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Standard Consumer Safety Specification for Booster Seats¹

This standard is issued under the fixed designation F2640; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

^{ε1} NOTE—Editorially corrected 8.4.7 and X1.2 in April 2017.

INTRODUCTION

This consumer safety specification addresses incidents associated with booster seats that were identified by the United States Consumer Product Safety Commission (CPSC). CPSC has identified hazards resulting in injuries that occurred when children fell from booster seats, tipped over and out of a booster seat, among other types of incidents. In response to a review of the data received by the CPSC, this specification attempts to minimize the following: incidents related to tray disengagement, restraint disengagement or absence of restraint system, stability of a booster seat while attached to adult chairs and entrapment within a booster seat, in addition to other hazards presented during the use of booster seats. This specification does not cover booster seats that were either blatantly misused or used in a careless manner that disregards the warning statements and safety instructions provided with each booster seat. This specification is written within the current state-of-the-art of booster seat technology. It is intended that this specification will be updated whenever substantive information becomes available that necessitates additional requirements or justifies the revision of the existing requirements.

(<https://standards.iteh.ai>)

1. Scope

1.1 This consumer safety specification covers the performance requirements and methods of test to ensure the satisfactory performance of the booster seat.

1.2 This consumer safety specification is intended to minimize injuries to children resulting from normal usage and reasonably foreseeable misuse or abuse of booster seats.

NOTE 1—This consumer safety specification is not intended to address accidents and injuries resulting from the interaction of older children with children in booster seats.

1.3 For purposes of this consumer safety specification, a booster seat is a juvenile chair, which is placed on an adult chair to elevate a child to standard dining table height. The booster seat is made for the purpose of containing a child, up

to 5 years of age, and normally for the purposes of feeding or eating. A booster seat may be height adjustable and include a reclined position.

1.4 No booster seat produced after the approval date of this consumer safety specification shall, either by label or other means, indicate compliance with this specification unless it conforms to all requirements contained herein.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 The following precautionary caveat pertains only to the test method portion, Section 7, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

¹ This consumer safety specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.16 on Highchairs, Hook-On Chairs and Expandable Gates.

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Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

D3359 Test Methods for Rating Adhesion by Tape Test

F963 Consumer Safety Specification for Toy Safety

2.2 Federal Regulations:³

16 CFR 1303 Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint

16 CFR 1500.48 Technical Requirements for Determining a Sharp Point in Toys or Other Articles Intended for Use by Children Under Eight Years of Age

16 CFR 1500.49 Technical Requirements for Determining a Sharp Metal or Glass Edge in Toys or Other Articles Intended for Use by Children Under Eight Years of Age

16 CFR 1500.50-.52 Test Methods for Simulating Use and Abuse of Toys and Other Articles Intended for Use by Children

16 CFR 1501 Method for Identifying Toys and Other Articles Intended for Use by Children Under Three Years of Age Which Present Choking, Aspiration, or Ingestion Hazards Because of Small Parts

2.3 ANSI Standard:⁴

ANSI Z535.4 Product Safety Signs and Labels

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *conspicuous, n*—label which is visible, when the product is in the manufacturer's recommended use position, to a person standing at the sides or front of the booster seat.

3.1.2 *contact surface, n*—a surface on the bottom of the booster seat that will be in contact with the adult chair seating surface.

3.1.3 *fabric, n*—any woven, knit, coated, laminated, extruded or calendered flexible material that is intended to be sewn, welded, heat sealed, or glued together as an assembly.

3.1.4 *manufacturer's recommended use position, n*—any position that is presented as a normal, allowable, or acceptable configuration for the use of the product by the manufacturer in any descriptive or instructional literature.

3.1.4.1 *Discussion*—This specifically excludes positions that the manufacturer shows in a like manner in its literature to be unacceptable, unsafe, or not recommended.

3.1.5 *nonpaper label, n*—any label material, such as plastic or metal, which either will not tear without the aid of tools or tears leaving a sharply defined edge.

3.1.6 *occupant, n*—individual who is in a product that is set up in one of the manufacturer's recommended use positions.

3.1.7 *paper label, n*—any label material which tears without the aid of tools and leaves a fibrous edge.

3.1.8 *seam, n*—means of joining fabric components, such as sewing, welding, heat sealing or gluing.

3.1.9 *static load, n*—vertically downward force applied by a calibrated force gauge or by dead weights.

4. Calibration and Standardization

4.1 All testing shall be conducted on a concrete floor that may be covered with 1/8 in. (3 mm) thick vinyl flooring covering, unless test instructs differently.

4.2 The product shall be completely assembled, unless otherwise noted, in accordance with the manufacturer's instructions.

4.3 No testing shall be conducted within 48 h of manufacturing.

4.4 The product to be tested shall be in a room with ambient temperature of 73 ± 9°F (23 ± 5°C) for at least 1 h prior to testing. Testing shall then be conducted within this temperature range.

4.5 All testing required by this specification shall be conducted on the same unit.

5. General Requirements

5.1 There shall be no hazardous sharp points or edges as defined by 16 CFR 1500.48 and 16 CFR 1500.49 before or after testing to this consumer safety specification.

5.2 There shall be no small parts as defined by 16 CFR 1501 before testing or liberated as a result of testing to this specification.

5.3 *Wood Parts*—Prior to testing, any exposed wood parts shall be smooth and free from splinters.

5.4 *Paint*—The paint and surface coating on the product shall comply with 16 CFR 1303.

5.5 *Scissoring, Shearing, and Pinching*—A product, when in a manufacturer's recommended use position, shall be designed and constructed so as to prevent injury to the occupant from any scissoring, shearing, or pinching when members or components rotate about a common axis or fastening point, slide, pivot, fold, or otherwise move relative to one another. Scissoring, shearing, or pinching that may cause injury shall not be permissible when the edges of any rigid parts admit a probe greater than 0.210 in. (5.33 mm) and less than 0.375 in. (9.53 mm) diameter at any accessible point throughout the range of motion of such parts.

5.6 *Openings*—Holes or slots that extend entirely through a wall section of any rigid material less than 0.375-in. (9.53-mm) thick and admit a 0.210-in. (5.33-mm) diameter rod shall also admit a 0.375-in. (9.53-mm) diameter rod. Holes or slots that are between 0.210 in. (5.33 mm) and 0.375 in. (9.53 mm) and have a wall thickness less than 0.375 in. (9.53 mm) but are limited in depth to 0.375 in. (9.53 mm) maximum by another

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

rigid surface shall be permissible (see Fig. 1). The product shall be evaluated in all manufacturer’s recommended use positions.

5.7 *Exposed Coil Springs*—Any exposed coil spring which is accessible to the occupant, having or capable of generating a space between coils of 0.210 in. (5.33 mm) or greater during static load testing in accordance with 6.3 shall be covered or otherwise designed to prevent injury from entrapment.

5.8 *Protective Components*—If a child can grasp components between the thumb and forefinger, or teeth, (such as caps, sleeves, or plugs used for protection from sharp edges, points, or entrapment of fingers or toes), or if there is at least a 0.040 in. (1.00 mm) gap between the component and its adjacent parent component, such component shall not be removed when tested in accordance with 7.1.

5.9 *Labeling:*

5.9.1 Warning labels (whether paper or non paper) shall be permanent when tested in accordance with 7.8.1 – 7.8.3.

5.9.2 Warning statements applied directly onto the surface of the product by hot stamping, heat transfer, printing, wood burning, etc. shall be permanent when tested in accordance with 7.8.4.

5.9.3 Non-paper labels shall not liberate small parts when tested in accordance with 7.8.5.

5.10 *Toys*—Toy accessories attached to, removable from, or sold with a booster seat, as well as their means of attachment, must meet applicable requirements of Consumer Safety Specification F963.

6. Performance Requirements

6.1 *Tray Performance (Drop)*—The tray shall remain functional with respect to the booster seat and exhibit no sharp points, sharp edges, or small parts when subjected to a drop test in accordance with 7.2.

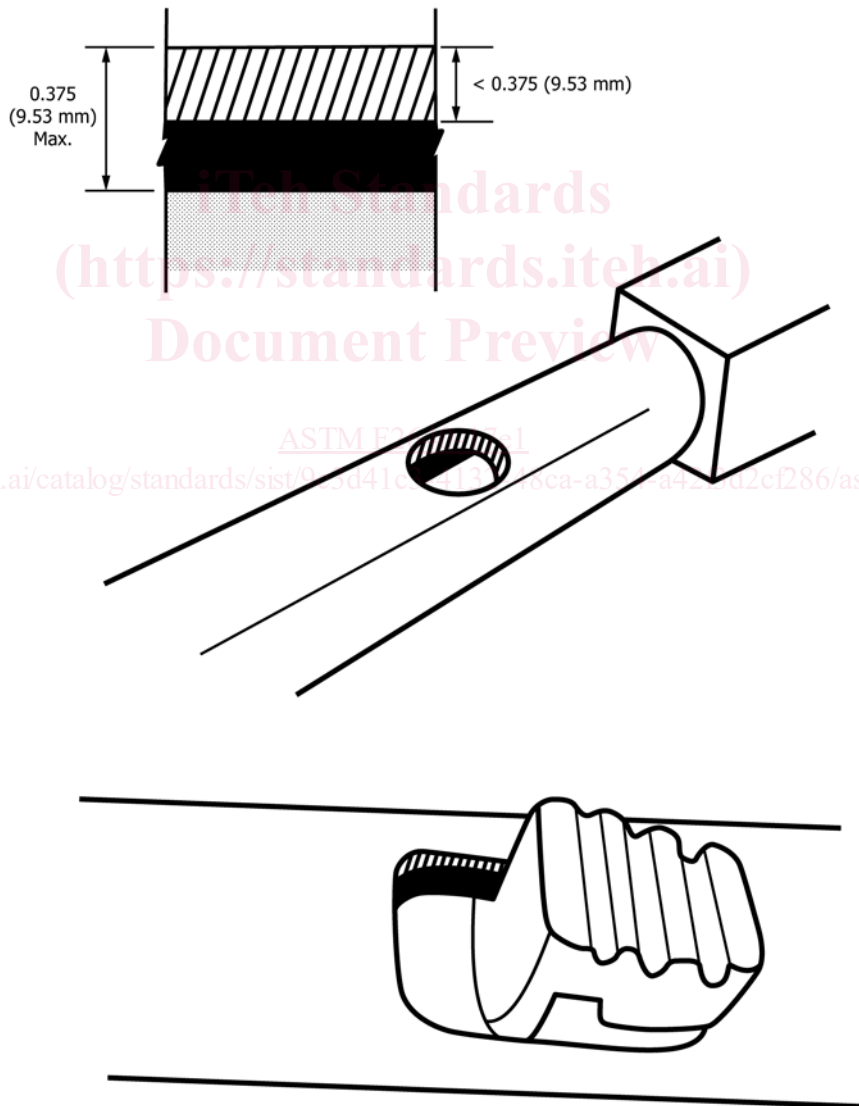


FIG. 1 Openings Examples

6.2 *Tray Performance (Pull)*—The tray shall not become disengaged or dislocated from its original adjustment position, when tested in accordance with 7.3 and 7.4.

6.3 *Static Load*—A booster seat shall support static loads without causing any hazardous conditions as identified within this consumer safety specification. Tests shall be conducted in accordance with 7.5.

6.4 *Child Restraint System:*

6.4.1 Booster seats which are age graded for children less than 36 months shall provide a child restraint system to secure a child in any of the manufacturer’s recommended use positions.

6.4.2 The child restraint system shall include both waist and crotch restraint designed such that the use of the crotch restraint is mandatory when the restraint system is in use.



FIG. 2 CAMI Infant Dummy Mark II

6.4.3 The child restraint system and its closing means (for example, buckle) shall not break, separate, or permit removal of the CAMI Infant Dummy Mark II⁵ (see Fig. 2), from the booster seat when tested in accordance with 7.6.

6.4.4 If during test in 7.6.5.1 and 7.6.5.2, the posterior of the test dummy is pulled past the front edge of the seat, the dummy shall be considered removed.

6.4.5 If during test in 7.6.5.3 and 7.6.5.4 the dummy with the force applied reaches a vertical position with the bottom of its feet touching or off the seat, the dummy shall be considered removed.

6.4.6 The waist restraint shall be capable of adjustment with a positive, self-locking mechanism that is capable, when locked, of withstanding the forces of tests in 7.6.5 without allowing restraint movement or slippage of more than 1 in. (25.4 mm).

⁵ CAMI Infant Dummy Mark II (shown in Fig. 2) Department of Transportation, Federal Aviation Administration, April 29, 1974, and CAMI Infant Dummy, Drawing No. SA-1001, Memorandum Report AAC-119-74-14, Revision 11, by Richard F. Chandler, July 2, 1994.

6.4.7 A connecting means and adjustment means for the waist restraint shall be capable of usage independent of one another. The connecting means shall not be an adjustment means but may have one integrally attached to it.

6.4.8 Before shipment, the child restraint system must be attached to the booster seat in such a manner as to not become detached through normal use.

6.5 *Booster Seat Attachment:*

6.5.1 There shall be a means of attaching a booster seat to an adult chair.

6.5.2 Following completion of the test in 7.9, the attachment means of the booster seat to the adult chair (a) shall not allow the booster seat to fall off the adult chair and (b) shall not break and shall remain functional.

6.6 *Structural Integrity:*

6.6.1 During and upon completion of the testing in accordance with 7.7, the booster seat shall comply with all of the following:

6.6.1.1 The booster seat shall not exhibit an instantaneous change in the height of the occupant seating surface above the seating surface of the adult chair of more than 1 in. (25.4 mm) during one cycle of the weight drop. During and after a change in the height of the seating surface, the booster seat must comply with the requirements for openings as defined in 5.6 and scissoring, shearing, and pinching as defined in 5.5.

6.6.1.2 There shall be no breakage of any structural component.

6.6.1.3 Latching or locking devices which prevent folding or adjustment of the booster seat shall remain engaged.

6.6.1.4 The angle of the occupant seating surface relative to the seating surface of the adult chair shall not change more than 10°.

6.7 *Maximum Booster Seat Dimensions:*

6.7.1 When measured in accordance with 7.10.1, the booster seat width shall be at least 0.8 in. (20 mm) less than the corresponding dimensions of the adult chair listed on the retail package and the seat depth shall be at least 0.4 in. (10 mm) less than the corresponding dimensions of the adult chair listed on the retail package (see 8.6).

6.7.2 If the booster seat includes an attachment means to the backrest of the adult chair, the height of the attachment means shall be at least 3.9 in. (100 mm) less than the height of the backrest of the adult chair listed on the retail package when measured in accordance with 7.10.2.

7. Test Methods

7.1 *Protective Components:*

7.1.1 Test all components in accordance with each of the following methods in the sequence listed.

7.1.2 Secure the booster seat so that it cannot move during the performance of the following tests.

7.1.3 *Torque Test*—Apply a torque of 4 lbf-in. (0.5 N · m) gradually within a period of 5 s in a clockwise direction until a rotation of 180° from the original position has been attained or 4 lbf-in. (0.5 N · m) has been reached. Maintain the torque or maximum rotation for an additional 10 s. Then remove the

torque and permit the test components to return to a relaxed condition. Then repeat this procedure in the counter clockwise direction.

7.1.4 *Tension Test:*

7.1.4.1 Attach a force gauge to the component cap, sleeve or plug by means of any suitable device. For components that cannot reasonably be expected to be grasped between thumb and forefinger, or teeth, on their outer diameter but have a gap of 0.04 in. (1.0 mm) or more between the rear surface of the component and the structural member of the booster seat to which they are attached, a clamp such as shown in Fig. 3 may be a suitable device.

7.1.4.2 Be sure the attachment device does not compress or expand the component to hinder removal of the component.

7.1.4.3 Gradually apply a 15-lbf (67-N) force in the direction that would normally be associated with the removal of the component. Apply the force within 5 s and maintain for an additional 10 s.

7.2 *Tray, Drop Test*—From a height of 36 in. (900 mm) measured from the center point of the tray, drop the tray on vinyl tile over concrete flooring once on each of four different surfaces, one surface of which shall include the attaching mechanism. Do not conduct this test on trays that require a tool to remove tray from booster seat.

NOTE 2—For the purposes of this test only, the center point of the tray coincides with the center of the smallest rectangle that circumscribes the tray in the plane of the tray.

7.3 *Tray, Horizontal Force:*

7.3.1 If the tray is of a type required to be tested in accordance with 7.2, perform this test on a tray that has been tested in accordance with 7.2.

7.3.2 *Horizontal Pull Test (Front and Rear):*

7.3.2.1 Secure the booster seat to an adult chair per the manufacturer’s instructions. Ensure that all legs of the adult

chair have contact with the floor so that the booster seat cannot move in the direction of the force being applied. Attach the tray in any one of the adjustable positions.

7.3.2.2 Attach a test device to the center front or back of the tray in such a manner that the force will be exerted on a pad not exceeding 2 in. (51 mm) in any direction.

7.3.2.3 Gradually apply a horizontal force of 45 lbf (200 N) to the tray within a 5 s period and maintain for an additional 10 s.

7.3.2.4 Perform this procedure a total of 5 times in both front and rear directions for all adjustable tray positions.

7.3.3 *Horizontal Pull Test (Sides):*

7.3.3.1 Perform this test under the same conditions as in 7.3.2.1 with the booster seat affixed in a position so that the horizontal force of 45 lbf (200 N) is applied perpendicularly to the center of a side of the tray within 5 s and maintain for 10 s.

7.3.3.2 Perform this procedure a total of 5 times on each side of the tray.

7.4 *Tray, Vertical Pull Test*—Secure the booster seat to an adult chair, per the manufacturer’s instructions, using the attachment means provided with the product. Ensure that all legs of the adult chair have contact with the floor so that the booster seat cannot move in the direction of the force being applied. Attach the tray in any one of the adjustable positions.

7.4.1 *Vertical Pull Test (Rear):*

7.4.1.1 Attach a test device to the rear center of the tray in such a manner that the force will be exerted on a pad not exceeding 2 in. (51 mm) in any direction.

7.4.1.2 Gradually apply a vertically upward force of 45 lbf (200 N) at the rear of the tray within 5 s and maintain for an additional 10 s.

7.4.1.3 Perform this procedure a total of 5 times.

7.4.2 *Vertical Pull Test (Sides):*

7.4.2.1 Attach a test device to the side of the tray at the center line of the locking mechanism in such a manner that the force will be exerted on a pad not exceeding 2 in. (51 mm) in any direction. The force shall not be applied to the locking mechanism. If the design does not allow for a force gauge attachment to the side of the tray, due to the locking mechanism location, a drill hole on the top surface of the tray may be employed as a means of attaching the force gauge.

7.4.2.2 Gradually apply a vertically upward force of 45 lbf (200 N) at the side of the tray within 5 s and maintain for an additional 10 s.

7.4.2.3 Perform this procedure a total of 5 times on each side of the tray.

7.5 *Static Load Testing:*

7.5.1 *Seat Static Load Test:*

7.5.1.1 Secure the booster seat to an adult chair, per the manufacturer’s instructions, using the attachment means provided with the product. Ensure that all legs of the adult chair have contact with the floor.

7.5.1.2 Gradually apply a static load of 100 lb (45 kg) or 3 times the maximum weight of the child recommended by the manufacturer, whichever is greater. Apply the load using a 6 to 8 in. (150 to 200 mm) diameter bag with steel shot, on the center of the seating surface, for a period of 5 s and maintain for an additional 60 s. When the manufacturer’s recommended

15 lb Max TENSION



FIG. 3 Tension Test Adapter/Clamp

weight exceeds the maximum amount of weight allowed by the bag, then stack additional static weights upon the weight bag ensuring that the total weight is applied in a vertical orientation to the seating surface.

7.5.2 Tray Static Load Test:

7.5.2.1 Secure the booster seat to an adult chair, per the manufacturer's instructions, using the attachment means provided with the product. Ensure that all legs of the adult chair have contact with the floor. If the tray is adjustable, adjust it to the rear position.

7.5.2.2 Place a 3 by 6-in. (75 by 150-mm) wood block at the center top surface of the tray.

7.5.2.3 Gradually apply a static load of 50 lb (22.7 kg) on the wood block for a period of 5 s and maintain for an additional 60 s.

7.6 Child Restraint System Retention Test:

7.6.1 Secure the booster seat to an adult chair, per the manufacturer's instructions, so it cannot move during the performance of the following tests.

7.6.2 Place a restraint system test harness (see Fig. 4) on a CAMI Infant Dummy Mark II (see Fig. 2), in accordance with the Department of Transportation specification, position the horizontal belt just below the arms, and adjust the horizontal belt snugly around the torso.

7.6.3 Place a CAMI Infant Dummy Mark II in the booster seat seat.

7.6.4 Secure the CAMI Infant Dummy Mark II into the booster seat in accordance with the manufacturer's instructions.

7.6.4.1 For active restraint systems (intended to exclude passive restraint systems designed such that they do not require adjustment by a caregiver) adjust the waist restraint, using the webbing tension pull device shown in Fig. 5, so that a force of 2 lbf (9 N) applied to the waist restraint will provide a ¼ in. (6 mm) space between the waist restraint and the CAMI Infant Dummy Mark II.

7.6.5 Perform the following tests without readjusting the restraint system and the adult chair straps/belts (if included with the product):

7.6.5.1 Apply a pull force of 45 lbf (200 N) horizontally on the approximate centerline of either leg of the dummy. Gradually apply the force within 5 s and maintain for an additional 10 s.

7.6.5.2 Repeat 7.6.5.1 four additional times, for a total of five force applications, with a maximum interval of 2 s between tests.

7.6.5.3 Apply a pull force that is 45 lbf (200 N) greater than the weight of the dummy vertically upwards in line with the approximate centerline of the dummy's torso. Gradually apply the force within 5 s and maintain for an additional 10 s.

7.6.5.4 Repeat 7.6.5.3 four additional times, for a total of five force applications, with a maximum interval of 2 s between tests.

7.7 Dynamic Booster Seat Test:

7.7.1 Secure the booster seat to an adult chair, per the manufacturer's instructions, so it cannot move during the performance of the following tests.

7.7.2 If seat height is adjustable, set seat at the highest setting in accordance with manufacturer's instructions.

7.7.3 Perform a drop test using a 50-lb (22.7-kg) bag drop weight of 6 to 8-in. (150 to 200-mm) diameter using steel shot as the mass in the bag. The bag will be dropped onto the center of the seating surface from a height of 3 in. (75 mm). The drop is to be repeated 500 cycles. The cycle time is to be 4 s/cycle, ±1 s. The drop height is to be adjusted to maintain the 3-in. (75-mm) drop height as is practical.

7.8 Permanency of Labels and Warnings:

7.8.1 A paper label (excluding labels attached by a seam) shall be considered permanent if, during an attempt to remove it without the aid of tools or solvents, it cannot be removed, it tears into pieces upon removal, or such action damages the surface to which it is attached.

7.8.2 A non-paper label (excluding labels attached by a seam) shall be considered permanent if, during an attempt to remove it without the aid of tools or solvents, it cannot be removed or such action damages the surface to which it is attached.

7.8.3 A warning label attached by a seam shall be considered permanent if it does not detach when subjected to a 15-lbf (67-N) pull force applied in any direction most likely to cause failure using a ¾-in. diameter clamp surface (see Fig. 6). Gradually apply the force over 5 s and maintain for an additional 10 s.

7.8.4 Adhesion test for warnings applied directly onto the surface of the product.

7.8.4.1 Apply the tape test defined in Test Method B—Cross-Cut Tape Test of Test Methods D3359 eliminating parallel cuts.

7.8.4.2 Perform this test once in each different location where warnings are applied.

7.8.4.3 The warning statements will be considered permanent if the printing in the area tested is still legible and attached after being subjected to this test.

7.8.5 A non-paper label, during an attempt to remove it without the aid of tools or solvents, shall not be removed or shall not fit entirely within the small parts cylinder defined in 16 CFR 1501 if it can be removed.

7.9 Booster Seat Attachment Test:

7.9.1 If the booster seat has recline or height adjustment, or both, install in the position(s) most likely to fail.

7.9.2 Attach the booster seat to an appropriately sized adult chair per the manufacturer's instructions.

7.9.3 Secure the adult chair so that it cannot move during the test.

7.9.4 Establish the center point at the intersection of the horizontal and vertical center of the front of the booster seating surface. Mark the point on the front of the booster seat.

7.9.5 Apply a pull force of 45 lbf (200 N) at the horizontal and vertical center of the front of the booster seat marked in 7.9.4. Apply the force horizontally in the direction most likely to fail between a position of 90° to the left of the seat center and 90° to the right of the seat center. Gradually apply the force within 5 s and maintain for an additional 10 s.