factors that make it ineffective to rely on consumer knowledge and actions. For example, the commenters noted that children are exposed to the CSU hazard outside their homes, so anchors may not be installed; consumers buy used CSUs, which may not have anchors, instructions, or labels; and consumers may not be permitted to anchor products to a wall in a rental, or may lack the technical skills to anchor CSUs properly. The commenters stated that a mandatory standard should mimic real-life circumstances that have been involved in CSU incidents, including less stable flooring and loaded drawers.

Response: CPSC appreciates the courage of these parents in sharing their stories. To each of these parents, we thank you for sharing these stories and we are deeply sorry for your loss. CPSC staff has considered the information about the interactions and conditions involved in the tip-over incidents in developing this NPR. The performance criteria were based on the children's interactions seen in fatal and nonfatal incident reports, and they are based on measured child climbing forces and child strength data. The performance

criteria also are based on real-life CSU use, as seen in the incident reports, including opening multiple drawers, drawers filled with clothing, and placing the CSU on a carpeted floor. The incidents described in these comments are captured in the incident data set and have been incorporated into staff's analyses.

CPSC agrees that CSUs should be inherently stable and should not require a tip restraint to prevent tip overs. As explained above, there are several barriers to the use of tip restraints and research that suggests that the rate of anchoring CSUs is low. Additionally, although the proposed rule includes a warning label requirement to inform consumers of the hazard and to motivate them to install tip restraints as a secondary safety mechanism, warnings have limited effectiveness in addressing the tip-over hazard.

XI. Alternatives to the Proposed Rule

The Commission considered several alternatives to reduce the risk of injuries and death related to CSU tip overs. However, as discussed below, the Commission concludes that none of these alternatives would adequately reduce the risk of injury.

A. No Regulatory Action

One alternative to the proposed rule is to take no regulatory action and, instead, rely on voluntary recalls, compliance with the voluntary standard, and education campaigns. The Commission has relied on these alternatives to address the CSU tip-over hazard to date.

Between January 1, 2000 and March 31, 2021, 40 consumer-level recalls occurred in response to CSU tip-over hazards. The recalled products were responsible for 328 tip-over incidents, involved 34 firms, and affected approximately 21,500,000 CSUs. ASTM F2057 has included stability requirements for unloaded and loaded CSUs since its inception in 2000 and, based on CPSC testing, there is a high rate of compliance with the standard; CPSC's market survey of 188 CSUs found that 91 percent complied with the stability requirements in ASTM F2057. In addition, CPSC's Anchor It! campaign—an education campaign intended to inform consumers about the risk of CSU tip overs, provide safety tips for avoiding tip overs, and promote the use of tip restraints—has been in effect since 2015.

Given that this alternative primarily relies on existing CPSC actions, the primary costs staff estimates for this alternative are associated with tip restraints. However, this alternative is

unlikely to provide additional benefits to adequately reduce the risk of CSU tip overs. For one, CPSC does not consider ASTM F2057 adequate to address the hazard because it does not account for several factors involved in tip-over incidents that contribute to instability, including multiple open and filled drawers, carpeting, and forces generated by children's interactions with the CSU. Based on the UMTRI studies of the dynamic forces imparted by children climbing on CSUs and staff testing of CSUs on carpeting, staff estimates that, even if all CSUs complied with ASTM F2057-19, that would only protect children weighing less than 29.1 pounds when climbing on a CSU, providing 70 percent of the benefits expected from the proposed rule.¹³³

In addition, as Tab C of the NPR briefing package explains, several studies indicate that the rate of consumer anchoring of furniture, including CSUs, is low. A 2010 CPSC survey found that 9 percent of participants who responded to a question about anchoring furniture under their television indicated that they had; the same survey found that 10 percent of consumers who used a CSU to hold their television reported anchoring the CSU. A 2018 Consumer Reports study found that 27 percent of consumers overall, and 40 percent of consumers with children under 6 years old in the home, had anchored furniture; the same study found that 10 percent of those with a dresser, tall chest, or wardrobe had anchored it. CPSC's 2020 study on the Anchor It! campaign found that 55 percent of respondents (which included parents and caregivers of children 5 years old and younger) reported anchoring furniture. As such, on their own, these options have limited ability to further reduce the risk of injury and death associated with CSU tip overs. CPSC's use of this alternative to date illustrates this since, despite these efforts, there has been no declining trend in child injuries from CSU tip overs (without televisions).

B. Require Performance and Technical Data

Another alternative is to adopt a standard that requires only performance and technical data, similar to or the same as the hang tag requirements in the proposed rule, with no performance

requirements for stability. This could consist of a test method to assess the stability of a CSU model, a calculation for determining a stability rating based on the test results, and a requirement that the rating be provided for each CSU on a hang tag. A stability rating would give consumers information on the stability of CSU models they are considering, to inform their buying decisions, and potentially give manufacturers an incentive to achieve a higher stability rating to increase their competitiveness or increase their appeal to consumers that desire more stable CSUs. The hang tag could also connect the stability rating to safety concerns, providing consumers with information about improving stability.

Because this alternative would not establish a minimum safety standard, it would not require manufacturers to discontinue or modify CSUs. Therefore, the only direct cost of this alternative would be the cost to manufacturers of testing their CSUs to establish their stability rating and labeling their CSUs in accordance with the required information. Any changes in the design of the CSUs would be the result of manufacturers responding to changes in consumer demand for particular models.

However, the Commission does not consider this alternative adequate, on its own, to reduce the risk of injury from CSU tip overs. Similar to tip restraints, this alternative relies on consumers, rather than making CSUs inherently stable. This assumes that consumers will consider the stability rating, and accurately assess their need for more stable CSUs. However, this is not a reliable approach to address this hazard, based on the low rates of anchoring, and the FMG focus group, which suggests that caregivers may underestimate the potential for a CSU to tip over, and overestimate their ability to prevent tip overs by watching children. In addition, this alternative would not address the risk to children outside their homes (where the stability of CSUs may not have been considered), or CSUs purchased before a child's birth. The long service life of CSUs and the unpredictability of visitors or family changes in that timespan, and these potential future risks might not be considered at the time of the original purchase.

C. Adopt a Performance Standard Addressing 60-Pound Children

Another alternative is to adopt a mandatory standard with the same requirements as the proposed rule, but addressing 60-pound children, rather than 51.2-pound children. This

alternative would be more stringent than the proposed rule.

About 74 percent of CSU tip-over injuries to children involve children 4 years old and younger,¹³⁴ and these are addressed by the proposed rule, because the 95th percentile weight for 4-year-old children is approximately 52 pounds. The proposed rule would also address some of the injuries to children who are 5 and 6 years old, as well, because many of these children also weigh less than 51.2 pounds. Mandating a rule that would protect 60-pound children would increase the benefit associated with child fatal and nonfatal injuries by about \$10.9 million, and the rule could increase the benefits associated with reductions in adult fatal and nonfatal injuries by \$3.2 million or a total of \$14.1 million annually. This comes to about 3 cents per unit on an annual basis. Over an assumed 15-year life of a CSU, this comes to 7 cents per unit, assuming a 7 percent discount rate, 36 cents assuming a 3 percent discount rate, or 45 cents without discounting. Therefore, increasing the weight of the child protected to 60 pounds would only increase benefits by about 4.5 percent over the benefits that could be obtained by the proposed rule.

Presumably, the cost of manufacturing furniture that complies with this more rigorous alternative would be somewhat higher than the costs of manufacturing CSUs that comply with the proposed rule, using similar, but somewhat more extensive modifications. Because this alternative would provide only a limited increase in benefits, but a higher level of costs than the proposed rule, the Commission did not select this alternative.

D. Mandate ASTM F2057 With a 60-Pound Test Weight

Another alternative would be to mandate a standard like ASTM F2057-19, but replace the 50-pound test weight with a 60-pound test weight. Sixty pounds approximately represents the 95th percentile weight of 5-year-old children, which is the age ASTM F2057-19 claims to address. This alternative was discussed in the ANPR.

This alternative would be less costly than the proposed rule, because, based on CPSC testing, about 57 percent of CSUs on the market would already meet this requirement. The cost of modifying CSUs that do not comply is likely to be less than modifying them to comply with the proposed rule, which is more stringent.

¹³³ Staff estimates that the proposed rule would reduce nonfatal climbing injuries by 91 percent, addressing 375.48 of the 412 climbing NEISS cases reviewed. Staff estimates that a rule that protects children weighing 29.1 pounds or less would address only 110.08 of the incidents or about 27 percent.

¹³⁴ Based on NEISS estimates for 2015 through 2019.

By increasing the test weight, it is possible that this alternative would prevent some CSU tip overs. However, this alternative still would not account for the factors that occur during CSU tip-over incidents that contribute to instability, including multiple open and filled drawers, carpeting, and the horizontal and dynamic forces from children's interactions with the CSU. As this preamble and the NPR briefing package explain, a 60-pound test weight does not equate to protecting a 60-pound child. The UMTRI study demonstrates that children generate forces greater than their weight during certain interactions with a CSU, including interactions that are common in CSU tip-over incidents. Because this alternative does not account for these factors, staff estimates that it may only protect children who weigh around 38 pounds or less, which is approximately the 75th percentile weight of 3-year-old children. For these reasons, the Commission does not believe this alternative would adequately reduce the CSU tip-over hazard, and did not select this alternative.

E. Longer Effective Date

Another alternative would be to provide a longer effective date than the 30-day effective date in the proposed rule. It is likely that hundreds of manufacturers, including importers, will have to modify potentially several thousand CSU models to comply with the proposed rule, which will require understanding the requirements, redesigning the CSUs, and manufacturing compliant units. Delays in meeting the effective date could result in disruptions to the supply chain, or fewer choices being available to consumers, at least in the short term. A longer effective date could reduce the costs associated with the rule and mitigate potential disruption to the supply chain. However, delaying the effective date would delay the safety benefits of the rule as well. As such, the Commission did not select this alternative. However, the Commission requests comments about the proposed effective date.

XII. Paperwork Reduction Act

This proposed rule contains information collection requirements that are subject to public comment and review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (PRA; 44 U.S.C. 3501–3521). Under the PRA, an agency must publish the following information:

- A title for the collection of information;

- a summary of the collection of information;
- a brief description of the need for the information and the proposed use of the information;
- a description of the likely respondents and proposed frequency of response to the collection of information;
- an estimate of the burden that will result from the collection of information; and
- notice that comments may be submitted to OMB.

44 U.S.C. 3507(a)(1)(D). In accordance with this requirement, the Commission provides the following information:

Title: Safety Standard for Clothing Storage Units.

Summary, Need, and Use of Information: The proposed consumer product safety standard prescribes the safety requirements, including labeling and hang tag requirements, for CSUs. These requirements are intended to reduce or eliminate an unreasonable risk of death or injury to consumers from CSU tip overs.

Requirements for marking and labeling, in the form of warning labels, and requirements to provide performance and technical data by labeling, in the form of a hang tag, will provide information to consumers. Warning labels on CSUs will provide warnings to the consumer regarding product use. Hang tags will provide information to the consumer regarding the stability of the unit. These requirements fall within the definition of "collection of information," as defined in 44 U.S.C. 3502(3).

Section 27(e) of the CPSA authorizes the Commission to require, by rule, that manufacturers of consumer products provide to the Commission performance and technical data related to performance and safety as may be required to carry out the purposes of the CPSA, and to give notification of such performance and technical data at the time of original purchase to prospective purchasers and to the first purchaser of the product. 15 U.S.C. 2076(e). Section 2 of the CPSA provides that one purpose of the CPSA is to "assist consumers in evaluating the comparative safety of consumer products." 15 U.S.C. 2051(b)(2).

Section 14 of the CPSA requires manufacturers, importers, or private labelers of a consumer product subject to a consumer product safety rule to certify, based on a test of each product or a reasonable testing program, that the product complies with all rules, bans or standards applicable to the product. In the case that a CSU could be considered to be a children's product, the

certification must be based on testing by an accredited third-party conformity assessment body. The proposed rule for CSUs specifies the test procedure be used to determine whether a CSU complies with the requirements. For products that manufacturers certify, manufacturers would issue a general certificate of conformity (GCC).

Identification and labeling requirements will provide information to consumers and regulators needed to locate and recall noncomplying products. Identification and labeling requirements include content such as the name and address of the manufacturer.

Warning labels will provide information to consumers on hazards and risks associated with product use. Warning label requirements include size, content, format, location, and permanency.

The standard requires that CSU manufacturers provide technical information for consumers on a hang tag at the point of purchase. The information provided on the hang tag would allow consumers to make informed decisions on the comparative stability of CSUs when making a purchase and would provide a competitive incentive for manufactures to improve the stability of CSUs. Specifically, the manufacturer of a CSU would provide a hang tag with every CSU that explains the stability of the unit. CSU hangtag requirements include:

- *Size:* Every hangtag shall be at least 5 inches wide by 7 inches tall.
- *Content:* Every CSU shall be offered for sale with a hang tag that states the stability rating for the CSU model.
- *Attachment:* Every hang tag shall be attached to the CSU and clearly visible. The hang tag shall be attached to the CSU and lost or damaged hang tags must be replaced. The hang tags may be removed only by the first purchaser.
- *Placement:* The hang tag shall appear on the product and immediate container of the product in which the product is normally offered for sale at retail. Ready-to-assemble furniture shall display the hang tag on the main panel of consumer-level packaging. Any units shipped directly to consumers shall contain the hang tag on the immediate container of the product.

• *Format:* The format of the hang tag is provided in the proposed rule and the hang tag shall include the elements shown in the example provided.

The requirements for the GCC are stated in section 14 of the CPSA. Among other requirements, each certificate must identify the manufacturer or private labeler issuing the certificate

and any third-party conformity assessment body, on whose testing the certificate depends, the date and place of manufacture, the date and place where the product was tested, each party's name, full mailing address, telephone number, and contact information for the individual responsible for maintaining records of test results. The certificates must be in English. The certificates must be furnished to each distributor or retailer of the product and to CPSC, if requested.

Respondents and Frequency:

Respondents include manufacturers and importers of CSUs. Manufacturers and importers will have to comply with the

information collection requirements when the CSUs are manufactured or imported; this is addressed further in the discussion of estimated burden.

Estimated Burden: CPSC has estimated the respondent burden in hours, and the estimated labor costs to the respondent. The hourly burden for labeling can be divided into two parts. The first part includes designing the label and the hang tag that will be used for each model. The second part includes physically attaching the label and hang tag to each CSU. Additionally, the burden for third-party testing is estimated for a subset of CSUs.

Manufacturers will have to place a hang tag on each CSU sold. In 2018,

about 43.6 million CSUs were sold in the United States. This would be a reasonable estimate of the number of responses per year. CPSC estimates there to be 7,000 suppliers of CSUs for which there would be an hourly burden, as defined by the PRA. CPSC estimates that there are about 35,000 different models of CSUs, or an average of 5 models per manufacturer.

Estimate of Respondent Burden. The hourly reporting burden imposed on firms includes the time it will take them to design and update hang tags, and identification labeling, including warning labels, as well as the hourly burden of attaching them to all CSUs sold domestically.

TABLE 7—ESTIMATED ANNUAL REPORTING BURDEN

Burden type	Type of supplier	Total annual responses	Length of response	Annual burden (hours)
Labeling, design and update	Manufacturer or Importer	35,000	12 min	7,000
Labeling, attachment	Manufacturer, Importer, or Retailer	43.6 million ....	.06 min	43,600
Total Labeling Burden .....	.....	.....	.....	50,600
Third-party recordkeeping, certification	Manufacturers of Children's CSUs	21,800	3 hours	65,400
Total Hourly Burden .....	.....	.....	.....	116,000

CPSC estimates that it could take an hour for a supplier to design the hang tags and identification labeling, and that the design could be used for a period of five years, or until the CSU is redesigned. At 60 minutes per hang tag, and an average of 5 models per firm, the hourly burden for designing a hang tag that will be used for five years is 1 hour (60 min × 5 models ÷ 5 years).

Therefore, for 7,000 firms, the annual burden would be 7,000 hours. CPSC estimates it could take 0.06 minutes (3.6 seconds) for a supplier to attach the hang tag to the CSU, for each of the 43.6 million units sold in the United States annually. Attaching the hang tag to the CSU would amount to an hourly burden of 43,600 hours (0.06 min × 43,600,000 CSUs).

In addition, three types of third-party testing of children's products are required: Certification testing, material change testing, and periodic testing. Requirements state that manufacturers conduct sufficient testing to ensure that they have a high degree of assurance that their children's products comply with all applicable children's product safety rules before such products are introduced into commerce. If a manufacturer conducts periodic testing, it is required to keep records that describe how the samples of periodic testing are selected. The hour burden of recordkeeping requirements will likely

vary greatly from product to product, depending on such factors as the complexity of the product and the amount of testing that must be documented. Therefore, estimates of the hour burden of the recordkeeping requirements are somewhat speculative.

CPSC estimates that 0.05 percent of all CSUs sold annually, 21,800 CSUs, are children's products and would be subject to third-party testing, for which 3 hours of recordkeeping and record maintenance will be required. Thus, the total hourly burden of the recordkeeping associated with certification is 65,400 hours (3 × 21,800).

Labor Cost of Respondent Burden. According to the U.S. Bureau of Labor Statistics (BLS), Employer Costs for Employee Compensation, the total compensation cost per hour worked for all private industry workers was \$36.64 (March 2021, Table 4, <https://www.bls.gov/news.release/pdf/ecec.pdf>). Based on this analysis, CPSC staff estimates that the labor cost of respondent burden would impose a cost to industry of approximately \$4,250,240 annually (116,000 hours × \$36.64 per hour).

Respondent Costs Other Than Burden Hour Costs. In addition to the labor burden costs addressed above, the hang tag requirement imposes additional annualized costs. These costs include capital costs for cardstock used for each

hang tag to be displayed and the wire or string used to attach the hang tag to the CSU. CPSC estimates the cost of the printed hang tag and wire for attaching the hang tag to the CSU will be about \$0.10. Therefore, the total cost of materials to industry would be about \$4.36 million per year (\$0.10 × 43.6 million units).

Cost to the Federal Government. The estimated annual cost of the information collection requirements to the federal government is approximately \$4,172, which includes 60 staff hours to examine and evaluate the information as needed for Compliance activities. This is based on a GS-12, step 5 level salaried employee. The average hourly wage rate for a mid-level salaried GS-12 employee in the Washington, DC metropolitan area (effective as of January 2021) is \$47.35 (GS-12, step 5). This represents 68.1 percent of total compensation (U.S. Bureau of Labor Statistics, "Employer Costs for Employee Compensation," March 2021, Table 2, percentage of wages and salaries for all civilian management, professional, and related employees: <https://www.bls.gov/news.release/ecec.t02.htm>). Adding an additional 31.9 percent for benefits brings average annual compensation for a mid-level salaried GS-12 employee to \$69.53 per hour. Assuming that approximately 60

hours will be required annually, this results in an annual cost of \$4,172 (\$69.53 per hour × 60 hours = \$4,171.80).

Comments. CPSC has submitted the information collection requirements of this rule to OMB for review, in accordance with PRA requirements. 44 U.S.C. 3507(d). CPSC requests that interested parties submit comments regarding information collection to the Office of Information and Regulatory Affairs, OMB (see the **ADDRESSES** section at the beginning of this NPR).

Pursuant to 44 U.S.C. 3506(c)(2)(A), the Commission invites comments on:

- Whether the proposed collection of information is necessary for the proper performance of CPSC's functions, including whether the information will have practical utility;
- the accuracy of CPSC's estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;
- ways to enhance the quality, utility, and clarity of the information the Commission proposes to collect;
- ways to reduce the burden of the collection of information on respondents, including the use of automated collection techniques, when appropriate, and other forms of information technology;
- the estimated burden hours associated with labels and hang tags, including any alternative estimates; and
- the estimated respondent cost other than burden hour cost.

XIII. Initial Regulatory Flexibility Analysis¹³⁵

This section provides an analysis of the impact on small businesses of a proposed rule that would establish a mandatory safety standard for CSUs. Whenever an agency is required to publish a proposed rule, section 603 of the Regulatory Flexibility Act (5 U.S.C. 601–612) requires that the agency prepare an initial regulatory flexibility analysis (IRFA) that describes the impact that the rule would have on small businesses and other entities. An IRFA is not required if the head of an agency certifies that the proposed rule will not have a significant economic impact on a substantial number of small entities. 5 U.S.C. 605. The IRFA must contain:

(1) A description of why action by the agency is being considered;

¹³⁵ Further details about the initial regulatory flexibility analysis are available in Tab I of the NPR briefing package. Additional information about costs associated with the rule are available in Tab H of the NPR briefing package.

(2) a succinct statement of the objectives of, and legal basis for, the proposed rule;

(3) a description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;

(4) a description of the projected reporting, recordkeeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record; and

(5) identification, to the extent practicable, of relevant Federal rules that may duplicate, overlap or conflict with the proposed rule.

An IRFA must also describe any significant alternatives that would accomplish the stated objectives of the applicable statutes and that would minimize any significant economic impact of the proposed rule on small entities. Alternatives could include: (1) Establishing different compliance or reporting requirements that consider the resources available to small businesses; (2) clarification, consolidation, or simplification of compliance and reporting requirements for small entities; (3) use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part of the rule thereof, for small entities.

A. Reason for Agency Action

The intent of this rulemaking is to reduce deaths and injuries resulting from CSUs tipping over on children. These tip-over incidents commonly result when young children attempt to climb on the CSU or open drawers; the weight and interaction of the child combined with the weight of any open and filled drawers causes the CSU to tip forward and fall on the child. Children can be killed or injured from the impact of the CSU falling on them or by being trapped beneath the CSU, restricting their ability to breathe. This preamble, and Tab A of the NPR briefing package, provide incident data for CSU tip overs. In addition, the Preliminary Regulatory Analysis, above, and in Tab H of the NPR briefing package, provide further information about medically treated CSU tip-over injuries from the ICM. That data demonstrates the need for agency action, and staff considered that data for the IRFA.

B. Objectives of and Legal Basis for the Rule

The objective of the proposed rule is to reduce deaths and injuries resulting from tip-over incidents involving CSUs.

The Commission published an ANPR in November 2017, which initiated this proceeding to evaluate regulatory options and potentially develop a mandatory standard to address the risks of CSU tip-over deaths and injuries. The proposed rule would be issued under the authority of the CPSA.

C. Small Entities to Which the Rule Will Apply

The proposed rule would apply to small entities that manufacture or import CSUs. Manufacturers of CSUs are principally classified in the North American Industrial Classification (NAICS) category 337122 (non-upholstered wood household furniture manufacturing), but may also be categorized in NAICS codes 337121 (upholstered household furniture manufacturing), 337124 (metal household furniture manufacturing), or 337125 (household furniture (except wood and metal) manufacturing). According to data from the U.S. Census Bureau, in 2017, there were a total of 3,404 firms classified in these four furniture categories. Of these firms, 2,024 were primarily categorized in the non-upholstered wood furniture category. More than 99 percent of the firms primarily categorized as manufacturers of non-upholstered wood furniture would be considered small businesses, as were 97 percent of firms in the other furniture categories, according to the U.S. Small Business Administration (SBA) size standards.¹³⁶ CPSC notes that these categories are broad and include manufacturers of other types of furniture, such as tables, chairs, bed frames, and sofas. It is also likely that not all of the firms in these categories manufacture CSUs.

Production methods and efficiencies vary among manufacturers; some make use of mass-production techniques, and others manufacture their products one at a time, or on a custom-order basis.

The number of U.S. firms that are primarily classified as manufacturers of non-upholstered wood household furniture has declined over the last few decades because retailers have turned to international sources of CSUs and other wood furniture. Additionally, firms that formerly produced all of their CSUs domestically have shifted production to foreign plants. Well over half (64 percent) of the value of apparent consumption of non-upholstered wood

¹³⁶ U.S. Small Business Administration, *Table of Small Business Size Standards Matched to North American Industry Classification System Codes* (2019), available at: https://www.sba.gov/sites/default/files/2019-08/SBA%20Table%20of%20Size%20Standards_Effective%20Aug%2019%2C%202019_Rev.pdf.

furniture (net imports plus domestic production for the U.S. market) in 2019 was comprised of imported furniture, and this likely was true for CSUs, as well. Firms that import furniture would likely be impacted by any rule that the Commission might promulgate regulating CSUs because they would have to ensure that any products that they import meet the requirements of the rule.

Under the NAICS classification system, importers are classified as either wholesalers or retailers. Furniture wholesalers are classified in NAICS category 423210 (Furniture Merchant Wholesalers). According to the Census Bureau data, in 2017, there were 5,117 firms involved in household furniture importation and distribution. A total of 4,920 of these (or 96 percent) are classified as small businesses because they employ fewer than 100 employees (which is the SBA size standard for NAICS category 423210). Furniture retailers are classified in NAICS category 442110 (Furniture Stores). According to the Census Bureau, there were 13,826 furniture retailers in 2017. The SBA considers furniture retailers to be small businesses if their gross revenue is less than \$22 million. Using these criteria, at least 97 percent of the furniture retailers are small (based on revenue data from the 2012 Economic Census of the United States). Wholesalers and retailers may obtain their products from domestic sources or import them from foreign manufacturers.

D. Compliance, Reporting, and Recordkeeping Requirements in the Proposed Rule

The proposed rule would establish a mandatory standard that all CSUs would have to meet to be sold in the United States. The requirements of the proposed standard are described, in detail, in this preamble, and the proposed regulatory text is at the end of this notice.

In addition to performance, labeling, and performance and technical information requirements, the proposed rule would also prohibit any person from manufacturing or importing noncomplying CSUs in any 1-month period between the date of promulgation of the final rule and the effective date, at a rate that is greater than 105 percent of the rate at which they manufactured or imported CSUs during the base period for the manufacturer. The base period is the calendar month with the median manufacturing or import volume within the last 13 months immediately preceding the month of promulgation of the final rule.

In addition, section 14 of the CPSA requires manufacturers, importers, or private labelers of a consumer product subject to a consumer product safety rule to certify, based on a test of each product or a reasonable testing program, that the product complies with all rules, bans or standards applicable to the product. The proposed rule specifies the test procedure to use to determine whether a CSU complies with the requirements. For products that manufacturers certify, manufacturers would issue a general certificate of conformity (GCC). In the case of CSUs that could be considered children's products, the certification must be based on testing by an accredited third-party conformity assessment body.

The requirements for the GCC are stated in section 14 of the CPSA. Among other requirements, each certificate must identify the manufacturer or private labeler issuing the certificate and any third-party conformity assessment body, on whose testing the certificate depends, the date and place of manufacture, the date and place where the product was tested, each party's name, full mailing address, telephone number, and contact information for the individual responsible for maintaining records of test results. The certificates must be in English. The certificates must be furnished to each distributor or retailer of the product and to CPSC, if requested.

1. Costs of the Proposed Rule That Would Be Incurred by Small Manufacturers

CPSC staff evaluated potential modifications that could be made to CSUs to improve their stability and comply with the proposed rule. These potential modifications represent changes that could be made to existing CSU designs, rather than design changes, and were merely intended as an example of potential options manufacturers could use to comply with the proposed rule. The potential modifications are described in detail in Tab D of the NPR briefing package. The most effective modification staff identified for improving CSU stability was interlock systems, which limit the number of drawers that can be open simultaneously. Additional options include adding a counterweight to the CSU; extending the front legs or edge of the CSU; reducing the distance that drawers may be extended; and increasing the height of the front legs to tilt the CSU backwards. Most CSUs may require a combination of these modifications.

Based on an analysis of how five CSUs could be modified to meet the cost of the proposed rule, CPSC staff estimated the potential cost increases to CSU manufacturers. For four of the CSUs, the cost estimates were \$13 or more per unit, and in some cases exceeded \$25, which exceeds the estimated average benefits per unit. For the fifth CSU, the estimated cost estimates of the modifications were in the same range as the estimated benefits per unit. Firms may choose other methods or different combinations resulting in lower or higher costs. In addition to costs of product modifications, any reductions in utility that might be caused by modifications such as reductions in the drawer extensions or significantly higher weights have not been quantified; nor have any aesthetic costs or the possibility of a tripping hazard that might result from the addition of significant foot extensions. Some models could require such substantial modifications that they no longer have the characteristics of the original models and manufacturers might withdraw them from the market, creating some unquantified loss of consumer utility.

The above estimates include the variable costs related to changes such as additional hardware, materials that increase the weight, and increased shipping costs. They also include the fixed costs associated with the research and development required to redesign CSUs and tooling costs. If products have to be completely redesigned to meet the proposed standard (e.g., if adding weight or other minor modifications are not sufficient, and suppliers need to make drawers deeper and add new drawer slides), the changes could add substantial costs, or they could be offset with lighter weight front panels or tops. One supplier contacted by Industrial Economics Corporation, on behalf of CPSC, estimated the cost of redesigning a CSU model as \$18,000, including prototype, testing, engineering, and design.¹³⁷

Costs of model redesign per unit produced would be greater for smaller manufacturers with lower production volumes. For smaller, lower-volume producers, the per-unit costs of the components necessary to modify their CSUs might also be higher than those for higher volume producers. CSUs that meet the requirements of the proposed

¹³⁷ Israel, J., Cahill, A., Baxter, J., Final Clothing Storage Units Cost Impact Analysis, Industrial Economics, Incorporated contract report (June 7, 2019), available at: [https://ecpsc.cpsc.gov/apps/6b-Temp/Section%206b%20Tracking/Final%20Clothing%20Storage%20Units%20\(CSUs\)%20Cost%20Impact%20Analysis.pdf](https://ecpsc.cpsc.gov/apps/6b-Temp/Section%206b%20Tracking/Final%20Clothing%20Storage%20Units%20(CSUs)%20Cost%20Impact%20Analysis.pdf).

rule may incorporate hardware designed to limit the ability of consumers to open multiple drawers at a time. Therefore, manufacturers would incur the costs of adding such drawer-interlock components. Based on information obtained from a CSU manufacturer, the cost of these components might average \$6 to \$12 per unit if the CSU only has one column of drawers. Component suppliers are likely to charge higher per unit prices to manufacturers that purchase fewer units. Also, larger companies with vertically integrated operations that own or operate suppliers can more easily adapt to changes in design and manufacturing, and therefore, may experience fewer impacts than smaller manufacturers without vertical integration.

Manufacturers would likely incur some additional costs to certify that their CSUs meet the requirements of the proposed rule as required by section 14 of the CPSA. The certification must be based on a test of each product or a reasonable testing program. The costs of the testing might be minimal, especially for small manufacturers that currently conduct testing for conformance to the current voluntary standard, ASTM F2057–19. Importers may also rely on testing completed by other parties, such as their foreign suppliers, if those tests provide sufficient information for the manufacturers or importers to certify that the CSUs comply with the proposed rule. In the case of CSUs that are children's products, which are thought to constitute a very small portion of the market for CSUs, the cost of the certification testing could be somewhat higher because it would be required to be conducted by an accredited third-party testing laboratory.

Small manufacturers and importers will also incur added costs of required warning labels and hang tags with comparative tip ratings. Those manufacturers currently using permanent warning labels in conformance with ASTM F2057–19, should not face significant incremental costs for the replacement labels specified by the proposed rule. The required hang tags showing tip ratings for each CSU would involve some incremental costs, although likely to be minor in relation to other product modifications required for compliance. The testing costs needed to generate the tip ratings will be incurred to comply with the performance testing of the proposed rule.

2. Impacts on Small Businesses

Average manufacturer shipment value for CSUs was \$118 per unit in 2018 (about \$104 for chests of drawers and

\$144 for dressers). The estimated costs to manufacturers for product modifications to comply with the proposed rule range from about \$5.80 (in one case) up to \$30 or more per unit. Generally, staff considers impacts that exceed one percent of a firm's revenue to be potentially significant. Because the estimated average cost per CSU could be between about 5 percent and 25 percent of the average revenue per unit for CSUs, staff believes that the proposed rule could have a significant impact on a substantial number of small manufacturers and importers that receive a significant portion of their revenue from the sale of CSUs.

For many small importers, the impact of the proposed rule would be expected to be similar to the impact on small domestic manufacturers. Foreign suppliers may pass much of the cost of redesigning and manufacturing CSUs that comply with the proposed rule to their domestic distributors. Therefore, the cost increases experienced by small importers would be similar to those experienced by small manufacturers.

Small importers would be responsible for issuing a GCC certifying that their CSUs comply with the rule. However, importers may rely upon testing performed and GCCs issued by their suppliers in complying with this requirement. In the case of CSUs that are children's products, the certification must be based on testing by an accredited third-party conformity assessment body, which may involve additional costs.

E. Federal Rules That May Duplicate, Overlap, or Conflict With the Proposed Rule

CPSC did not identify any federal rules that duplicate or conflict with the proposed rule.

F. Alternatives Considered To Reduce the Burden on Small Entities

As discussed in XI. Alternatives to the Proposed Rule, above, CPSC examined several alternatives to the proposed rule, which could reduce the burden on firms, including small entities. For the reasons described in that section, the Commission concluded that those alternatives would not adequately reduce the risk of injury and death associated with CSU tip overs, and is not proposing those alternatives.

As part of that analysis, staff considered alternatives that could reduce the impact on small entities, specifically. One such alternative that could be specific to small entities could be variations on the proposed standard, such as reducing the required tip moment or testing units with weight in

closed drawers of units with drawer interlock systems. Such modifications might reduce the need for other product changes, such as foot extensions, raising front feet, and added weight in the backs of CSUs. However, while perhaps reducing costs for manufacturers, such lessening of requirements would reduce the stability of units complying with the standard, thereby reducing the benefits of the standard.

Another alternative that could be specific to small entities would be a longer effective date for the rule. In its report on potential cost impacts, Industrial Economics, Incorporated¹³⁸ concluded from its limited subset of interviews that it appears likely that, unlike larger firms involved in ASTM standards development, "many small furniture makers are not aware of the potential regulations under consideration." Smaller firms may, therefore, find it much more difficult to meet an effective date of 30 days after the rule is published. As discussed in XI. Alternatives to the Proposed Rule, extending the period before the rule becomes effective could reduce costs, but would also delay the benefits of the rule.

See Tab I of the NPR briefing package for further discussion of alternatives to the proposed rule. The Commission seeks comments on any alternatives that would reduce the impact on small entities, while adequately reducing the risk of injury and death associated with CSU tip overs.

G. Request for Comments

The Commission invites comments on this IRFA and the potential impact of the proposed rule on small entities, especially small businesses. In particular, the Commission seeks comments on:

- The types and magnitude of manufacturing costs that might disproportionately impact small businesses or were not considered in this analysis;
- the costs of the testing and certification, warning label, and hang tag requirements in the proposed rule;
- the different impacts on small businesses associated with different effective dates;
- different impacts of the proposed rule on small manufacturers or suppliers that compete in different segments of the CSU market; and
- other alternatives that would minimize the impact on small

¹³⁸ Industrial Economics, Incorporated (2019). Final Clothing Storage Units (CSUs) Market Research Report. CPSC Contractor Report. Researchers analyzed the characteristics of 890 CSUs, and found a height range of 18 to 138 inches.

businesses but would still reduce the risk of CSU tip-over incidents.

XIV. Incorporation by Reference

The proposed rule incorporates by reference ASTM F2057–19. The Office of the Federal Register (OFR) has regulations regarding incorporation by reference. 1 CFR part 51. Under these regulations, in the preamble of the NPR, an agency must summarize the incorporated material, and discuss the ways in which the material is reasonably available to interested parties or how the agency worked to make the materials reasonably available. 1 CFR 51.5(a). In accordance with the OFR requirements, this preamble summarizes the provisions of ASTM F2057–19 that the Commission proposes to incorporate by reference.

The standard is reasonably available to interested parties and interested parties can purchase a copy of ASTM F2057–19 from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959 USA; telephone: 610–832–9585; www.astm.org. Additionally, during the NPR comment period, a read-only copy of ASTM F2057–19 is available for viewing on ASTM’s website at: <https://www.astm.org/CPSC.htm>. Once a final rule takes effect, a read-only copy of the standard will be available for viewing on the ASTM website at: <https://www.astm.org/READINGLIBRARY/>. Interested parties can also schedule an appointment to inspect a copy of the standard at CPSC’s Division of the Secretariat, U.S. Consumer Product Safety Commission, 4330 East-West Highway, Bethesda, MD 20814, telephone: 301–504–7479; email: cpsc-os@cpsc.gov.

XV. Testing, Certification, and Notice of Requirements

Section 14(a) of the CPSA includes requirements for certifying that children’s products and non-children’s products comply with applicable mandatory standards. 15 U.S.C. 2063(a). Section 14(a)(1) addresses required certifications for non-children’s products, and sections 14(a)(2) and (a)(3) address certification requirements specific to children’s products.

A “children’s product” is a consumer product that is “designed or intended primarily for children 12 years of age or younger.” *Id.* 2052(a)(2). The following factors are relevant when determining whether a product is a children’s product:

- Manufacturer statements about the intended use of the product, including a label on the product if such statement is reasonable;

- whether the product is represented in its packaging, display, promotion, or advertising as appropriate for use by children 12 years of age or younger;

- whether the product is commonly recognized by consumers as being intended for use by a child 12 years of age or younger; and

- the Age Determination Guidelines issued by CPSC staff in September 2002, and any successor to such guidelines.

Id. “For use” by children 12 years and younger generally means that children will interact physically with the product based on reasonably foreseeable use. 16 CFR 1200.2(a)(2). Children’s products may be decorated or embellished with a childish theme, be sized for children, or be marketed to appeal primarily to children. *Id.* 1200.2(d)(1).

As discussed above, some CSUs are children’s products and some are not. Therefore, a final rule on CSUs would subject CSUs that are not children’s products to the certification requirements under section 14(a)(1) of the CPSA and would subject CSUs that are children’s products to the certification requirements under section 14(a)(2) and (a)(3) of the CPSA. The Commission’s requirements for certificates of compliance are codified at 16 CFR part 1110.

Non-Children’s Products. Section 14(a)(1) of the CPSA requires every manufacturer (which includes importers¹³⁹) of a non-children’s product that is subject to a consumer product safety rule under the CPSA or a similar rule, ban, standard, or regulation under any other law enforced by the Commission to certify that the product complies with all applicable CPSC-enforced requirements. 15 U.S.C. 2063(a)(1).

Children’s Products. Section 14(a)(2) of the CPSA requires the manufacturer or private labeler of a children’s product that is subject to a children’s product safety rule to certify that, based on a third-party conformity assessment body’s testing, the product complies with the applicable children’s product safety rule. *Id.* 2063(a)(2). Section 14(a) also requires the Commission to publish a notice of requirements (NOR) for a third-party conformity assessment body (*i.e.*, testing laboratory) to obtain accreditation to assess conformity with a children’s product safety rule. *Id.* 2063(a)(3)(A). Because some CSUs are children’s products, the proposed rule is a children’s product safety rule, as applied to those products. Accordingly,

if the Commission issues a final rule, it must also issue an NOR.

The Commission published a final rule, codified at 16 CFR part 1112, entitled *Requirements Pertaining to Third Party Conformity Assessment Bodies*, which established requirements and criteria concerning testing laboratories. 78 FR 15836 (Mar. 12, 2013). Part 1112 includes procedures for CPSC to accept a testing laboratory’s accreditation and lists the children’s product safety rules for which CPSC has published NORs. When CPSC issues a new NOR, it must amend part 1112 to include that NOR. Accordingly, as part of this NPR, the Commission proposes to amend part 1112 to add CSUs to the list of children’s product safety rules for which CPSC has issued an NOR.

Testing laboratories that apply for CPSC acceptance to test CSUs that are children’s products for compliance with the new rule would have to meet the requirements in part 1112. When a laboratory meets the requirements of a CPSC-accepted third party conformity assessment body, the laboratory can apply to CPSC to include 16 CFR part 1261, *Safety Standard for Clothing Storage Units*, in the laboratory’s scope of accreditation of CPSC safety rules listed on the CPSC website at: www.cpsc.gov/labsearch.

XVI. Environmental Considerations

The Commission’s regulations address whether CPSC is required to prepare an environmental assessment (EA) or an environmental impact statement (EIS). 16 CFR 1021.5. Those regulations list CPSC actions that “normally have little or no potential for affecting the human environment,” and therefore, fall within a “categorical exclusion” under the National Environmental Policy Act (42 U.S.C. 4231–4370h) and the regulations implementing it (40 CFR parts 1500–1508) and do not require an EA or EIS. 16 CFR 1021.5(c). Among those actions are rules that provide performance standards for products. *Id.* 1021.5(c)(1). Because this proposed rule would create performance requirements for CSUs, the proposed rule falls within the categorical exclusion, and thus, no EA or EIS is required.

XVII. Preemption

Executive Order (E.O.) 12988, *Civil Justice Reform* (Feb. 5, 1996), directs agencies to specify the preemptive effect of a rule in the regulation. 61 FR 4729 (Feb. 7, 1996), section 3(b)(2)(A). In accordance with E.O. 12988, CPSC states the preemptive effect of the proposed rule, as follows:

The regulation for CSUs is proposed under authority of the CPSA. 15 U.S.C.

¹³⁹The CPSA defines a “manufacturer” as “any person who manufactures or imports a consumer product.” 15 U.S.C. 2052(a)(11).

2051–2089. Section 26 of the CPSA provides that “whenever a consumer product safety standard under this Act is in effect and applies to a risk of injury associated with a consumer product, no State or political subdivision of a State shall have any authority either to establish or to continue in effect any provision of a safety standard or regulation which prescribes any requirements as to the performance, composition, contents, design, finish, construction, packaging or labeling of such product which are designed to deal with the same risk of injury associated with such consumer product, unless such requirements are identical to the requirements of the Federal Standard.” 15 U.S.C. 2075(a). The federal government, or a state or local government, may establish or continue in effect a non-identical requirement for its own use that is designed to protect against the same risk of injury as the CPSC standard if the federal, state, or local requirement provides a higher degree of protection than the CPSA requirement. *Id.* 2075(b). In addition, states or political subdivisions of a state may apply for an exemption from preemption regarding a consumer product safety standard, and the Commission may issue a rule granting the exemption if it finds that the state or local standard: (1) Provides a significantly higher degree of protection from the risk of injury or illness than the CPSA standard, and (2) does not unduly burden interstate commerce. *Id.* 2075(c).

Thus, the CSU requirements proposed in today’s **Federal Register** would, if finalized, preempt non-identical state or local requirements for CSUs designed to protect against the same risk of injury and prescribing requirements regarding the performance, composition, contents, design, finish, construction, packaging or labeling of CSUs.

XVIII. Effective Date

The CPSA requires that consumer product safety rules take effect at least 30 days after the date the rule is promulgated, but not later than 180 days after the date the rule is promulgated unless the Commission finds, for good cause shown, that an earlier or a later effective date is in the public interest and, in the case of a later effective date, publishes the reasons for that finding. 15 U.S.C. 2058(g)(1). The Commission proposes that this rule become effective 30 days after publication of the final rule in the **Federal Register**. The rule would apply to all CSUs manufactured or imported on or after that effective date. Consistent with that, the Commission also proposes that the amendment to part 1112 become

effective 30 days after publication of the final rule. The Commission requests comments on the proposed effective date.

XIX. Proposed Findings

The CPSA requires the Commission to make certain findings when issuing a consumer product safety standard. Specifically, the CPSA requires the Commission to consider and make findings about the following:

- The degree and nature of the risk of injury the rule is designed to eliminate or reduce;
- the approximate number of consumer products subject to the rule;
- the need of the public for the products subject to the rule and the probable effect the rule will have on the cost, availability, and utility of such products;
- any means to achieve the objective of the rule while minimizing adverse effects on competition, manufacturing, and commercial practices;
- that the rule, including the effective date, is reasonably necessary to eliminate or reduce an unreasonable risk of injury associated with the product;
- that issuing the rule is in the public interest;
- if a voluntary standard addressing the risk of injury has been adopted and implemented, that either compliance with the voluntary standard is not likely to result in the elimination or adequate reduction of the risk or injury, or it is unlikely that there will be substantial compliance with the voluntary standard;
- that the benefits expected from the rule bear a reasonable relationship to its costs; and
- that the rule imposes the least burdensome requirement that prevents or adequately reduces the risk of injury.

15 U.S.C. 2058(f)(1), (f)(3). This section discusses these findings.

A. Degree and Nature of the Risk of Injury

Based on incident data available through NEISS and CPSRMS, there were 193 reported CSU tip-over fatalities to children (*i.e.*, under 18 years old), 11 reported fatalities to adults (*i.e.*, ages 18 through 64 years), and 22 reported fatalities to seniors (*i.e.*, ages 65 years and older) that were reported to have occurred between January 1, 2000 and December 31, 2020. Of the 193 reported child fatalities from CSU tip overs, 86 percent (166 fatalities) involved children 3 years old or younger, 6 percent (12 fatalities) involved 4-year-olds, 4 percent (7 fatalities) involved 5-year-olds, 2 percent (4 fatalities) involved 6-year-olds, less than one percent (1 fatality) involved a 7-year-old, and 2 percent (3 fatalities) involved 8-year-olds.

Based on NEISS, there were an estimated 78,200 injuries, an annual

average of 5,600 estimated injuries, related to CSU tip overs for all ages that were treated in U.S. hospital EDs from January 1, 2006 to December 31, 2019. Of the estimated 78,200 injuries, 56,400 (72 percent) were to children, which is an annual average of 4,000 estimated injuries to children over the 14-year period. In addition, the ICM projects that there were approximately 19,300 CSU tip-over injuries treated in other settings from 2015 through 2019, or an average of 3,900 per year. Combining the NEISS estimate of injuries treated in hospital EDs with the ICM estimate of medically attended injuries treated in other settings brings the estimate of all nonfatal, medically attended CSU tip-over injuries to children to 34,100 during the years 2015 through 2019.

Injuries to children, resulting from CSUs tipping over, include soft tissue injuries, skeletal injuries and bone fractures, and fatalities resulting from skull fractures, closed-head injuries, compressional and mechanical asphyxia, and internal organ crushing leading to hemorrhage.

B. Number of Consumer Products Subject to the Proposed Rule

In 2017, there were approximately 463.5 million CSUs in use. In 2018, combined shipments of dressers and chests totaled 43.6 million units. Annual sales of CSUs total about 44 million units.

C. The Public Need for CSUs and the Effects of the Proposed Rule on Their Utility, Cost, and Availability

Consumers commonly use CSUs to store clothing in their homes. The proposed rule provides a performance standard that requires CSUs to meet a minimum stability threshold, but does not restrict the design of CSUs. As such, CSUs that meet the standard would continue to serve the purpose of storing clothing in consumers’ homes. There may be a negative effect on the utility of CSUs if CSUs that comply with the standard are less convenient to use, such as altered designs to limit drawer extensions, an increase in the footprint of the product, or a reduction in storage capacity. Another potential effect on utility could occur if, in order to comply with the standard, manufacturers modify CSUs to eliminate certain desired characteristics or styles, or discontinue models. However, this loss of utility would be mitigated to the extent that other CSUs with similar characteristics and features are available that comply with the standard.

Retail prices of CSUs vary substantially. The least expensive units retail for less than \$100, while some

more expensive units may retail for several thousand dollars. Of the potential modifications to comply with the standard for which CPSC staff was able to estimate the potential cost, the lowest costs were about \$5.80 per unit; however, several were significantly higher. CSU prices may increase to reflect the added cost of modifying or redesigning products to comply with the standard, or to account for increased distribution costs if CSUs are heavier or include additional parts. In addition, consumers may incur a cost in the form of additional time to assemble CSUs if additional safety features are included.

If the costs associated with redesigning or modifying a CSU model to comply with the standard results in the manufacturer discontinuing that model, there would be some loss in availability of CSUs.

D. Other Means To Achieve the Objective of the Proposed Rule, While Minimizing Adverse Effects on Competition and Manufacturing

The Commission considered alternatives to achieving the objective of the rule of reducing unreasonable risks of injury and death associated with CSU tip overs. For example, the Commission considered relying on voluntary recalls, compliance with the voluntary standard, and education campaigns, rather than issuing a standard. Because this is the approach CPSC has relied on, to date, this alternative would have minimal costs; however, it is unlikely to further reduce the risk of injury from CSU tip overs.

The Commission also considered issuing a standard that requires only performance and technical data, with no performance requirements for stability. This would impose lower costs on manufacturers, but is unlikely to adequately reduce the risk of injury from CSU tip overs because it relies on manufacturers choosing to offer more stable units; consumer assessment of their need for more stable units (which CPSC's research indicates consumers underestimate); and does not account for CSUs outside a child's home or purchased before a child was born.

The Commission also considered mandating a standard like ASTM F2057–19, but replacing the 50-pound test weight with a 60-pound test weight. This alternative would be less costly than the proposed rule, because many CSUs already meet such a requirement, and it would likely cost less to modify noncompliant units to meet this less stringent standard. However, this alternative is unlikely to adequately reduce the risk of CSU tip overs because it does not account for factors that are

present in CSU tip-over incidents that contribute to CSU instability, including multiple open and filled drawers, carpeting, and forces generated by a child interacting with the CSU.

Another alternative the Commission considered was providing a longer effective date. This may reduce the costs of the rule by spreading them over a longer period, but it would also delay the benefits of the rule, in the form of reduced deaths and injuries.

Another alternative the Commission considered is adopting a mandatory standard with the requirements in the proposed rule, but addressing 60-pound children, rather than 51.2-pound children. However, this alternative would be more stringent than the proposed rule and, therefore, would likely increase the costs associated with the rule, while only increasing the benefits of the rule by about 4.5 percent.

E. Unreasonable Risk

As described above, incident data from NEISS and CPSRMS indicates that there were 226 reported CSU tip-over fatalities that were reported to have occurred between January 1, 2000 and December 31, 2020, of which 85 percent (193 incidents) were children, 5 percent (11 incidents) were adults, and 10 percent (22 incidents) were seniors. Of the reported child fatalities from CSU tip overs, 86 percent (166 fatalities) involved children 3 years old or younger.

Based on NEISS, there were an estimated 78,200 injuries, an annual average of 5,600 estimated injuries, related to CSU tip overs that were treated in U.S. hospital EDs from January 1, 2006 to December 31, 2019. Of these, 72 percent (56,400) were to children, which is an annual average of 4,000 estimated injuries to children over the 14-year period. In addition, the ICM projects that there were approximately 19,300 CSU tip-over injuries treated in other settings from 2015 through 2019, or an average of 3,900 per year. Combining the NEISS estimate of injuries treated in hospital EDs with the ICM estimate of medically attended injuries treated in other settings brings the estimate of all nonfatal, medically attended CSU tip-over injuries to children to 34,100 during the years 2015 through 2019.

Injuries to children when CSUs tip over can be serious. They include fatal injuries resulting from skull fractures, closed-head injuries, compressional and mechanical asphyxia, and internal organ crushing leading to hemorrhage; they also include serious nonfatal injuries, including skeletal injuries and bone fractures.

The Commission estimates that the rule would result in aggregate benefits of about \$305.5 million annually. Of the potential modifications for which staff was able to estimate the potential cost, the lowest costs were about \$5.80 per unit. Several were significantly higher. Even assuming the low cost of about \$5.80 per unit, assuming annual sales of at least 43 million units, the annual cost of the proposed rule would be around \$250 million. In addition, there is an unquantifiable cost to consumers associated with lost utility and availability, and increased costs.

The Commission concludes preliminarily that CSU tip overs pose an unreasonable risk of injury and finds that the proposed rule is reasonably necessary to reduce that unreasonable risk of injury

F. Public Interest

This proposed rule is intended to address an unreasonable risk of injury and death posed by CSUs tipping over. The Commission believes that adherence to the requirements of the proposed rule will significantly reduce CSU tip-over deaths and injuries in the future; thus, the rule is in the public interest.

G. Voluntary Standards

The Commission is aware of four voluntary and international standards that are applicable to CSUs: ASTM F2057–19, *Standard Consumer Safety Specification for Clothing Storage Units*; AS/NZS 4935: 2009, the Australian/New Zealand Standard for *Domestic furniture—Freestanding chests of drawers, wardrobes and bookshelves/bookcases—determination of stability*; ISO 7171 (2019), the International Organization for Standardization *International Standard for Furniture—Storage Units—Determination of stability*; and EN14749 (2016), the European Standard, *European Standard for Domestic and kitchen storage units and worktops—Safety requirements and test methods*. The Commission does not consider the standards adequate because they do not account for the multiple factors that are commonly present simultaneously in CSU tip-over incidents and that testing indicates decrease the stability of the CSU. These factors include multiple open and filled drawers, carpeted flooring, and dynamic forces generated by children's interactions with the CSU, such as climbing or pulling on the top drawer.

H. Relationship of Benefits to Costs

The aggregate benefits of the rule are estimated to be about \$305.5 million annually; and the cost of the rule is

estimated to be about \$250 million annually (based on the lowest estimated cost of potential modifications to the units staff evaluated). On a per unit basis, the Commission estimates the expected benefits per unit to be \$6.01, assuming a 7 percent discount rate; \$7.88 assuming a 3 percent discount rate; and \$9.90 without discounting. The Commission's lowest estimated expected cost to manufacturers per unit is \$5.80 (based on the CSUs evaluated), plus an unquantifiable cost to consumers associated with lost utility and availability, and increased costs. Based on this analysis, the Commission preliminarily finds that the benefits expected from the rule bear a reasonable relationship to the anticipated costs of the rule.

I. Least Burdensome Requirement That Would Adequately Reduce the Risk of Injury

The Commission considered less-burdensome alternatives to the proposed rule, but preliminarily concludes that none of these alternatives would adequately reduce the risk of injury.

The Commission considered relying on voluntary recalls, compliance with the voluntary standard, and education campaigns, rather than issuing a mandatory standard. This alternative would have minimal costs, but would be unlikely to reduce the risk of injury from CSU tip overs. The Commission has relied on these efforts to date, but despite these efforts, there has been no declining trend in child injuries from CSU tip overs (without televisions) from 2006 to 2019.

The Commission considered issuing a standard that requires only performance and technical data, with no performance requirements for stability. This would impose lower costs on manufacturers, but is unlikely to adequately reduce the risk of injury because it relies on manufacturers choosing to offer more stable units; consumer assessment of their need for more stable units (which CPSC's research indicates consumers underestimate); and does not account for CSUs outside a child's home or purchased before a child was born.

The Commission considered mandating a standard like ASTM F2057-19, but replacing the 50-pound test weight with a 60-pound test weight. This alternative would be less costly than the proposed rule, because many CSUs already meet such a requirement, and it would likely cost less to modify noncompliant units to meet this less stringent standard. However, this alternative is unlikely to adequately reduce the risk of CSU tip overs because

it does not account for several factors that are simultaneously present in CSU tip-over incidents and contribute to instability, including multiple open and filled drawers, carpeting, and forces generated by a child interacting with the CSU.

The Commission considered providing a longer effective date. This may reduce the costs of the rule by spreading them over a longer period, but it would also delay the benefits of the rule, in the form of reduced deaths and injuries.

XX. Request for Comments

The Commission invites comments on all aspects of the proposed rule. Comments should be submitted in accordance with the instructions in the **ADDRESSES** section at the beginning of this notice. The following are specific comment topics that the Commission would find helpful:

A. Scope and Definitions

- The scope of the proposed standard, including the products covered, and the characteristics used to define and identify CSUs;
- the listed exclusions, including whether the excluded products should be included, or whether other products should be excluded;
- whether the scope of the proposed rule should include CSUs under 27 inches, or all CSUs, regardless of height;
- whether lightweight units, including lightweight plastic units, should be excluded from the scope of the rule, and if so, the safety justification for doing so, and what the weight threshold should be and why;
- whether all freestanding items marketed and/or advertised as suitable for clothing storage should be included in the scope of the standard, even if they would otherwise be excluded based on their design;
- whether nightstands with drawers and/or doors should be included in the scope and what design features and safety considerations distinguish nightstands from CSUs;
- design features that distinguish non-CSU cabinets from door chests and other similar CSUs; and
- the proposed definitions, including whether any definitions should be modified, or any additional terms should be defined.

B. Fill Requirements

- Whether the fill amounts for drawers and pull-out shelves at 8.5 pounds per cubic foot are reasonable or should be revised;
- data on the weight of clothes in drawers; and

- whether pull-out shelves should be tested with the same storage density as drawers, or would a lower fill weight for pull-out drawers be appropriate (*e.g.*, 4.25 pounds per cubic foot).

C. Performance Requirements

- The stability requirements, and whether they are adequate, or should be modified;
- whether the moment requirements should be increased (*e.g.*, the same stability requirements as in the proposed rule, but with a 60-pound child interaction, or simulating more aggressive behavior) or decreased (*e.g.*, use different force/moment values to simulate climbing);
- the proposed test methods and any alternatives;
- whether a 1.5-degree forward tilt adequately replicates the effects of a CSU resting on carpet;
- whether an inclined surface test should be added to account for sloped floors;
- whether ANSI/BIFMA SOHO S6.5-2008 (R2013) requirements for interlocks are appropriate to consider for CSU interlocks, or what different requirements to consider and why;
- whether the 30-pound proposed performance requirement is adequate to assess that the drawer interlock design cannot be easily defeated or overridden by consumers;
- whether drawer interlocks should be subject to a performance requirement to ensure designs cannot be easily defeated or overridden by consumers;
- whether labeling or instructions for proper leveling on carpet should be a requirement;
- whether levelling devices should be non-adjustable to account for carpeting;
- whether levelling devices should be allowed to be adjusted per the manufacturer instructions during stability testing;
- whether levelling devices should include preset heights to account for carpeting;
- whether levelling devices should require a permanent adjustment mark that indicates the position recommended for use on a carpeted surface;
- whether the criteria to measure the maximum tip-over load should be the rear of the CSU lifting off at least ¼ inch from the test surface;
- whether interlocks for ready-to-assemble furniture should be pre-assembled and/or automatically engage;
- how to test interlock systems that have an override, such as two drawers opened simultaneously, and how to determine whether children can engage an override, and associated test methods;

- whether interlocks on other extendible elements besides drawers should be considered (*e.g.*, doors, shelves);
- whether and how to test automatically closing drawers;
- whether all three of the comparison tip-over moments should be included in the standard, whether any should not be included, or whether any additional forces or interactions should be included;
- pull force and force application location; and
- drawer extension requirements during testing.

D. Child Interactions and Associated Forces

- Whether the test method should account for pull forces on the CSU, and the assumptions of pull force and force application location (*e.g.*, is the 17.2-pound horizontal force applied at maximum 4.12 feet vertical distance appropriate to simulate a child pulling a drawer or pulling on a CSU);
- assumptions relating to children's interactions with doors and associated forces, including whether interactions involving opening doors and climbing on doors should be addressed; and
- the adequacy of the proposed requirement regarding opening and climbing on doors.

E. Marking and Labeling

- Whether the proposed warning requirements are adequate, or should be modified;
- suggestions for the language and format of the warning label;
- suggestions for the language and format of the informational label;
- whether the graphical symbols being studied, as well as the symbols included in ASTM F2057–19 are appropriate, effective, and understandable;
- the size, content, symbols, format, location, and permanency of marking and labeling;
- whether there should be a warning on CSUs to anchor the television, when the CSU is suitable for holding a television;
- whether labeling or instructions for proper levelling on carpet should be a requirement, especially for CSUs with levelers to tilt the unit backwards on carpet; and
- whether the product and packaging should contain a label that states: "meets CPSC stability requirements."

F. Hang Tags

- All aspects of the proposed hang tag requirements;
- whether the hang tag rating and explanatory text is understandable;

- suggestions for the language or format of the hang tag;
- potential rating calculations, and suggestions for other ratings; and
- improvements in the graphic quality that maintain symbolic, iconic representation of a tip-over event.

G. Tip Restraints

- Tip restraints, including their adequacy and suggestions for improving the tip restraint requirements outlined in ASTM F3096–14 and ASTM F2057–19;
- whether there should be a requirement that all CSUs come with a tip restraint and/or whether there should be a requirement that CSUs intended for use with televisions should include a television restraint device and/or means to anchor a television (including a flat panel televisions) on the CSU, such as a universal attachment point;
- potential test methods related to tip restraints, including whether requirements should address designs where tip restraint installation is mandatory to unlock drawers; and
- whether the Commission should develop tip restraint requirements, such as restraints permanently attached to the CSU or an attachment point, such as a D-ring, that will not fail when pulled at a specified force.

H. Economic Analysis (Preliminary Regulatory Analysis and IRFA)

- The annual unit sales of CSUs;
- the accuracy and reasonableness of the benefits estimates;
- the accuracy or reasonableness of the cost estimates for manufacturers and importers (if available, sales or other shipment data would be helpful);
- costs of the testing and certification requirements;
- costs associated with the warning label and hang tag requirements;
- the cost and other impacts of adding weight to the rear of the CSU to meet the requirements of the proposed rule;
- the practicality and costs of using levelers or other means of raising the front of a CSU to meet the requirements of the proposed rule;
- the potential modifications discussed in this preamble and the NPR briefing package, and their estimated costs;
- other ways CSUs could be modified to comply with the requirements of the proposed rule, including the potential cost of the modifications and other impacts on the CSUs or their utility. CPSC is particularly interested in ways that the cost of the modifications could be offset by making other changes in the

design of the CSUs or the manufacturing processes used;

- the sensitivity analysis and any other valuations used in CPSC's analysis;
- the types and magnitude of manufacturing costs that might disproportionately impact small businesses or were not considered in the agency's analysis;
- the different impacts on small businesses associated with different effective dates;
- the differential impacts of the proposed rule on small manufacturers or suppliers that compete in different segments of the CSU market; and
- other alternatives that would minimize the impact on small businesses but would still reduce the risk of CSU tip-over incidents.

I. Stockpiling

- The need for an anti-stockpiling requirement;
- the proposed manufacture and import limits; and
- the proposed base period for the stockpiling provision.

J. Effective Date

- The reasonableness of the proposed 30-day effective date and recommendations for a different effective date, if justified; and
- comments recommending a longer effective date should describe the problems associated with meeting the proposed effective date and the justification for a longer one.

XXI. Promulgation of a Final Rule

Section 9(d)(1) of the CPSA requires the Commission to promulgate a final consumer product safety rule within 60 days of publishing a proposed rule. 15 U.S.C. 2058(d)(1). Otherwise, the Commission must withdraw the proposed rule, if it determines that the rule is not reasonably necessary to eliminate or reduce an unreasonable risk of injury associated with the product, or is not in the public interest. *Id.* However, the Commission can extend the 60-day period for good cause shown, if it publishes the reasons for doing so in the **Federal Register**. *Id.*

The Commission finds there is good cause to extend the 60-day period for this rulemaking. Under both the Administrative Procedure Act (APA; 5 U.S.C. 551–559) and the CPSA, the Commission must provide an opportunity for interested parties to submit written comments on a proposed rule. 5 U.S.C. 553; 15 U.S.C. 2058(d)(2). The Commission typically provides 75 days for interested parties to submit written comments. Because of the size,

complexity, and potential impacts of this proposed rule, the Commission considers it appropriate to provide a 75-day comment period. In addition, the CPSA requires the Commission to provide interested parties with an opportunity to make oral presentations of data, views, or arguments. 15 U.S.C. 2058. This requires time for the Commission to arrange a public meeting for this purpose, and provide notice to interested parties in advance of that meeting. After receiving written and oral comments, CPSC staff must have time to review and evaluate those comments.

These factors make it impossible for the Commission to issue a final rule within 60 days of this proposed rule. Accordingly, the Commission finds there is good cause to extend the 60-day period.

XXII. Conclusion

For the reasons stated in this preamble, the Commission proposes requirements for CSUs to address an unreasonable risk of injury associated with CSU tip overs.

List of Subjects

16 CFR Part 1112

Administrative practice and procedure, Audit, Consumer protection, Reporting and recordkeeping requirements, Third-party conformity assessment body.

16 CFR Part 1261

Consumer protection, Imports, Incorporation by reference, Information, Labeling, Safety.

For the reasons discussed in the preamble, the Commission proposes to amend chapter II, subchapter B, title 16 of the Code of Federal Regulations as follows:

PART 1112—REQUIREMENTS PERTAINING TO THIRD PARTY CONFORMITY ASSESSMENT BODIES

■ 1. The authority citation for part 1112 continues to read as follows:

Authority: Pub. L. 110–314, section 3, 122 Stat. 3016, 3017 (2008); 15 U.S.C. 2063.

■ 2. Amend § 1112.15 by adding paragraph (b)(54) to read as follows:

§ 1112.15 When can a third party conformity assessment body apply for CPSC acceptance for a particular CPSC rule or test method?

* * * * *

(b) * * *

(54) 16 CFR part 1261, Safety Standard for Clothing Storage Units.

* * * * *

■ 3. Add part 1261 to read as follows:

PART 1261—SAFETY STANDARD FOR CLOTHING STORAGE UNITS

Sec.

1261.1 Scope, purpose, application, and exemptions.

1261.2 Definitions.

1261.3 Requirements for interlocks.

1261.4 Requirements for stability.

1261.5 Requirements for marking and labeling.

1261.6 Requirements to provide performance and technical data by labeling.

1261.7 Prohibited stockpiling.

1261.8 Findings.

Authority: 15 U.S.C. 2051(b), 2056, 2058, 2063(c), 2076(e)

§ 1261.1 Scope, purpose, application, and exemptions.

(a) *Scope and purpose.* This part, a consumer product safety standard, prescribes the safety requirements, including labeling and hang tag requirements, for *clothing storage units*, as defined in § 1261.2(a). These requirements are intended to reduce or eliminate an unreasonable risk of death or injury to consumers from clothing storage unit tip overs.

(b) *Application.* Except as provided in paragraph (c) of this section, all clothing storage units that are manufactured in the United States, or imported, on or after [EFFECTIVE DATE OF FINAL RULE], are subject to the requirements of this part 1261, if they are *consumer products*. Section 3(a)(1) of the Consumer Product Safety Act (15 U.S.C. 2052(a)(1)) defines the term *consumer product* as an “article, or component part thereof, produced or distributed.

(1) For sale to a consumer for use in or around a permanent or temporary household or residence, a school, in recreation, or otherwise, or

(2) For the personal use, consumption or enjoyment of a consumer in or around a permanent or temporary household or residence, a school, in recreation, or otherwise.” The term does not include products that are not customarily produced or distributed for sale to, or for the use or consumption by, or enjoyment of, a consumer.

(c) *Exemptions.* The following products are exempt from this part:

(1) *Clothes lockers*, as defined in § 1261.2(b), and

(2) *Portable storage closets*, as defined in § 1261.2(s).

§ 1261.2 Definitions.

In addition to the definitions given in section 3 of the Consumer Product Safety Act (15 U.S.C. 2052), the following definitions apply for purposes of this part:

(a) *Clothing storage unit* means a *freestanding* furniture item, with *drawer(s)* and/or *door(s)*, that may be reasonably expected to be used for storing clothing, that is greater than or equal to 27 inches in height, and with a total *functional volume* of the *closed storage* greater than 1.3 cubic feet and greater than the sum of the total *functional volume* of the *open storage* and the total volume of the *open space*.

Common names for clothing storage units include, but are not limited to: Chests, bureaus, dressers, armoires, wardrobes, chests of drawers, drawer chests, chifforobes, and door chests. Whether a product is a clothing storage unit depends on whether it meets this definition. Some products that generally do not meet the criteria in this definition and, therefore, likely are not considered clothing storage units are: Shelving units, office furniture, dining room furniture, laundry hampers, built-in closets, and single-compartment closed rigid boxes (storage chests).

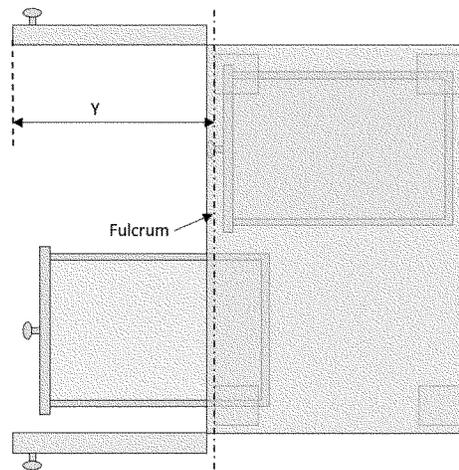
(b) *Clothes locker* means a predominantly metal furniture item without exterior drawers and with one or more doors that either locks or accommodates an external lock.

(c) *Closed storage* means storage space inside a *drawer* and/or behind an opaque *door*. For this part, both sliding and hinged doors are considered in the definition of *closed storage*.

(d) *Door* means a hinged furniture component that can be opened or closed, typically outward or downward, to form a barrier; or a sliding furniture component that can be opened or closed by sliding across the face or case of the furniture item. This does not include vertically opening hinged lids.

(e) *Door extension from fulcrum distance* means the horizontal distance measured from the farthest point of a hinged door that opens outward or downward, while the door is in a position where the center of mass of the door is extended furthest from the front face of the unit (typically 90 degrees), to the *fulcrum*, while the CSU is on a *hard, level, and flat test surface*. See figure 1 to this paragraph (e). Sliding doors that remain within the CSU case are not considered to have a door extension.

Figure 1 to paragraph (e)—(Top View) The *door extension from fulcrum distance*, illustrated by the letter **Y.**

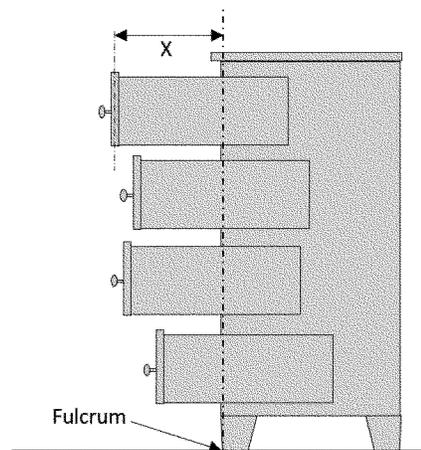


(f) *Drawer* means a furniture component intended to contain or store items that slides horizontally in and out of the furniture case and may be attached to the case by some means, such as glides.

(g) *Drawer or pull-out shelf extension from fulcrum distance* means the horizontal distance measured from the centerline of the front face of the *drawer* or the outermost surface of the pull-out shelf to the *fulcrum*, when the drawer or pull-out shelf is at the *maximum*

extension and the CSU is on a *hard, level, and flat test surface*. For a curved or angled surface this measurement is taken where the distance is at its greatest. See figure 2 to this paragraph (g).

Figure 2 to paragraph (g)—The *drawer extension from fulcrum distance*, illustrated by the letter **X.**



(h) *Freestanding* means that the unit remains upright, without requiring attachment to the wall, when it is fully assembled and empty, with all extension elements closed. Built-in units or units intended to be permanently attached to the building structure, other than by tip restraints, are not considered freestanding. Examples of units that are intended to

be permanently installed include, but are not limited to, kitchen cabinets and bathroom vanities.

(i) *Functional volume* of a *drawer* or *pull-out shelf* means the interior bottom surface area multiplied by the effective *drawer/pull-out shelf* height, which is distance from the bottom surface of the *drawer/pull-out shelf* to the top of the *drawer/pull-out shelf* compartment

minus $\frac{1}{8}$ inches (see figure 3 to this paragraph (i)). *Functional volume* behind a *door* means the interior bottom surface area behind the *door*, when the *door* is closed, multiplied by the height of the storage compartment (see figure 4 to this paragraph (i)). *Functional volume* of *open storage* means the interior bottom surface area multiplied by the effective *open storage* height, which is

distance from the bottom surface of the *open storage* to the top of the *open storage compartment* minus $\frac{1}{8}$ inches.

Figure 3 to paragraph (i)—*Functional volume of drawer or pull-out shelf.*

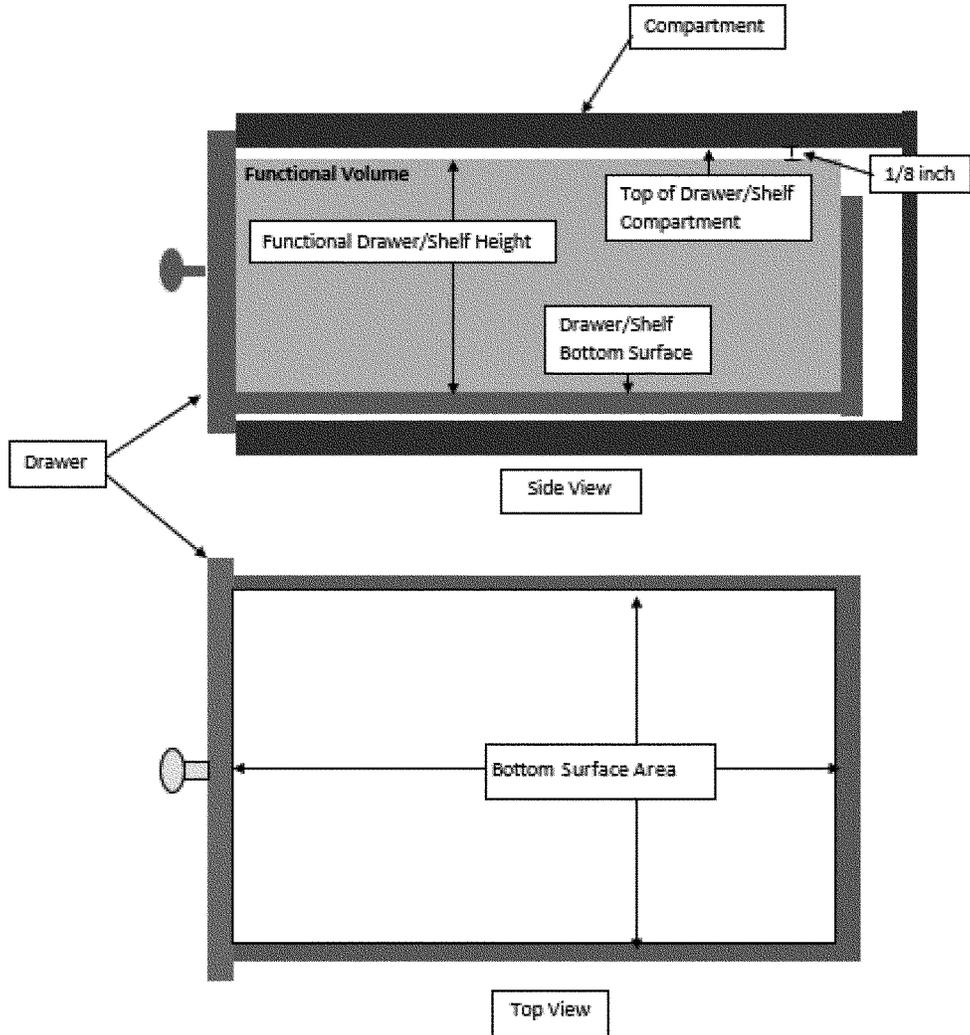
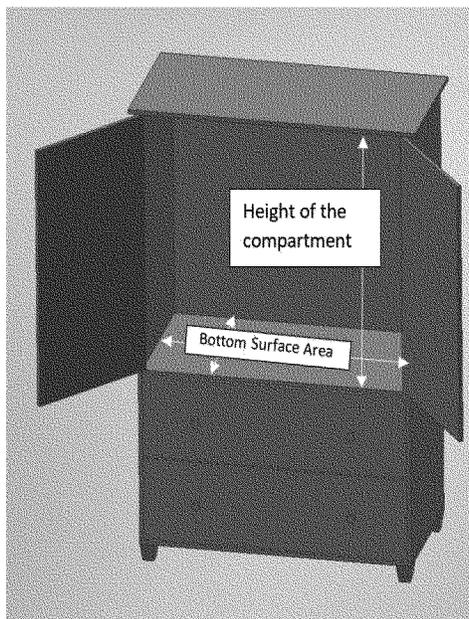


Figure 4 to paragraph (i)—*Functional volume behind a door.*

(j) *Fulcrum* means the point or line at the base of the CSU about which the CSU pivots when a *tip-over force* is applied (typically the front feet).

(k) *Hard, level, and flat test surface* means a test surface that is

(1) Sufficiently hard to not bend or break under the weight of a *clothing storage unit* and any loads associated with testing the unit;

(2) Level with no more than 0.5 degrees of variation; and

(3) Smooth and even.

(l) *Interlock* means a device that restricts simultaneous opening of *drawers*. An *interlock* may allow only one *drawer* to open at a time, or may

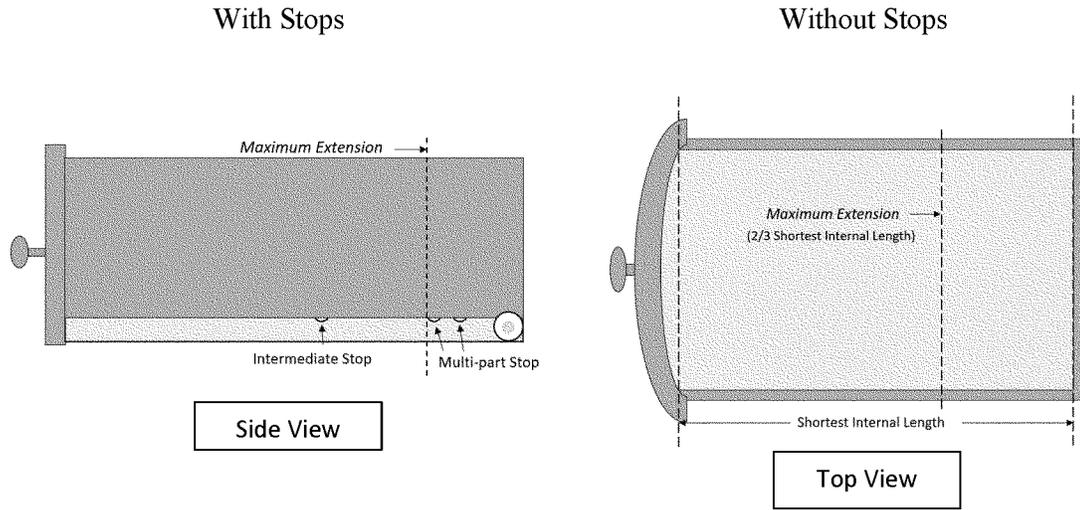
allow more than one *drawer*, but fewer than all the *drawers*, to open simultaneously.

(m) *Levelling device* means an adjustable device intended to adjust the level of the clothing storage unit.

(n) *Maximum extension* means a condition when a *drawer* or *pull-out shelf* is open to the furthest manufacturer recommended use position, as indicated by way of a stop. In the case of slides with multiple intermediate stops, this is the stop that allows the *drawer* or *pull-out shelf* to extend the furthest. In the case of slides with a multipart stop, such as a stop

that extends the *drawer* or *pull-out shelf* to the furthest manufacturer recommended use position with an additional stop that retains the *drawer* or *pull-out shelf* in the case, this is the stop that extends the *drawer* or *pull-out shelf* to the manufacturer recommended use position. If the manufacturer does not provide a recommended use position by way of a stop, this is $\frac{2}{3}$ the shortest internal length of the *drawer* measured from the inside face of the *drawer* front to the inside face of the *drawer* back or $\frac{2}{3}$ the length of the *pull-out shelf*. See figure 5 to this paragraph (n).

Figure 5 to paragraph (n)—Example of *maximum extension* on *drawers and pull-out shelves* with stops and without stops.

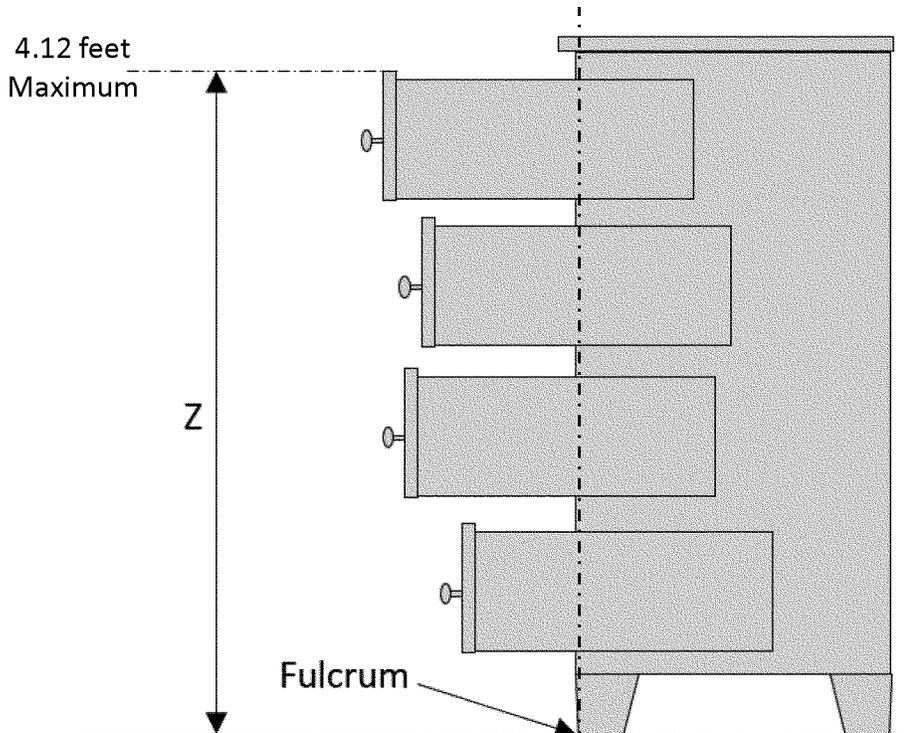


(o) *Maximum handhold height* means the highest position at which a child may grab hold of the CSU. This includes

the top of the CSU. This height is limited to a maximum of 4.12 feet from the ground, while the CSU is on a flat

and level surface. See figure 6 to this paragraph (o).

Figure 6 to paragraph (o)—The *maximum handhold height*, illustrated by the letter *Z*.



(p) *Moment* means a moment of a force, which is a measure of the tendency to cause a body to rotate about a specific point or axis. It is measured in pound-feet, representing a force

multiplied by a lever arm, or distance from the force to the point of rotation.

(q) *Open storage* means storage space enclosed on at least 5 sides by a frame

or panel(s) and/or behind a non-opaque door and with a flat bottom surface.

(r) *Open space* means space enclosed within the frame or panels, but without a bottom surface. For example, under

legs or between storage components, as with a vanity.

(s) *Portable storage closet* means a freestanding furniture item with an open frame that encloses hanging clothing storage space and/or shelves. This item may have a cloth case with curtain(s), flap(s), or door(s) that obscure the contents from view.

(t) *Pull-out shelf* means a furniture component with a horizontal flat surface that slides horizontally in and out of the furniture case and may be attached to the case by some means, such as glides.

(u) *Tip over* means the point at which a clothing storage unit pivots forward such that the rear feet or, if there are no feet, the edge of the CSU lifts at least $\frac{1}{4}$ inch from the floor and/or is supported by a non-support element.

(v) *Tip-over force* means the force required to cause tip over of the clothing storage unit.

(w) *Tip-over moment* means the minimum moment in pounds-feet about the *fulcrum* that causes *tip over*.

§ 1261.3 Requirements for interlocks.

(a) *General*. For all clothing storage units, including consumer-assembled units, the *interlock* components must be pre-installed, and automatically engage when the consumer installs the *drawers* in the unit. All *interlocks* must engage automatically as part of normal use.

(b) *Interlock pull test*. (1) If the unit is not fully assembled, assemble the unit according to the manufacturer's instructions.

(2) Place the unit on a *hard, level, and flat test surface*.

(3) If the unit has a *levelling device*, adjust the *levelling device* to the lowest level; then adjust the *levelling device* in accordance with the manufacturer's instructions.

(4) Secure the unit to prevent sliding or *tip over*.

(5) Open any *doors* in front of the *interlocked drawers*.

(6) Engage the *interlock* by opening a *drawer*, or the number of *drawers*

necessary to engage the *interlock*, to the *maximum extension*.

(7) Gradually apply over a period of at least 5 seconds a 30-pound horizontal pull force on each locked *drawer*, one *drawer* at a time, and hold the force for at least 10 seconds.

(8) Repeat this test until all possible combinations of *drawers* have been tested.

(c) *Performance requirement*. During the testing specified in paragraph (b) of this section, if any locked *drawer* opens or the *interlock* is damaged, then the *interlock* will be disabled or bypassed for the stability testing in § 1261.4(c).

§ 1261.4 Requirements for stability.

(a) *General*. Clothing storage units shall be configured as described in paragraph (b) of this section, and tested in accordance with the procedure in paragraph (c) of this section. Clothing storage units shall meet the requirement for tip-over stability based on the minimum *tip-over moment* as specified in paragraph (d) of this section.

(b) *Test configuration*. The clothing storage unit used for tip-over testing shall be configured in the following manner:

(1) If the unit is not fully assembled, assemble the unit according to the manufacturer's instructions.

(2) Place the unit on a *hard, level, and flat test surface*.

(3) If the CSU has a *levelling device*, adjust the *levelling device* to the lowest level; then adjust the *levelling device* in accordance with the manufacturer's instructions.

(4) Tilt the CSU forward to 1.5 degrees by one of the following methods:

(i) Raise the rear of the unit until the unit has a 1.5-degree forward tilt, or

(ii) Place the unit on a hard and flat 1.5-degree inclined surface, with the high point at the rear of the unit surface, or

(iii) Other means to achieve a 1.5-degree forward tilt.

(5) If the CSU has a *levelling device* intended for a carpeted surface, adjust

the level in accordance with the manufacturer's instructions for a carpeted surface.

(6) Open all hinged *doors* that open outward or downward to the position where the center of mass of the *door* is extended furthest from the front face of the unit (typically 90 degrees).

(7) For units without an *interlock*:

(i) Open all *drawers* and *pull-out shelves* to the *maximum extension*.

(ii) Place a fill weight in the center of each *drawer* or *pull-out shelf* consisting of a uniformly distributed mass in pounds that is 8.5 (pounds/cubic foot) times the *functional volume* (cubic feet).

(8) For units with an *interlock*:

(i) If, during the testing specified in § 1261.3(b), any locked *drawer* opens or the *interlock* is damaged, then disable or bypass the *interlock* for the stability testing required in this section, and follow the requirements for units without an *interlock*.

(ii) If, during the testing specified in § 1261.3(b), no locked *drawer* opens and the *interlock* is not damaged, then:

(A) Open all *drawers* that are not locked by the *interlock* system to the *maximum extension*, in the configuration most likely to cause tip over (typically the configuration with the largest *drawers* in the highest position open).

(B) If 50 percent or more of the *drawers* and *pull-out shelves* by *functional volume* are open, place a fill weight in the center of each *drawer* or *pull-out shelf*, including those that remain closed (see figure 1 to this paragraph (b)(8)), consisting of a uniformly distributed mass in pounds that is 8.5 (pounds/cubic foot) times the *functional volume* (cubic feet). Secure the fill weights to prevent sliding.

(C) If less than 50 percent of the *drawers* and *pull-out shelves* by *functional volume* are open, do not place a fill weight in any *drawers* or on any *pull-out shelves* (see figure 2 to this paragraph (b)(8)).

Figure 1 to paragraph (b)(8)—If 50 percent or more of the *drawers/pull-out shelves* open, clothing storage units tested with fill weights in all drawers.

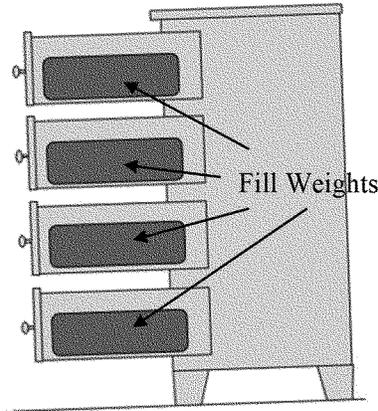
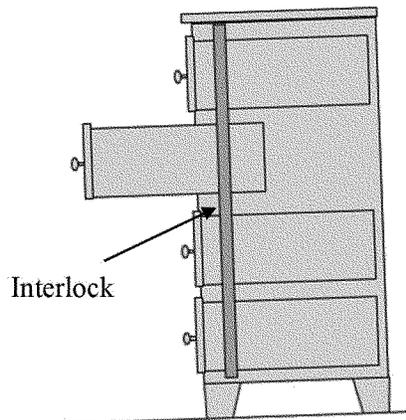


Figure 2 to paragraph (b)(8)—If less than 50 percent of the *drawers/pull-out shelves* open, clothing storage units tested empty.



(c) *Test procedure to determine tip-over moment of the unit.* Perform one of the following two tip-over tests (Test Method 1 or Test Method 2), whichever is the most appropriate for the unit:

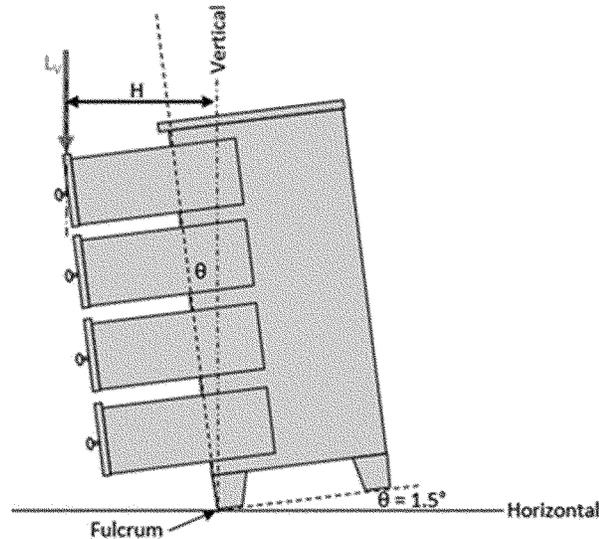
(1) Test Method 1 can be used for units with *drawers* or *pull-out shelves*. Gradually apply over a period of at least

5 seconds a vertical force to the face of the uppermost extended *drawer/pull-out shelf* of the unit to cause the unit to *tip over*. Record the *tip-over force* and horizontal distance from the force application point to the *fulcrum*. Calculate the *tip-over moment* of the unit by multiplying the *tip-over force*

(pounds) by the horizontal distance from the force application point to the *fulcrum* (feet). See figure 3 to this paragraph (c)(1). NOTE: If a drawer breaks during the test due to the force, use Test Method 2 or secure or reinforce the drawer, as long as the modifications do not increase the *tip-over moment*.

Figure 3 to paragraph (c)(1)—Illustration of force application methods for Test

Method 1 with vertical load L_V (tilt angle not to scale).



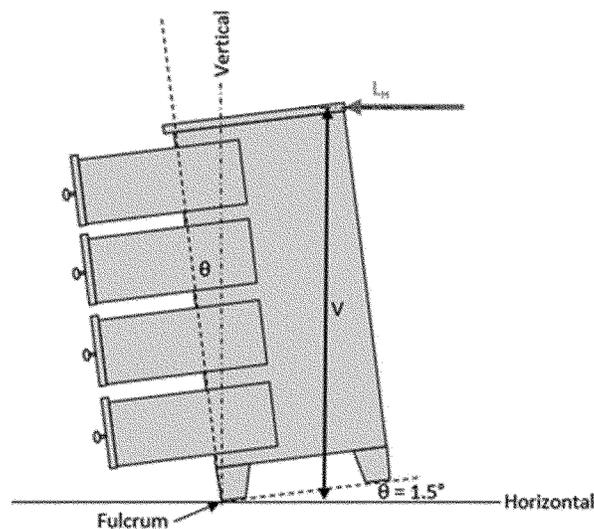
(2) Test Method 2 can be used for any unit. Gradually apply over a period of at least 5 seconds a horizontal force to the back of the unit orthogonal to the *fulcrum* to cause the unit to *tip over*.

Record the force and the vertical distance from the force application point to the *fulcrum*. Calculate the *tip-over moment* of the unit by multiplying the *tip-over force* (pounds) by the

vertical distance from the force application point to the *fulcrum* (feet). See figure 4 to this paragraph (c)(2).

Figure 4 to paragraph (c)(2)—Illustration of force application methods for Test Method 2

with horizontal load L_H (tilt angle not to scale).



(d) *Performance requirement*. The *tip-over moment* of the clothing storage unit must be greater than the threshold

moment, which is the greatest of all of the applicable moments in paragraphs (d)(1) through (3) of this section:

(1) For units with a *drawer(s)* or *pull-out shelf(ves)*: 55.3 pounds times the *drawer or pull-out shelf extension from*

fulcrum distance in feet + 26.6 pounds feet;

(2) For units with a *door(s)*: 51.2 pounds times the *door extension from fulcrum distance* in feet—12.8; and

(3) For all units: 17.2 pounds times *maximum handhold height* in feet.

§ 1261.5 Requirements for marking and labeling.

(a) *Warning label requirements.* The clothing storage unit shall have a warning label, as defined below and as shown in figure 1 to this paragraph (a).

(1) *Size.* The warning label shall be at least 2 inches wide by 2 inches tall.

(2) *Content.* (i) The warning label shall contain the following text:

Children have died from furniture tip over. To reduce the risk of tip over:

- ALWAYS secure this furniture to the wall using an anti-tip device
- NEVER allow children to stand, climb, or hang on drawers, doors or shelves.
- [for units with interlocks only] Do not defeat or remove the drawer interlock system
- Place heaviest items in the lowest drawers
- [for units that are not designed to hold a television only] NEVER put a TV on this furniture

(ii) The warning label shall contain the child climbing symbol displayed in figure 1 to this paragraph (a), with the prohibition symbol in red. For units that are not designed to hold a television, the warning label shall contain the no television symbol displayed in figure 1, with the prohibition symbol in red.

(3) *Format.* The warning label shall use the signal word panel content and format specified in Section 8.2.2 of ASTM F2057–19, *Standard Safety Specification for Clothing Storage Units*, and the font, font size, and color specified in Section 8.2.3 of ASTM F2057–19 (incorporated by reference, see paragraph (c) of this section). Each safety symbol shall measure at least 1 in. by 1 in. See figure 1 to this paragraph (a).

(4) *Location.* (i) For units with one or more drawer(s):

(A) The warning label shall be located on the interior side panel of a drawer in the upper most drawer row, or if the top of the drawer(s) in the upper most drawer row is more than 56 inches from the floor, on the interior side panel of a drawer in the upper most drawer row

below 56 inches from the floor, as measured from the top of the drawer.

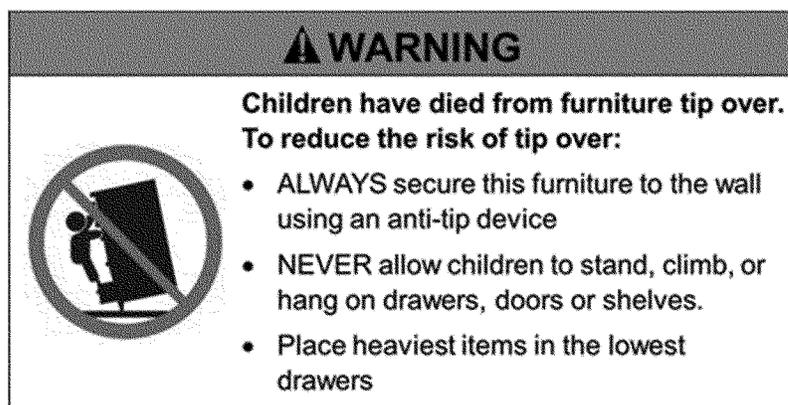
(B) The top left corner of the warning label shall be positioned within 1 inch of the top of the drawer side panel and within the front 1/3 of the interior drawer depth.

(ii) For units with only doors: The warning label shall be located on an interior side or back panel of the cabinet behind the door(s), or on the interior door panel. The warning label shall not be obscured by a shelf or other interior element.

(iii) For consumer-assembled units: The warning label shall be pre-attached to the panel, and the assembly instructions shall direct the consumer to place the panel with the warning label according to the placement requirements in paragraphs (a)(4)(i) and (ii) of this section.

(5) *Permanency.* The warning label shall be legible and attached after it is tested using the methods specified in Section 7.3 of ASTM F2057–19, *Standard Safety Specification for Clothing Storage Units* (incorporated by reference, see paragraph (c) of this section).

Figure 1 to paragraph (a)—Example warning label for a clothing storage unit with an interlock system and not designed to hold a television (top) and for a clothing storage unit without an interlock system and designed to hold a television (bottom).



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(b) *Identification labeling requirements.* The clothing storage unit shall have an identification label, as defined in this paragraph (b)

(1) *Size.* The identification label shall be at least 2 inches wide by 1 inch tall.

(2) *Content.* The identification label shall contain the following:

(i) Name and address (city, state, and zip code) of the manufacturer, distributor, or retailer; the model number; and the month and year of manufacture.

(ii) The statement “Complies with U.S. CPSC Safety Standard for Clothing Storage Units,” as appropriate; this label may spell out “U.S. Consumer Product Safety Commission” instead of “U.S. CPSC.”

(3) *Format.* The identification label text shall not be less than 0.1 in. (2.5

mm) capital letter height. The text and background shall be contrasting colors (e.g., black text on a white background).

(4) *Location.* The identification label shall be visible from the back of the unit when the unit is fully assembled.

(5) *Permanency.* The identification label shall be legible and attached after it is tested using the methods specified in Section 7.3 of ASTM F2057-19, *Standard Safety Specification for Clothing Storage Units* (incorporated by reference, see paragraph (c) of this section).

(c) *Incorporation by reference.* Certain portions, identified in this section, of ASTM F2057-19, *Standard Safety Specification for Clothing Storage Units*, approved on August 1, 2019, are incorporated by reference into this part with the approval of the Director of the Federal Register in accordance with 5

U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959; phone: (610) 832-9585; www.astm.org. A read-only copy of the standard is available for viewing on the ASTM website at <https://www.astm.org/READINGLIBRARY/>. You may inspect a copy at the Division of the Secretariat, U.S. Consumer Product Safety Commission, 4330 East-West Highway, Bethesda, MD 20814, telephone (301) 504-7479, email: cpsc-os@cpsc.gov, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, email fr.inspection@nara.gov, or go to: www.archives.gov/federal-register/cfr/ibr-locations.html.

§ 1261.6 Requirements to provide performance and technical data by labeling.

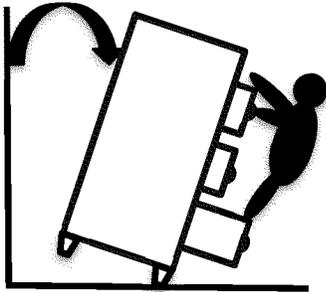
Manufacturers of clothing storage units shall give notification of performance and technical data related to performance and safety to prospective purchasers of such products at the time of original purchase and to the first purchaser of such product for purposes other than resale, in the manner set forth in this section:

(a) *Consumer information requirements.* The manufacturer shall provide a hang tag with every clothing storage unit that provides the ratio of tip-over moment as tested to the minimally allowed tip-over moment of that model clothing storage unit. The label must conform in content, form, and sequence to the hang tag shown in figure 1 to this paragraph (a).

(1) *Size.* Every hang tag shall be at least 5 inches wide by 7 inches tall.

(2) *Side 1 Content.* The front of every hang tag shall contain the following:

- (i) The title—“TIP OVER GUIDE.”
- (ii) The icon:



(iii) The statement—“Stability Rating.”

(iv) The manufacturer’s name and model number of the unit.

(v) Ratio of tip-over moment, as tested per § 1261.4(c), to the threshold moment, as determined per § 1261.4(d), of that model clothing storage unit, displayed on a progressive scale. This value shall be the rating.

(vi) The scale shall start at 0 and end at 5.

(vii) “Less” and “More” on the left and right sides of the scale, respectively.

(viii) A rating of 1 shall be indicated by the text “Minimum rating” and a vertical dotted line.

(ix) A solid horizontal line from 0 to the calculated rating.

(x) The statement—“Compare with other units before you buy.”

(xi) The statement—“This is a guide to compare the unit’s resistance to tipping over.”

(xii) The statement—“Higher numbers represent more stable units.”

(xiii) The statement—“No unit is completely safe from tip over.”

(xiv) The statement—“Always secure the unit to the wall.”

(xv) The statement—“Tell children not to climb furniture.”

(xvi) The statement—“See back side of this tag for more information.”

(xvii) The statement—“THIS TAG NOT TO BE REMOVED EXCEPT BY THE CONSUMER.”

(3) *Side 2 Content.* The reverse of every hang tag shall contain the following:

(i) The statement—“Stability Rating Explanation.”

(ii) The icon in paragraph (a)(2)(ii) of this section.

(iii) The tip rating determined in paragraph (a)(2)(v) of this section.

(iv) The statement—“Test data on this unit indicated it withstood [insert rating determined in paragraph (a)(2)(v) of this section] times the minimally acceptable moment, per tests required by the Consumer Product Safety Commission (see below).”

(v) The statement—“Deaths or serious crushing injuries have occurred from furniture tipping over onto people.”

(vi) The statement—“To reduce tip-over incidents, the U.S. Consumer Product Safety Commission (CPSC) requires that clothing storage units, such as dressers, chests, bureaus, and armoires, resist certain tip-over forces.

The test that CPSC requires measures the stability of a clothing storage unit and its resistance to rotational forces, also known as moments. This test is based on threshold rotational forces of a 3-year-old child climbing up, hanging on, or pulling on drawers and/or doors of this unit. These actions create rotational forces (moments) that can cause the unit to tip forward and fall over. The stability rating on this tag is the ratio of this unit’s tip-over moment (using CPSC’s test) and the threshold tip-over moment. More information on the test method can be found in 16 CFR part 1261.”

(4) *Format.* The hang tag shall be formatted as shown in Figure 9. The background of the front of the tag shall be printed in full bleed process yellow or equivalent; the background of the back of the tag shall be white. All type and graphics shall be printed in process black.

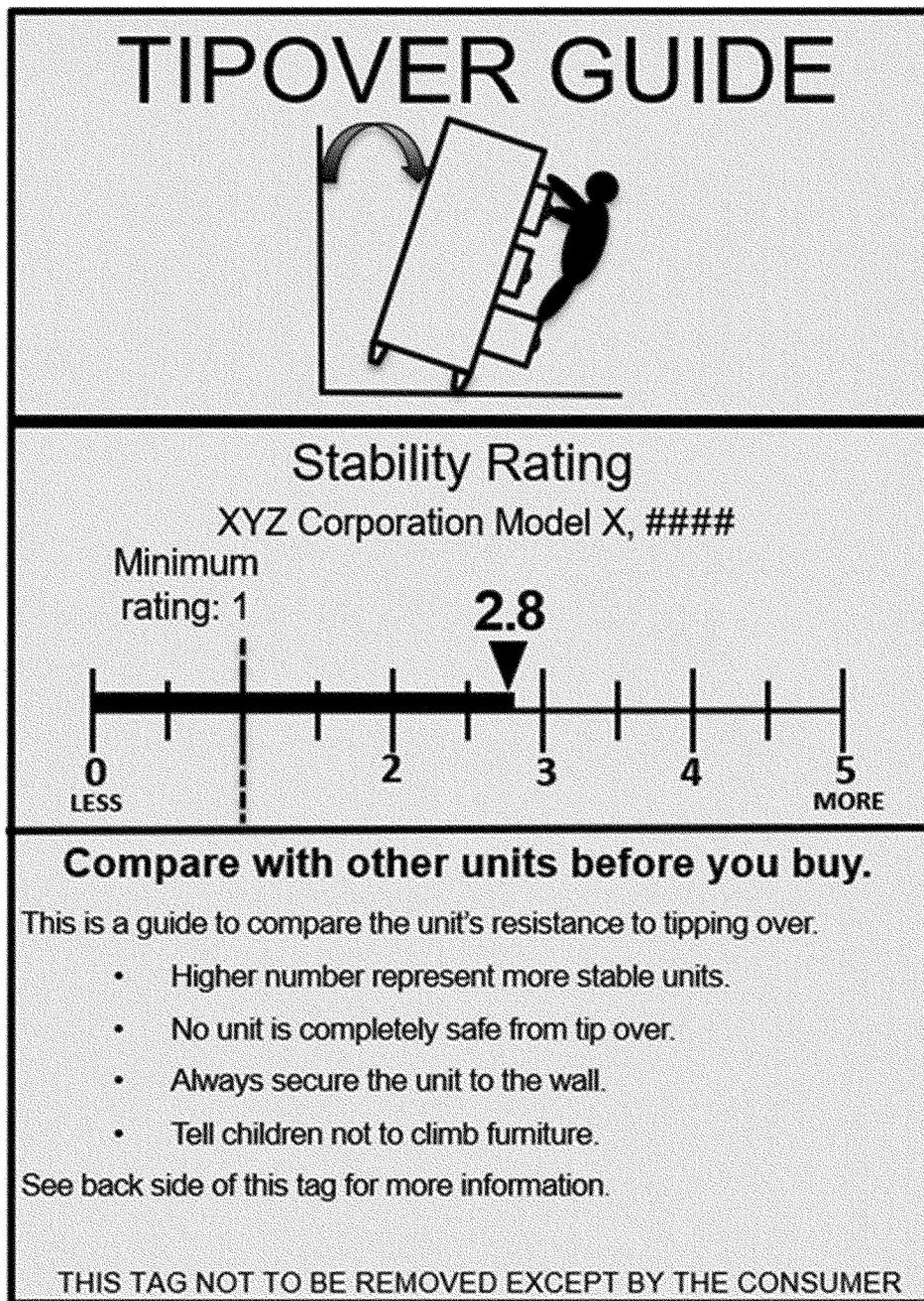
(5) *Attachment.* Every hang tag shall be attached to the CSU and be clearly visible to a person standing in front of the unit. The hang tag shall be attached to the CSU and lost or damaged hang tags must be replaced such that they are attached and provided, as required by this section, at the time of original purchase to prospective purchasers and to the first purchaser other than resale. The hang tags may be removed only by the first purchaser.

(6) *Placement.* The hang tag shall appear on the product and the immediate container of the product in which the product is normally offered for sale at retail. Ready-to-assemble furniture shall display the hang tag on the main panel of consumer-level packaging. The hang tag shall remain on the product/container/packaging until the time of original purchase. Any units shipped directly to consumers shall contain the hang tag on the immediate container of the product.

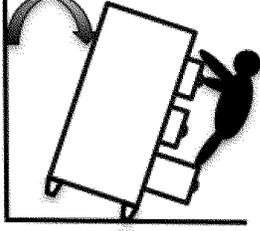
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Figure 1 to paragraph (a)—Hang tag example shown for a unit with a tip rating of 2.8.

FRONT



REVERSE

<p>Stability Rating: 2.8</p>	
<h2>Stability Rating Explanation</h2> <p>Test data on this unit indicated it withstood 2.8 times the threshold tip over rotational force/moment, per tests required by the Consumer Product Safety Commission (see below)</p> <p>Deaths and serious crushing injuries have occurred from furniture tipping over onto people.</p> <p>To reduce tip-over incidents, the U.S. Consumer Product Safety Commission (CPSC) requires that clothing storage units, such as dressers, chests, bureaus, and armoires, resist certain tip-over forces. The test that CPSC requires measures the stability of a clothing storage unit and its resistance to rotational forces, also known as moments. This test is based on threshold rotational forces of 3-year-old child climbing up, hanging on, or pulling on drawers and/or doors of this unit. These actions create rotational forces (moments) that can cause the unit to tip forward and fall over. The stability rating on this tag is the ratio of this unit's tip-over moment (using CPSC's test) and the threshold tip-over moment. More information on the test method can be found in 16 CFR XXXX.</p>	

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(b) [Reserved]

§ 1261.7 Prohibited stockpiling.

(a) *Prohibited acts.* Manufacturers and importers of clothing storage units shall not manufacture or import clothing storage units that do not comply with the requirements of this part in any 1-month period between [DATE OF PUBLICATION OF FINAL RULE] and [EFFECTIVE DATE OF FINAL RULE] at a rate that is greater than 105 percent of the rate at which they manufactured or imported clothing storage units during the *base period* for the manufacturer.

(b) *Base period.* The base period for clothing storage units is the calendar month with the median manufacturing or import volume within the last 13 months immediately preceding the month of promulgation of the final rule.

§ 1261.8 Findings.

(a) *General.* Section 9(f) of the Consumer Product Safety Act (15 U.S.C. 2058(f)) requires the Commission to make findings concerning the following topics and to include the findings in the rule. Because the findings are required to be published in the rule, they reflect the information that was available to the Consumer Product Safety Commission (Commission, CPSC) when the standard was issued on [DATE OF PUBLICATION OF FINAL RULE].

(b) *Degree and nature of the risk of injury.* The standard is designed to reduce the risk of death an injury from clothing storage units tipping over onto children. The Commission has identified 193 clothing storage unit tip-over fatalities to children that were reported to have occurred between January 1, 2000 and December 31, 2020. There were an estimated 56,400 injuries,

an annual average of 4,000 estimated injuries, to children related to clothing storage unit tip overs that were treated in U.S. hospital emergency departments from January 1, 2006 to December 31, 2019. Injuries to children, resulting from clothing storage units tipping over, include soft tissue injuries, skeletal injuries and bone fractures, and fatalities resulting from skull fractures, closed-head injuries, compressional and mechanical asphyxia, and internal organ crushing leading to hemorrhage.

(c) *Number of consumer products subject to the rule.* In 2017, there were approximately 463.5 million clothing storage units in use. In 2018, combined shipments of dressers and chests totaled 43.6 million units. Annual sales of clothing storage units total about 44 million units.

(d) *The need of the public for clothing storage units and the effects of the rule*

on their cost, availability, and utility. (1) Consumers commonly use clothing storage units to store clothing in their homes. The standard requires clothing storage units to meet a minimum stability threshold, but does not restrict the design of clothing storage units. As such, clothing storage units that meet the standard would continue to serve the purpose of storing clothing in consumers' homes. There may be a negative effect on the utility of clothing storage units if products that comply with the standard are less convenient to use. Another potential effect on utility could occur if, in order to comply with the standard, manufacturers modify clothing storage units to eliminate certain desired characteristics or styles, or discontinue models. However, this loss of utility would be mitigated to the extent that other clothing storage units with similar characteristics and features are available that comply with the standard.

(2) Retail prices of clothing storage units vary widely. The least expensive units retail for less than \$100, while some more expensive units retail for several thousand dollars. Of the potential modifications to comply with the standard for which CPSC was able to estimate the potential cost, the lowest costs were about \$5.80 per unit; however, several were significantly higher. Clothing storage unit prices may increase to reflect the added cost of modifying or redesigning products to comply with the standard, or to account for increased distribution costs. In addition, consumers may incur a cost in the form of additional time to assemble clothing storage units if additional safety features are included.

(3) If the costs associated with redesigning or modifying a clothing storage unit model to comply with the standard results in the manufacturer discontinuing that model, there would be some loss in availability of clothing storage units.

(e) *Other means to achieve the objective of the rule while minimizing adverse effects on competition, manufacturing, and commercial practices.* (1) The Commission considered alternatives to achieving the objective of the rule of reducing unreasonable risks of injury and death associated with clothing storage unit tip overs. For example, the Commission considered relying on voluntary recalls, compliance with the voluntary standard, and education campaigns, rather than issuing a standard. This alternative would have minimal costs; however, it is unlikely to further reduce the risk of injury from clothing storage

unit tip overs because the Commission has relied on these efforts to date.

(2) The Commission also considered issuing a standard that requires only performance and technical data, with no performance requirements for stability. This would impose lower costs on manufacturers, but is unlikely to adequately reduce the risk of injury from clothing storage unit tip overs because it relies on manufacturers choosing to offer more stable units; consumer assessment of their need for more stable units (which CPSC's research indicates consumers underestimate); and does not account for units outside a child's home or purchased before a child was born.

(3) The Commission also considered mandating a standard like the voluntary standard, but replacing the 50-pound test weight with a 60-pound test weight. This alternative would be less costly than the proposed rule, because many clothing storage units already meet such a requirement, and it would likely cost less to modify noncompliant units to meet this less stringent standard. However, this alternative is unlikely to adequately reduce the risk of clothing storage unit tip overs because it does not account for factors that are present in tip-over incidents that contribute to clothing storage unit instability, including multiple open and filled drawers, carpeting, and forces generated by a child interacting with the unit.

(4) Another alternative the Commission considered was providing a longer effective date. This may reduce the costs of the rule by spreading them over a longer period, but it would also delay the benefits of the rule, in the form of reduced deaths and injuries.

(5) Another alternative the Commission considered is adopting a mandatory standard with the requirements in the proposed rule, but addressing 60-pound children, rather than 51.2-pound children. However, this alternative would be more stringent than the proposed rule and, therefore, would likely increase the costs associated with the rule, while only increasing the benefits of the rule by about 4.5 percent.

(f) *Unreasonable risk.* (1) Incident data indicates that there were 226 reported tip-over fatalities involving clothing storage units that were reported to have occurred between January 1, 2000 and December 31, 2020, of which 85 percent (193 incidents) were children, 5 percent (11 incidents) were adults, and 10 percent (22 incidents) were seniors. Of the reported child fatalities, 86 percent (166 fatalities) involved children 3 years old or younger.

(2) There were an estimated 78,200 injuries, an annual average of 5,600 estimated injuries, related to clothing storage unit tip overs that were treated in U.S. hospital emergency departments from January 1, 2006 to December 31, 2019. Of these, 72 percent (56,400) were to children, which is an annual average of 4,000 estimated injuries to children over the 14-year period. In addition, there were approximately 19,300 tip-over injuries involving clothing storage units treated in other settings from 2015 through 2019, or an average of 3,900 per year. Therefore, combined, there were an estimated 34,100 nonfatal, medically attended tip-over injuries to children from clothing storage units during the years 2015 through 2019.

(3) Injuries to children when clothing storage units tip over can be serious. They include fatal injuries resulting from skull fractures, closed-head injuries, compressional and mechanical asphyxia, and internal organ crushing leading to hemorrhage; they also include serious nonfatal injuries, including skeletal injuries and bone fractures.

(g) *Public interest.* This rule is intended to address an unreasonable risk of injury and death posed by clothing storage units tipping over. The Commission believes that adherence to the requirements of the rule will significantly reduce clothing storage unit tip-over deaths and injuries in the future; thus, the rule is in the public interest.

(h) *Voluntary standards.* The Commission is aware of four voluntary and international standards that are applicable to clothing storage units: ASTM F2057–19, *Standard Consumer Safety Specification for Clothing Storage Units*; AS/NZS 4935: 2009, the Australian/New Zealand Standard for *Domestic furniture—Freestanding chests of drawers, wardrobes and bookshelves/bookcases—determination of stability*; ISO 7171 (2019), the International Organization for Standardization *International Standard for Furniture—Storage Units—Determination of stability*; and EN14749 (2016), the European Standard, *European Standard for Domestic and kitchen storage units and worktops—Safety requirements and test methods*. The Commission does not consider the standards adequate because they do not account for the multiple factors that are commonly present simultaneously during clothing storage unit tip-over incidents and that testing indicates decrease the stability of clothing storage units. These factors include multiple open and filled drawers, carpeted flooring, and dynamic forces generated

by children's interactions with the clothing storage unit, such as climbing or pulling on the top drawer.

(i) *Relationship of benefits to costs.* The aggregate net benefits of the rule are estimated to be about \$305.5 million annually; and the cost of the rule is estimated to be about \$250 million annually. On a per unit basis, the Commission estimates the expected benefits per unit to be \$6.01, assuming a 7 percent discount rate; \$7.88 assuming a 3 percent discount rate; and \$9.90 without discounting. The Commission estimates the expected costs to manufacturers per unit to be \$5.80 (based on the lowest estimated potential cost), plus an unquantifiable cost to consumers associated with lost utility and availability, and increased costs. Based on this analysis, the Commission preliminarily finds that the benefits expected from the rule bear a reasonable relationship to the anticipated costs of the rule.

(j) *Least burdensome requirement that would adequately reduce the risk of injury.* (1) The Commission considered less-burdensome alternatives to the proposed rule, but preliminarily concluded that none of these alternatives would adequately reduce the risk of injury.

(2) The Commission considered relying on voluntary recalls, compliance

with the voluntary standard, and education campaigns, rather than issuing a mandatory standard. This alternative would be less burdensome by having minimal costs, but would be unlikely to reduce the risk of injury from clothing storage unit tip overs. The Commission has relied on these efforts to date, but despite these efforts, there has been no declining trend in child injuries from clothing storage unit tip overs (without televisions) from 2006 to 2019.

(3) The Commission considered issuing a standard that requires only performance and technical data, with no performance requirements for stability. This would be less burdensome by imposing lower costs on manufacturers, but is unlikely to adequately reduce the risk of injury because it relies on manufacturers choosing to offer more stable units; consumer assessment of their need for more stable units (which CPSC's research indicates consumers underestimate); and does not account for clothing storage units outside a child's home or purchased before a child was born.

(4) The Commission considered mandating a standard like ASTM F2057-19, *Standard Consumer Safety Specification for Clothing Storage Units*, but replacing the 50-pound test weight

with a 60-pound test weight. This alternative would be less burdensome in terms of costs than the proposed rule, because many clothing storage units already meet such a requirement, and it would likely cost less to modify noncompliant units to meet this less stringent standard. However, this alternative is unlikely to adequately reduce the risk of tip overs because it does not account for several factors that are simultaneously present in clothing storage unit tip-over incidents and contribute to instability, including multiple open and filled drawers, carpeting, and forces generated by a child interacting with the unit.

(5) The Commission considered providing a longer effective date. This may reduce the cost burden of the rule by spreading the costs over a longer period, but it would also delay the benefits of the rule, in the form of reduced deaths and injuries.

(6) Therefore, the Commission concludes that the rule is the least burdensome requirement that would adequately reduce the risk of injury.

Alberta E. Mills,

Secretary, Consumer Product Safety Commission.

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