



# Standard Consumer Safety Performance Specification for Carriages and Strollers<sup>1</sup>

This standard is issued under the fixed designation F833; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

## INTRODUCTION

This consumer safety performance specification addresses carriage and stroller incidents that were identified by the U.S. Consumer Product Safety Commission (CPSC).

The CPSC identified injuries to children associated with the following: stability, brakes, restraint systems, latches and folding mechanisms, structural integrity, cords, wheel detachment, and deaths due to entrapment in openings of convertible carriage/strollers. In response to the incident-data compiled by the CPSC, this consumer safety performance specification attempts to minimize the previously listed problems. This specification does not cover carriages and strollers that are blatantly misused, although warnings and safety instructions are required to be prominently displayed on or with each carriage or stroller.

NOTE 1—This consumer safety performance specification is not intended to address incidents and injuries resulting from the interaction of other persons with children in carriages or strollers or incidents resulting from unforeseeable abuse or misuse.

This consumer safety performance specification is written within the current state of the art of carriage and stroller technology. It is intended that this specification will be updated whenever substantive information becomes available which necessitates additional requirements or justifies the revision of existing requirements.

## 1. Scope

1.1 This consumer safety specification establishes safety performance requirements, test methods, and labeling requirements to minimize the hazards to children presented by carriages and strollers as identified in the introduction. Children's products such as tricycles, bicycles or other similar wheeled products that can be self-propelled by a child are not considered carriages or strollers subject to the requirements of this standard, even if the item has a temporary or permanent handle.

1.2 No carriage or stroller produced after the approval date of this consumer safety performance specification shall, either by label or other means, indicate compliance with this specification unless it conforms to all requirements herein.

1.3 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.

1.4 The following precautionary caveat pertains only to the test method portion, Section 7, of this consumer safety 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.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

**D3359** Test Methods for Measuring Adhesion by Tape Test  
**F406** Consumer Safety Specification for Non-Full-Size Baby Cribs/Play Yards  
**F963** Consumer Safety Specification for Toy Safety  
**F2680** Specification for Manually Operated Front Wheel Retention Systems for Bicycles

### 2.2 Federal Standards:

**16 CFR 1303** Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint<sup>3</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.17 on Carriages, Strollers, Walkers and Stationary Activity Centers.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> *Code of Federal Regulations*, available from U.S. Government Printing Office, Washington, DC 20402.

16 CFR 1500 Hazardous Substances Act Regulations<sup>3</sup> including sections:

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

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

1500.50-52 Tests 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<sup>3</sup>

16 CFR 1508.07 (c)

2.3 Other Standards:

AS/NZS 2088 Prams and strollers—safety requirements<sup>4</sup>

EN 1888 Child care articles - Wheeled child conveyances - Safety requirements and test methods<sup>5</sup>

### 3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *2D fold stroller*, *n*—a stroller that folds the handlebars and leg tubes only in the front-to-back (or back-to-front) direction.

3.1.2 *3D fold stroller*, *n*—a stroller that, when folded, collapses all handlebars and leg tubes both in the front-to-back (or back-to-front) and side-to-side directions.

3.1.3 *carriage*, *n*—wheeled vehicle generally used for the transport of an infant who is generally in a lying down position. The motive power is supplied by a person or persons pushing or pulling on a handle attached to the vehicle. A carriage may be capable of being folded for storage.

3.1.4 *conspicuous*, *n*—label that is visible, when the unit is in a manufacturer's recommended use position, to a person standing near the unit at any one position around the unit but not necessarily visible from all positions.

3.1.5 *convertible carriage/stroller*, *n*—wheeled vehicle that is intended to be converted by the owner to be used as either a carriage or a stroller.

3.1.6 *cord*, *n*—a length of slender, flexible material including monofilaments, woven and twisted cord, rope, elastic cords, plastic textile tapes, ribbon, and those fibrous materials commonly called string.

3.1.7 *double action release mechanism*, *n*—a release mechanism that requires either two consecutive actions, the first of which must be maintained while the second is carried out, or two separate and independent single action locking mechanisms that must be activated simultaneously to fully release.

3.1.8 *harness system*, *n*—shall include a waist and crotch restraint and a means of restraining the upper torso.

3.1.9 *infant*, *n*—young child who is not capable of sitting unassisted.

3.1.10 *jogging stroller*, *n*—stroller intended to be used for children at a jogging rate (run at a steady slow trot).

3.1.11 *manufacturer's recommended use position*, *n*—any position that is presented as a normal, allowable, or acceptable configuration for use of the product by the manufacturer in any descriptive or instructional literature. This specifically excludes positions that the manufacturer shows in a like manner in its literature to be unacceptable, unsafe, or not recommended.

3.1.12 *non-paper label*, *n*—any label material (such as plastic or metal) that either will not tear without the aid of tools or tears leaving a sharply defined edge.

3.1.13 *occupant(s)*, *n*—that individual or those individuals who are in a product that is set up in one of the manufacturer's recommended use positions.

3.1.14 *occupant retention space*, *n*—space enclosed by the surfaces, for example, side walls or the floor, or both, of a carriage or convertible carriage/stroller that contains the occupant within a carriage or a stroller in the reclined carriage position.

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

3.1.16 *quick release mechanism*, *n*—lever-actuated cam mechanism that connects and retains a wheel in a fork assembly.

3.1.17 *reclined carriage position*, *n*—adjustment position of a convertible carriage/stroller that allows for an interior angle of greater than 150° between the seat surface and the backrest.

3.1.18 *removable-wheel fork assembly*, *n*—fork assembly from which the wheel can be removed and reattached as a manufacturer recommended normal product use.

3.1.18.1 *Discussion*—A removable-wheel fork assembly can employ a quick release mechanism or other manually operated mechanism that does not require the use of tools for installation or removal.

3.1.19 *saddle hinge link*, *n*—a folding joint on the side of a 3D fold stroller that connects the front leg tube and handle tube.

3.1.19.1 *Discussion*—It includes a component (saddle hinge) that contains a pivot location and a recessed groove (see Fig. 1). When the stroller is unfolded, one of the tubes rotates around the saddle hinge pivot and rests in the recessed groove.

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

3.1.21 *strap*, *n*—piece of flexible material of which the width is significantly greater than the thickness.

3.1.22 *stroller*, *n*—wheeled vehicle for the transport of infants or children generally in a sitting-up or semi-reclined position. The motive power is supplied by a person moving at a walking rate while pushing on a handle attached to the stroller. A stroller generally is capable of being folded for storage. Strollers normally are used for children from infancy to 36 months of age.

<sup>4</sup> Available from SAI Global, <http://www.saiglobal.com>.

<sup>5</sup> Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, <http://www.cen.eu>.

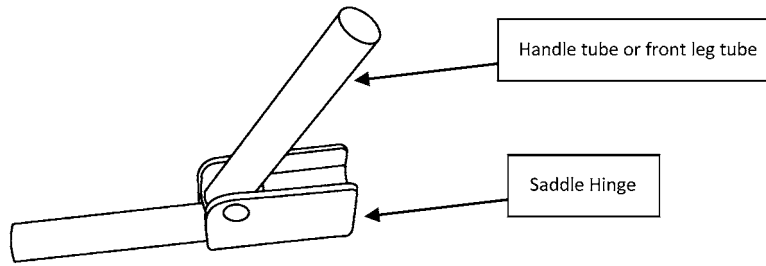


FIG. 1 Saddle Hinge Link

#### 4. Calibration and Standardization

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

4.2 The unit 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 an ambient temperature of  $73 \pm 9^\circ\text{F}$  ( $23 \pm 5^\circ\text{C}$ ) 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 with the exception of 7.2, where a new unit can be used if the unit frame permanently deforms.

#### 5. General Requirements

5.1 There shall be no hazardous points or edges as defined by 16 CFR 1500.48 and 16 CFR 1500.49 before and 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 The paint and surface-coating on the product shall comply to 16 CFR 1303.

5.4 Prior to testing, any exposed wood parts shall be smooth and free of splinters.

##### 5.5 Latching Mechanisms:

5.5.1 Any unit that folds shall have a latching device or other provision in the design that will prevent the unit from unintentional folding when properly placed in the manufacturer's recommended use position. Products with latching devices for prevention of unintentional folding shall be tested in accordance with 7.2. During and upon completion of this test, the unit shall meet the requirements in 5.5.1.1 or 5.5.1.2.

5.5.1.1 The locking device on the unit shall remain latched.

5.5.1.2 The stroller frame components yield and permanently deform in a manner such that the full load specified cannot be applied in the direction of folding and the locking device remains engaged.

5.5.2 Strollers that employ hinged links with a geometric over center action (see Fig. 2) to maintain the product in the normal use position shall require two distinct and separate actions on the part of the user to initiate folding of the product.

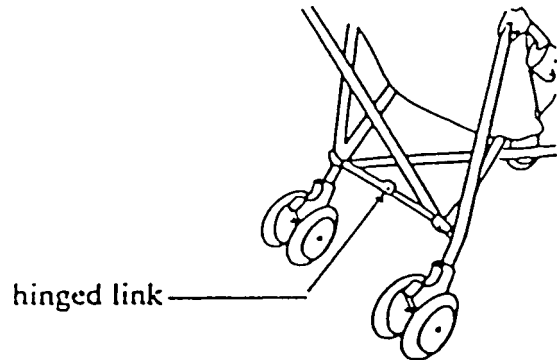


FIG. 2 Stroller With Hinged Link

Such strollers shall require only a single action on the part of the user to secure the stroller in the normal use position.

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 rigid surface shall be permissible (see Fig. 3). The product shall be evaluated in all manufacturer's recommended use positions.

##### 5.7 Scissoring, Shearing, and Pinching:

5.7.1 The unit, when in the 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 exists when the edges of the rigid parts admit a 0.210-in. (5.33-mm) diameter probe but do not admit a 0.375-in. (9.53-mm) diameter probe at any accessible point throughout the range of motion of such parts. This excludes the adjustment of accessory items such as storage latches, baskets, etc.

NOTE 1—The evaluation at any given location is performed with the understanding that the probes are allowed to enter the location from any angle/direction.

5.7.2 Saddle hinge links on 3D fold strollers shall be designed and constructed so as to prevent injury from scissoring, shearing, or pinching. Scissoring, shearing, or pinching that may cause injury exists in a saddle hinge link when the edges of the rigid parts admit a 0.210-in. (5.33-mm)

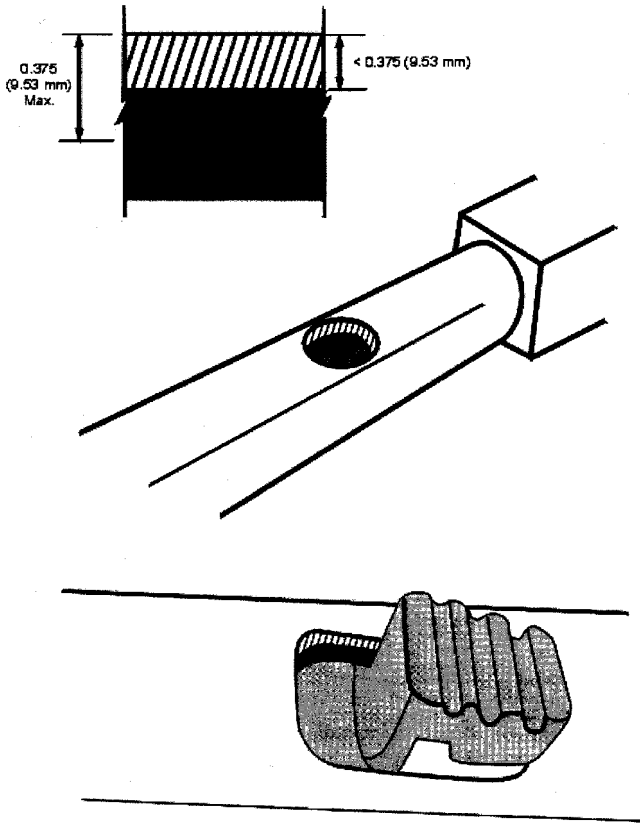


FIG. 3 Opening Example.



FIG. 4 Stretcher/Locking Device

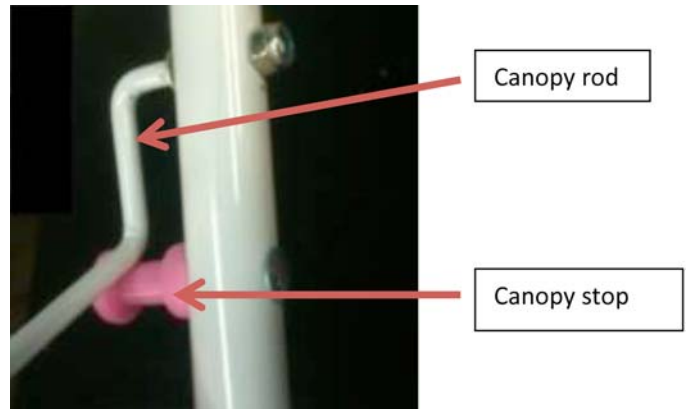


FIG. 5 Canopy Stop

diameter probe but do not admit a 0.375-in. (9.53-mm) diameter probe when tested in accordance with 7.17.1.

NOTE 2—The evaluation at any given location is performed with the understanding that the probes are allowed to enter the location from any angle/direction.

5.7.3 Canopy pivots and canopy frame members shall comply with 5.7.1 when tested in accordance with 7.17.2. Canopy stretcher/locking device(s) are exempt from this requirement (see Fig. 4). The interface between canopy rods and canopy stops are exempt from this requirement if the canopy rod does not pass over or through the final canopy stop. Final canopy stops are those that prevent further movement or adjustment of the canopy (see example in Fig. 5). Intermediate canopy stop positions are not exempt from this requirement.

5.7.4 The frame folding action of a 2D fold stroller and convertible carriage/stroller (carriages are exempted from this requirement) shall be designed and constructed so as to prevent injury from scissoring, shearing, or pinching. Scissoring, shearing, or pinching that may cause injury exists when the edges of the rigid parts admit a 0.210-in. (5.33-mm) diameter probe but do not admit a 0.375-in. (9.53-mm) diameter probe when tested in accordance with 7.15. Units with a removable seat that prevent the complete folding of the unit when still attached are exempt from this requirement.

NOTE 3—The evaluation at any given location is performed with the understanding that the probes are allowed to enter the location from any angle/direction.

5.8 *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 (see 6.2 and 7.3) shall be covered or otherwise designed to prevent injury from entrapment.

#### 5.9 Labeling:

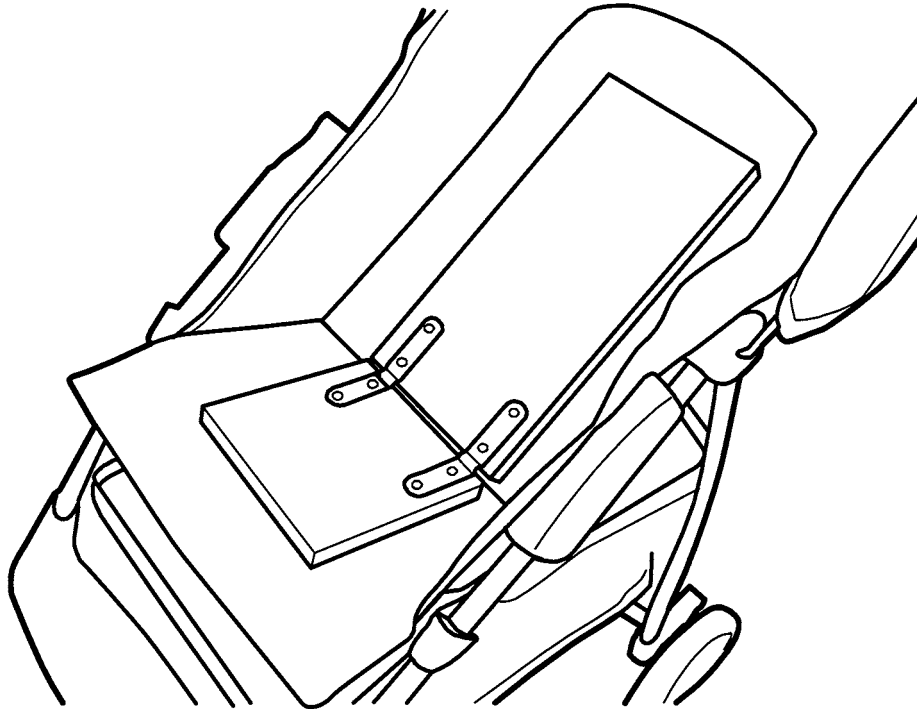
5.9.1 Warning labels (whether paper or non-paper) shall be permanent when tested in accordance with 7.8.1 – 7.8.3.

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 *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 7.9.

5.11 *Seat Recline Measurement*—Place the back of the stroller in the most reclined position. Place the hinged boards with the hinged edge into the junction of the stroller back and seat (see Fig. 6). Measure the angle between the two boards.



NOTE 1— $\frac{3}{4}$  in. (19 mm) by 6 in. (150 mm) by 6 in. (150 mm) board hinged to a  $\frac{3}{4}$  in. (19 mm) by 6 in. (150 mm) by 9 in. (225 mm) board placed in the junction of the stroller seat.

FIG. 6 Seat Back Recline Board

5.12 *Toy*—Toy accessories attached to, removable from, or sold with unit, as well as their means of attachment, shall meet applicable requirements of Consumer Safety Specification F963.

5.13 *Cord/Strap Length*—Cords and straps that originate within or extend into the occupant space shall not create a loop that has an internal perimeter exceeding 14.8 in. (376 mm) nor have a free stretched length that exceeds a length of 7.4 in. (188 mm) when evaluated with 7.16. Cords or straps that do not originate within the occupant space but that can extend into the occupant space shall be evaluated in accordance with 7.16 only on the portion of the cord/strap that can extend into the occupant space. Restraint systems used to secure an occupant, all straps used to attach hand held infant carriers, and straps on hand held infant carriers, stroller carry straps, and stroller tether straps are exempt from this requirement.

## 6. Performance Requirements

NOTE 4—The forces that are to be applied to the sample in the test methods described in Section 7 of this specification are applied readily by means of a calibrated force gage, or in the case of static load and dynamic load test methods, by dead weights.

### 6.1 Parking Brake Requirements:

6.1.1 A parking brake shall be provided on the unit. Each parking brake shall remain engaged during the test as specified in 7.6. Each parking brake shall prevent the braked wheel(s) from rotating more than 90° during the 5th test cycle specified in 7.6.

6.1.2 After completing the test described in 7.6, each parking brake shall be able to be engaged and functional in all parking brake engagement positions.

6.1.3 Each parking brake shall be constructed so that it cannot be disengaged by the child within the unit when the child is secured in the unit in accordance with the instructional literature.

### 6.2 Static Load:

6.2.1 A carriage shall support a static load of 50 lbf (222 N) when placed in the approximate center of the area intended to support the infant occupant.

6.2.2 A stroller shall support a static load of 100 lb (45.4 kg) or 2.5 times the manufacturer's recommended maximum weight, whichever is greater, per individual seating area, when placed in the approximate center of the area intended to support the child occupant.

6.2.3 A convertible carriage/stroller shall support a static load appropriate to the configuration in which the unit is erected. All configurations shall be tested.

6.2.4 A combination unit of a car seat on a stroller shall support a static load of 50 lbf (222 N) when placed in the approximate center of the area intended to support the occupant.

6.2.5 Test methods shall be performed in accordance with 7.3. At the conclusion of the test method, there shall be no unacceptable conditions as identified within this specification (see Note 5). In cases of multiple occupancy units, a specified test weight shall be applied simultaneously to each occupant position.

NOTE 5—For the purpose of this specification, the unacceptable conditions that might be identified by the static load test methods shall be tip over, collapse of the product or a component of the product, sharp edges or points, and small parts.

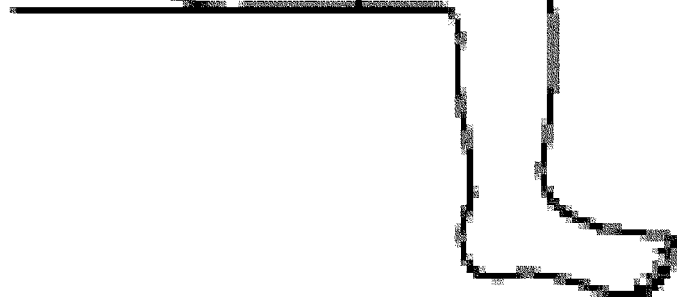


### FIG. 7 Restraint System Setup

6.4 *Restraining System*—All products covered by this specification, except carriages designed only for an infant, must have a child restraint system. The manufacturer shall attach the restraint system in such a manner that it will not become detached through normal usage. The restraint system shall include both waist and crotch restraint. The crotch resistant shall be designed such that its use is mandatory when the restraint system is in use.

6.4.2 *Stroller*—A restraining system shall be provided pre-assembled by the manufacturer to a component of the stroller.

**6.4.4 Restraining System**—Test methods for all restraining systems shall be in accordance with 7.5. The restraint system and its closing means (for example, buckle) shall not part or slip more than 1 in. (25 mm). The anchorages shall not separate from their attachment points. At the end of the tests, the CAMI dummy shall not be released fully. When tested in accordance with 7.5.2.8, the restraint system (see Fig. 7 for Point C) shall not move more than 2 in. (51 mm).

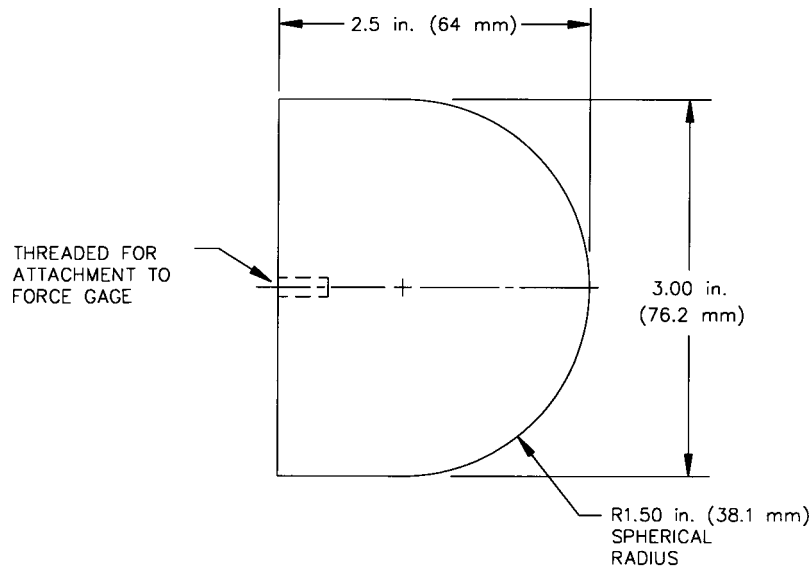


**FIG. 8 Thigh Depth, Seated**

6.4.6 *Location of Restraining System*—When tested in accordance with 7.5.4, the restraining system shall meet the following requirements.

6.4.6.2 A 1-in. (25-mm) diameter probe shall not freely pass through any gap between the waist restraint and the test cylinder when tested in accordance with 7.5.4.4.

6.4.6.3 The forward most position of the junction of the crotch strap and seat surface shall not be in front of the test cylinder when tested in accordance with 7.5.4.5. A removable seat pad shall not be considered part of the seat surface.



MATERIAL: SMOOTH FINISH PLASTIC OR METAL

FIG. 9 Occupant Retention Probe

6.4.6.4 The point on the lower edge of the waist strap shall be between the 4.5-in. (114-mm) line and the 7.5-in. (190-mm) line on the test cylinder when tested in accordance with 7.5.4.6.

6.4.7 *Buckle Release*—The waist buckle release mechanism shall meet either 6.4.7.1 or 6.4.7.2 when tested in accordance with 7.5.5.

6.4.7.1 The buckle shall have a single action release mechanism that does not release at a force less than 9 lbf (40 N) when tested in accordance with 7.5.5.2.

6.4.7.2 The buckle shall consist of a double-action release mechanism that does not release with any one of the release mechanisms activated alone when tested in accordance with 7.5.5.3.

6.5 *Occupant Retention*—Carriages or seating locations of convertible carriage/strollers with a reclined carriage position(s) shall have a wall(s) surrounding all sides above the floor of the occupant retention space. The enclosure shall not allow the complete passage of the test probe shown in Fig. 9 through any completely bounded external openings (any holes) below the top edge of the occupant retention space when tested in accordance with 7.7.

6.5.1 Products with a reclined carriage position(s) must have a nondetachable feature to enable them to conform to the requirement in 6.5 unless the product only can be adjusted to any reclined carriage position when a detachable device is attached.

6.5.1.1 Nondetachable denotes that the occupant retention assembly cannot be separated or removed from the product without damaging it or be removed without the aid of tools.

6.6 *Combination Unit of a Car Seat on a Stroller*—The combined unit shall conform to the requirements of 2.2, 6.1 in accordance with 7.6, 6.2.4 in accordance with 7.3.2, 6.3 in accordance with 7.4.1, 7.10, and 9.1 when the car seat is installed in all manufacturer's recommended use positions. When testing the combination unit according to 7.10 (16 CFR

1500.52 (b) (4) (iii)), the unit shall neither have any broken parts nor allow the car seat to completely separate from the stroller.

#### 6.7 Impact Test:

6.7.1 For combination unit of a car seat on a carriage, stroller, or convertible carriage/stroller:

6.7.1.1 The unit shall not allow any attachment point(s) provided by the manufacturer for securing the car seat to the unit to release when tested in accordance with 7.11.1 – 7.11.5. After the test, the car seat shall remain in the manufacturer's recommended use position.

6.7.2 For carriage, stroller, or convertible carriage/stroller:

6.7.2.1 The fold locking/latching mechanism shall not disengage or break, or both, and breakage shall not occur to the frame of the unit when tested in accordance with 7.11.6.

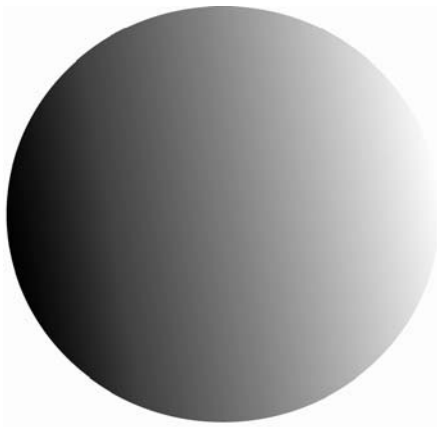
6.8 *Passive Containment/Foot Opening*—The test shall be performed on all strollers and convertible carriage/strollers that have a tray(s) or grab bar(s) that create a completely or partial bounded opening(s) in front of the occupant. An opening(s) shall either permit complete passage of the head probe (Fig. 10) when tested in accordance with 7.12.2 or shall not permit complete passage of the torso probe (Fig. 11) when tested in accordance with 7.12.4.

#### 6.9 Wheel and Swivel Assemblies Detachment:

6.9.1 Wheel(s) and swivel(s) assemblies shall not detach from the unit upon completion of the test in accordance with 7.13.1 and 7.13.2.

6.9.2 A removable-wheel fork assembly(s) shall incorporate a secondary retention device and shall be so designed as to prevent unintended detachment of the wheel from the unit when tested in accordance with 7.14.

6.10 *Head Entrapment with Car Seat on a Stroller or Convertible Carriage/Stroller*—This requirement applies to a combination unit of a rear-facing car seat on a stroller or



8.0-in. (200-mm) hollow sphere  
Material: ABS  
Weight: 5 lb (2.3 kg)

FIG. 10 Head Probe

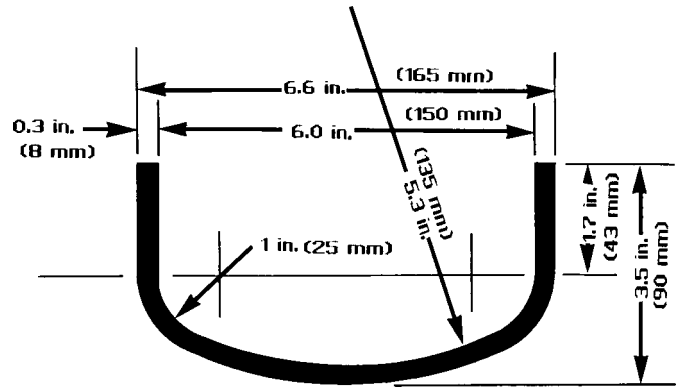


FIG. 12 Weld Cap

## 7.2 Latching Mechanisms for Prevention of Unintentional Folding:

7.2.1 Place the product in the manufacturer's recommended use position. Gradually place a 5-lb (2.3-kg) weight in the center of each seating surface.

7.2.2 Secure the product so that the normal folding motion is not impeded.

7.2.3 Apply a force of 67 lbf (298 N) at the location normally associated with the folding action and in the direction normally associated with folding the product in accordance with the manufacturer's instructions. Gradually apply the force within 5 s while maintaining the direction of force relative to the floor and maintain for an additional 10 s. To apply the force to the handle of a product with separate gripping handles, place a rigid bar horizontally across the handles and apply the force centered between the handles. Discontinue the application of the force if the condition outlined in 5.5.1.2 occurs.

NOTE 6—Do not apply this force on latching or unlatching means itself.

7.2.4 Repeat 7.2.3 for a total of 5 times within 4 min.

## 7.3 Static Load Test Method:

7.3.1 Place the product in the manufacturer's recommended use position.

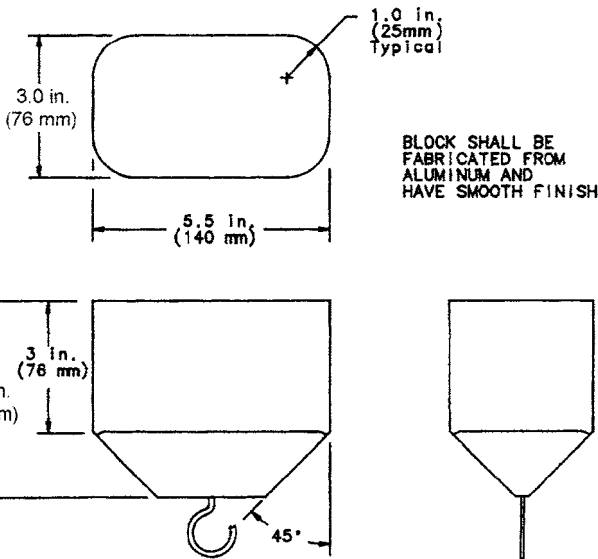
7.3.2 Place the specified weight from 6.2 upon a 6 by 6-in. (150 by 150-mm) wood block  $\frac{3}{4}$  in. (19 mm) thick in the unit at the location called for in 6.2. If the unit has a hammock-type seat, use a standard 6-in. weld cap as identified in Fig. 12 instead of the specified wood block upon which to place the test weight. Make allowances for the mass of the weld cap. Gradually apply the weight within 5 s and maintain for an additional 60 s.

7.3.3 Place a 50-lb (22.7-kg) weight or 1.25 times the manufacturer's recommended maximum weight of an individual seating area, whichever is greater, upon the center of any step or footrest and distribute it upon a 3 by 6-in. (75 by 150-mm) wood block  $\frac{3}{4}$  in. (19 mm) thick. If the step or footrest is adjustable, the test method shall be done in the lowest use position. Gradually apply the weight within 5 s and maintain for an additional 60 s.

## 7.4 Stability Test Method:

### 7.4.1 Stability with Occupant(s) in the Product:

7.4.1.1 Place the product in the manufacturer's use position with all wheels on a 12° inclined plane. If the test model has an



NOTE 1—Not to scale.

FIG. 11 Torso Probe

convertible carriage/stroller when tested in accordance with 7.18. Any completely bounded external opening within 5 in. (127 mm) above the foot end of the car seat shall either not allow the complete passage of the torso probe (Fig. 11) when tested in accordance with 7.18.3 or shall permit complete passage of the head probe (Fig. 10) when tested in accordance with 7.18.5. Any horizontal openings between the car seat foot end and the front surface of the unit seat back are excluded from this requirement.

## 7. Test Methods

### 7.1 Testing Guidelines:

7.1.1 The last three tests under this section shall be as listed below and conducted in the order shown.

- (1) 7.11.1 – 7.11.5
- (2) 7.11.6
- (3) 7.2 (the last test)



NOTE 1—Department of Transportation, Federal Aviation Administration, Drawing No. SA-1001.

**FIG. 13 CAMI Dummy, Mark II**

adjustable back rest, test in the most upright, recline, and carriage use positions. If the unit has a rotating seat, test the unit with the seat in all recommended use positions.

7.4.1.2 In the upright and recline (an interior angle of 150° or less as measured in accordance with 5.11 between the seat surface and the backrest) use positions, place a CAMI Dummy, Mark II (see Fig. 13) in the carriage or stroller, and secure the restraint system in accordance with the manufacturer's instruction.

7.4.1.3 For the carriage use position, an interior angle of greater than 150° as measured in accordance with 5.11 between the seat surface and the backrest, place the CAMI Dummy, Mark II (see Fig. 13) with the dummy's head against the rear surface of the occupant retention space and the handle in the stroller mode.

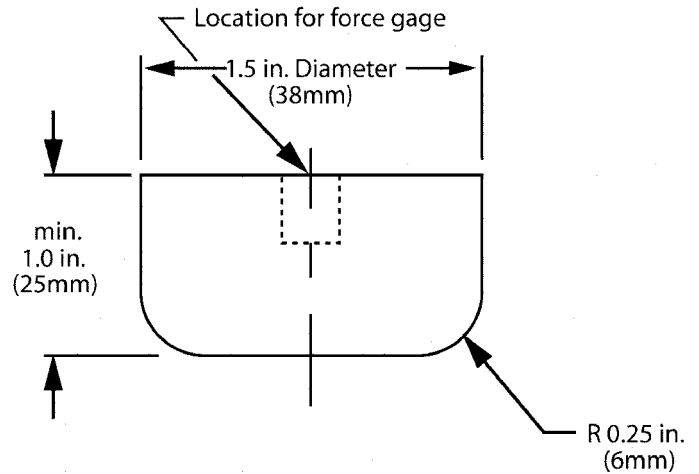
7.4.1.4 Place a stop on the plane against the wheels in a manner that will prevent the carriage or stroller from moving on the plane but will not prevent it from tipping.

7.4.1.5 Position the stroller or carriage on the plane in all orientations that present maximum tendency for the unstable condition to exist.

7.4.2 *Front Stability (Child Climbing in) for Stroller or Convertible Carriage/Stroller in Stroller Use Only:*

7.4.2.1 Place the unit in the manufacturer's recommended use position with all wheels on a flat horizontal plane. With no weight in the seating compartment, place the footrest or step, or both, in the lowest use position. If the wheels swivel, test with the wheels positioned to most likely cause failure.

7.4.2.2 Apply a force of 40 lbf (178 N) with a disk (see Fig. 14) vertically downward to any member forward of the front edge of the seat on any location likely to cause the unit to tip over. The position must support the vertical force applied through the disk and without the disk sliding off the surface. Gradually apply the force within 5 s, and maintain it for 10 s.



NOTE 1—Disk shall be made of aluminum with a smooth finish.

**FIG. 14 1.5 in. Disk**

7.4.2.3 If the disk slides off at a particular spot on the footrest or step, it is considered a pass at that particular spot on the unit.

7.5 *Restraining System Integrity and Occupant Retention Test Methods:*

7.5.1 *Restraining System Integrity Test Method:*

7.5.1.1 Secure the test model so that it cannot move vertically or horizontally.

7.5.1.2 Apply a force of 45 lbf (200 N) to a single attachment point of the restraint system in the normal use direction(s) that stress would be applied to that attachment. Gradually apply the force within 5 s and maintain for an additional 10 s.

7.5.1.3 Repeat 7.5.1.2 for a total of five times with a maximum interval of 5 s between tests.

7.5.1.4 Repeat 7.5.1.2 and 7.5.1.3 for each attachment point of the restraint system and fastening device.

7.5.2 *Restraining System Occupant Retention Test Method:*

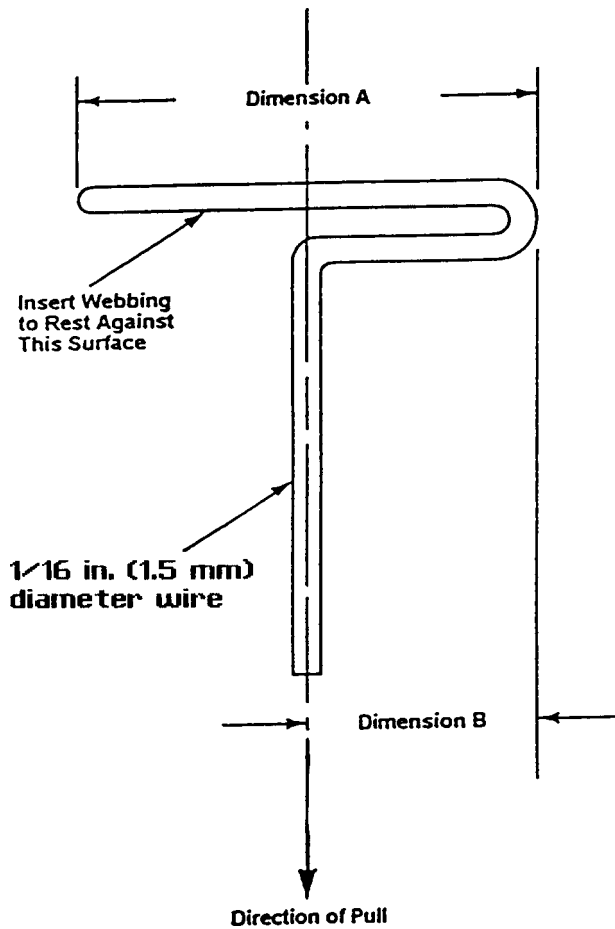
7.5.2.1 If the test model has an adjustable back rest, place it in the most upright use position. Place a CAMI Infant Dummy, Mark II (see Fig. 13) in the test unit with the restraining system fastened in accordance with the manufacturer's instructions. Tighten the restraining system in such a manner that a force of 2 lbf (9 N) or less will provide at least a 1/4-in. (6-mm) space between the restraint system and the dummy. The webbing tension pull device shown (Fig. 15) is required to determine proper restraint system fit. Perform the following tests without readjusting the restraint system.

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

7.5.2.3 Repeat 7.5.2.2 for a total of five times with a maximum interval of 5 s between tests.

7.5.2.4 Release the test unit from its attachment to the test plane (7.5.1).

7.5.2.5 Reposition the CAMI Infant Dummy, Mark II (Fig. 13) into the seated position without adjusting the restraint system.



NOTE 1—Dimension A: Width of webbing plus  $\frac{1}{8}$  in. (3 mm).

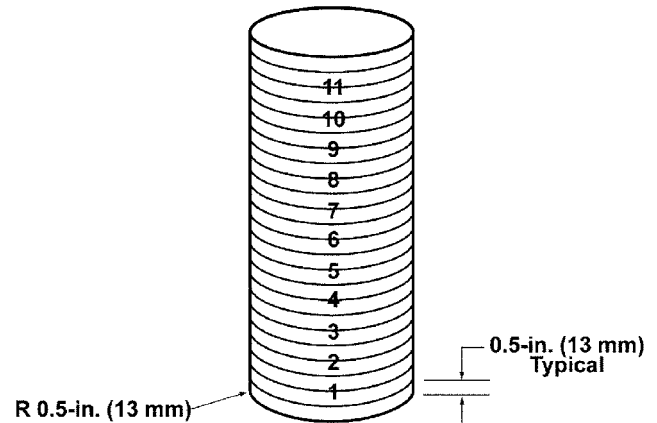
NOTE 2—Dimension B: One half of Dimension A.

FIG. 15 Webbing Tension Pull Device

7.5.2.6 By any convenient means, lift the unit and rotate it backwards  $360^\circ$  around an axis approximating the intersection of the seat back and bottom. The rotation must hesitate for a minimum of 1 s every  $90^\circ$ .

7.5.2.7 Rotate the stroller  $360^\circ$  around an axis approximating the side edge of the seat bottom. Rotation must hesitate a minimum of 1 s every  $90^\circ$ .

7.5.2.8 Remove any removable soft goods. Adjust the waist strap(s) to the position in 7.5.2.1 (see Fig. 7), without the CAMI Infant Dummy, Mark II. Place a 5-lb (2.2-kg) weight on a 6 by 6-in. (150 by 150-mm) wood block  $\frac{3}{4}$  in. (19 mm) thick in the center of the seat. Establish a horizontal reference line (Line A) forward of the seat back and on a plane (Plane B) perpendicular to the seat back and through the point where the waist strap(s) attaches to or emerges from the seat back rest (Point C). Apply a force of  $\frac{1}{2}$  lbf (2.2 N), using the web tension device (Fig. 15), to the loop to remove any slack and measure (D1) from the forward most point of the loop (Point E) to the horizontal reference line (Line A). Apply a force of 7 lbf (31 N) to Point E perpendicular to the seat back (Plane B), and measure the distance (D2). The difference between the initial measurement (D1) and the second measurement (D2) shall conform to 6.4.4.



NOTE 1—5.37-in. (136-mm) diameter by 12-in. (304-mm) high, weighing 10 lb. (4.6 kg), rigid material with bottom.

NOTE 2—The rationale for the 5.37 diameter was determined by taking the average of the waist diameter converted from the waist circumference, waist breadth, and hip circumference of a 5 % 6-month-old to a 95 % 15-month-old child. Most incidents of children falling from strollers are with children between 6 months and 15 months.

|                 |                            |               |
|-----------------|----------------------------|---------------|
|                 | <b>Waist Circumference</b> |               |
| 6 to 8 months   | 5 % 14.137                 | 4.5 diameter  |
| 12 to 15 months | 95 % 17.874                | 5.7 diameter  |
|                 | <b>Waist Breadth</b>       |               |
| 6 to 8 months   | 5 % 11.8                   | 4.65 diameter |
| 12 to 15 months | 95 % 15.3                  | 6.02 diameter |
|                 | <b>Hip Circumference</b>   |               |
| 6 to 8 months   | 5 % 16.22                  | 5.1 diameter  |
| 12 to 15 months | 95 % 19.57                 | 6.2 diameter  |

FIG. 16 Test Cylinder

7.5.3 The height of the shoulder strap's potential anchors shall be at  $10.5 \pm 1.0$  in. ( $267 \pm 26$  mm) and  $12.5 \pm 1.0$  in. ( $318 \pm 26$  mm) from the junction of the stroller back and seat (see Fig. 6) with the stroller back in most upright position. For strollers with a maximum child weight of greater than 40 lb (18.1 kg) per seat, a third potential anchor shall be at 15 in.  $\pm 1.0$  in. ( $380 \pm 26$  mm). The measurement shall be from the junction of the seat/back to the lowest point of the strap/seat back junction. With the stroller back in the most upright position, these measurements shall be taken from the top of the uncompressed seat or the bottom of the seat board (see Fig. 6) parallel to the back.

7.5.4 *Restraining System Waist Restraint/Crotch Strap Test Method:*

7.5.4.1 If the test model has an adjustable backrest, place it in the fully upright position.

7.5.4.2 Snugly secure the test cylinder (see Fig. 16) in the unit (see Fig. 17) with the restraint system.

7.5.4.3 The lower corner of the test cylinder shall be at the seat bottom/back junction with the test cylinder centered and in full contact with the seat back. Align the waist restraint so that it is parallel with the lines on the test cylinder. Determine the location of the waist restraint anchor center point(s) by visual inspection.

7.5.4.4 With the same configuration in accordance with 7.5.4.3, attempt to freely pass a 1-in. (25-mm) diameter probe through any space between the waist restraint system and the test cylinder.

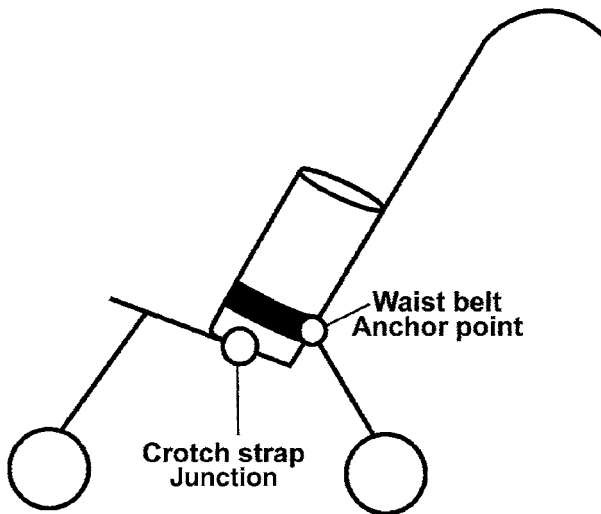


FIG. 17 Test Cylinder in Stroller

7.5.4.5 Position the test cylinder so that the lower corner is at the seat surface/back junction and the bottom of the test cylinder is in full contact with the seat surface. Determine the forward most position of the junction of the crotch strap and seat surface by visual inspection.

7.5.4.6 Position the test cylinder in accordance with 7.5.4.5. If the crotch strap is adjustable, adjust it to the maximum length. Locate the points 2-in. (50-mm) to the right and left of the center of the crotch/waist junction in accordance with Fig. 18. With the waist restraint adjusted to allow full extension of the crotch restraint, pull the crotch restraint to its highest point on the test cylinder.

#### 7.5.5 Buckle Release Test Method:

##### 7.5.5.1 Buckle Pre-load:

(1) *Single Latch Plate Buckles* (Fig. 19a)—Place the buckle on a hard, flat horizontal surface shaped so that it does not impede the release when being tested. Preload the strap ends of the buckle with 2 lb (9N) in opposing directions away from the buckle.

(2) *Double Latch Plate Buckles* (Fig. 19b)—Place the buckle on a hard, flat horizontal surface shaped so that it does not impede the release when being tested. Preload the strap ends of the buckle with 2 lb (9N) in opposing directions away from the buckle. Latch plates that are removed from the buckle in the same direction shall be loaded equally so that the total load is 2 lb (9 N) in the direction away from the buckle.

##### 7.5.5.2 Buckle Release Force Application:

(1) *Hinged Button Buckles* (Fig. 19c)—Preload the buckle using the appropriate method in 7.5.5.1. Apply a release force at the centerline of the button using a conical surface (Fig. 20) located 0.125 in. (3.17 mm) away from the movable edge directly opposite the fixed edge, and in the direction that produces maximum releasing effect.

(2) *Floating Button Buckles* (Fig. 19d)—Preload the buckle using the appropriate method in 7.5.5.1. Apply a release force using a conical surface (Fig. 20) located at the center of the release mechanism in the direction that produces the maximum releasing effect.

(3) For all other single action buckle release mechanisms, the force shall be applied on the centerline of the buckle lever or finger tab in the direction that produces the maximum releasing effect. Measure the force required to release the buckle. (Fig. 19 illustrates the loading for the different buckles and the point where the release force should be applied, and Fig. 20 illustrates the conical surface used to apply the release force to pushbutton release buckles.)

##### 7.5.5.3 Double Action Release Mechanisms:

(1) Secure the buckle in a manner that does not contact any activation buttons. Fully activate and maintain one of the two mechanisms so that it is no longer fully engaged. While maintaining activation, apply a 2 lb (9 N) force to each strap end in opposite directions away from the buckle release button. See Fig. 21 as an example of double action release mechanism.

(2) Repeat (1) for the other activation mechanism of the buckle which was not previously activated.

#### 7.6 Test Method for Parking Brake Requirements:

##### 7.6.1 Deriving Test Force F:

7.6.1.1 Establish  $W_1$  – the weight of the product including all manufacturer provided accessories assembled in accordance with the manufacturer's instructions.

7.6.1.2 Establish  $W_2$  – the weight placed in the unit per 7.6.2.

7.6.1.3  $F = 0.34(W_1 + W_2)$  rounded up to the next whole number.

7.6.2 With the parking brake(s) applied, place the unit on a rigid, horizontal test surface covered with 60 grit sandpaper or equivalent. Gradually load the unit with a 40-lb (18.1-kg) weight(s) or a weight(s) equal to the manufacturer's recommended maximum weight, whichever is greater, in the center of each weightbearing seating surface(s) or body of the unit. Maintain the load throughout the tests described in 7.6.3, 7.6.4, and 7.6.5.

7.6.3 *Rearward Test*—Pull rearward horizontally with the test force F applied at the center of the unit and as near to the height of the center of the wheels as possible, as shown in Fig. 22. Gradually apply the force F within 5 s and maintain for an additional 10 s or until wheels slide 5 in. (127 mm) on the test surface.

7.6.4 *Forward Test*—Pull forward horizontally with the test force F applied at the center of the unit between the wheels of the stroller and as near to the height of the center of the wheels as possible that does not interfere with the rotation of the wheel(s), as shown in Fig. 23. Gradually apply the force F within 5 s and maintain for an additional 10 s or until wheels slide 5 in. (127 mm) on the test surface.

7.6.5 Repeat 7.6.3 and 7.6.4 for a total of 5 cycles alternating the direction of the applied force after each pull. At the end of the 5th rearward pull and with the force still applied, mark the point on each braked wheel that is in contact with the test surface as a reference A1. At the end of the 5th forward pull, with the force still applied, mark the point on each braked wheel that is in contact with the test surface as a reference A2. Determine the angle between A1 and A2 for each braked wheel.

##### 7.7 Occupant Retention Test Method:

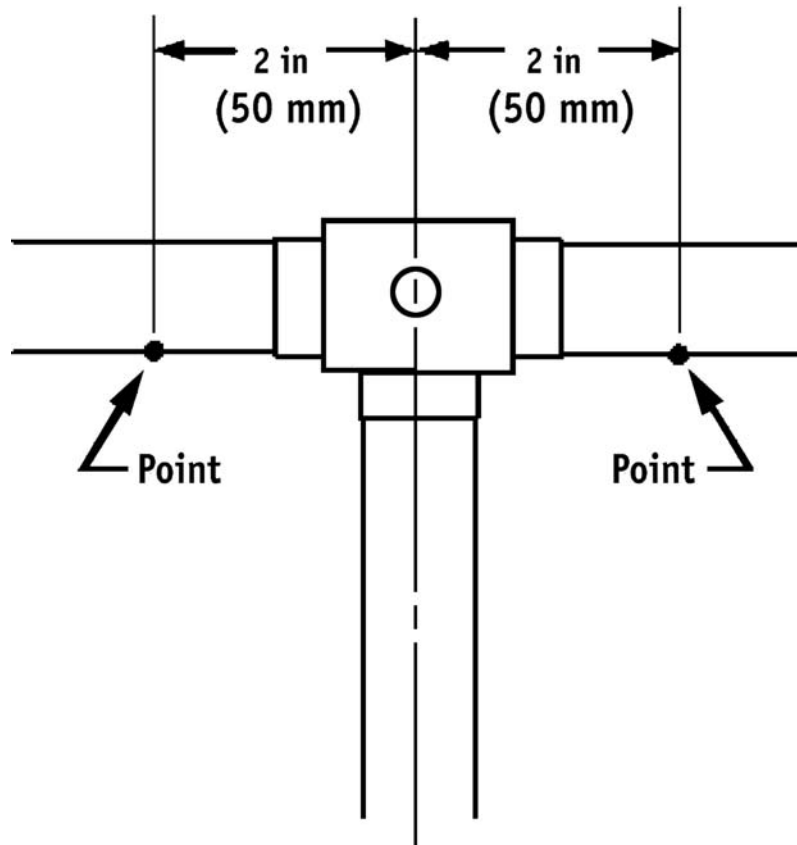


FIG. 18 Point

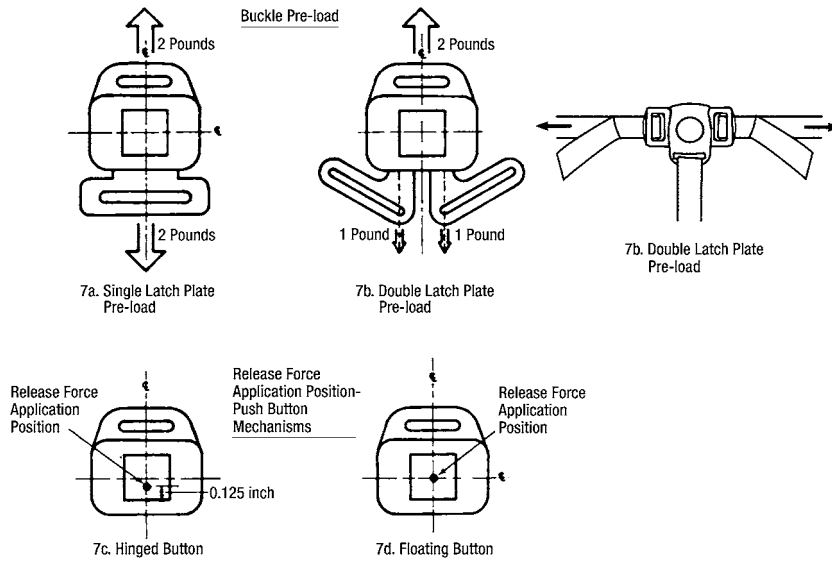
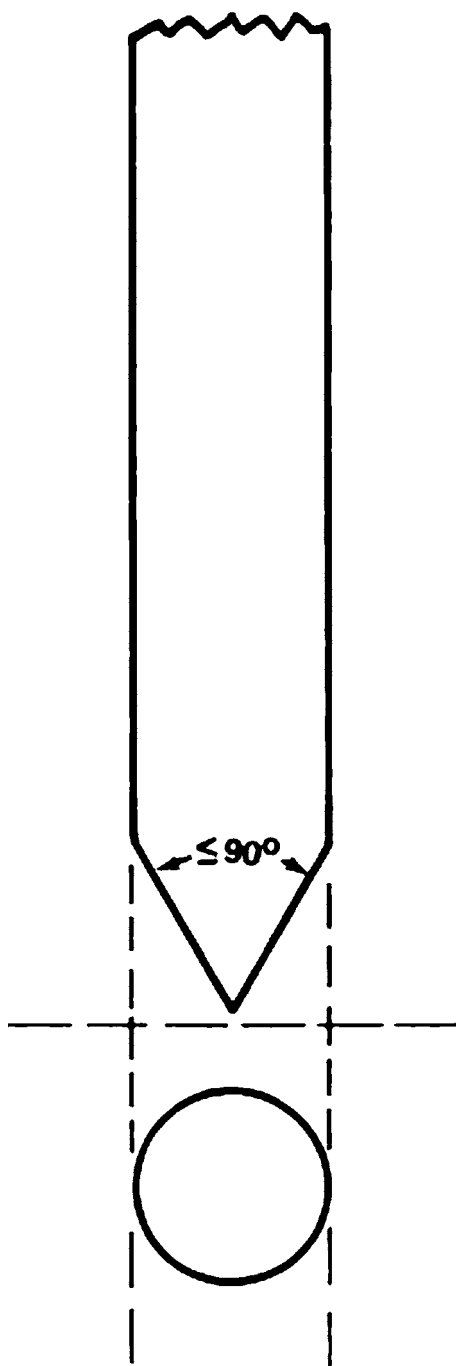


FIG. 19 Pre-Impact Buckle Release Force Test Set-Up

7.7.1 Affix the unit securely so that it cannot move horizontally. If testing a stroller with a reclined carriage position, conduct the test with the back rest in all reclined positions greater than 150°.

7.7.2 Adjust the unit in accordance with the manufacturer's directions to close or block leg or other completely bounded external openings.

7.7.3 Apply the probe shown in Fig. 9 with a force of 20 lbf (90 N) from within to all completely bounded external openings below the top edge of the occupant retention space in the direction most likely to allow the test probe to pass completely through. Apply the force gradually over 5 s and maintain for an additional 10 s.



**FIG. 20 Release Force Application Device—Push Button Release Buckles**

### 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.



**FIG. 21 Example of Double Action Release Mechanism**



**FIG. 22 Pull Rearward**



**FIG. 23 Pull Forward**

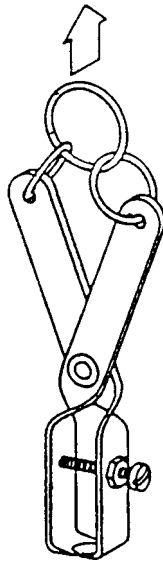
7.8.3 A warning label attached by a seam shall be considered permanent if it does not detach when subjected to a 15-lbf (67-N) pull force applied in any direction most likely to cause failure using a 3/4-in. diameter clamp surface. Apply the force evenly over 5 s and maintain for an additional 10 s.

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, from Test Methods **D3359**, eliminating parallel cuts.

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

**15 lbf (67 N)  
Maximum Tension**



**FIG. 24 Tension Test Adaptor/Clamp**

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 Removal of Protective Components:

7.9.1 Any protective component shall be tested in accordance with each of the following test methods in the sequence listed.

7.9.2 Secure the unit so that it cannot move during the performance of the following test methods.

7.9.3 *Torque Test Method*—A torque of 3 lbf-in. (0.3 N-m) shall be applied evenly within a period of 5 s in a clockwise direction until a rotation of 180° from the original position has been attained or 3 lbf-in. has been exceeded. The torque or maximum rotation shall be maintained for an additional 10 s. The torque shall then be removed and the test components permitted to return to a relaxed condition. This procedure shall then be repeated in a counterclockwise direction.

#### 7.9.4 Tension Test Method:

7.9.4.1 Attach a force gage to the component caps, sleeve, or plug by means of any suitable device. For components that reasonably cannot be expected to be grasped between thumb and forefinger, or teeth, on their outer diameter but has a gap of at least 0.040 in. (1.00 mm) between the rear surface of the component and the structural member of the unit to which they are attached, a clamp such as the one shown in Fig. 24 may be a suitable device.

7.9.4.2 Be sure that the attachment device does not compress or expand the component so that it hinders any possible removal.

7.9.4.3 Gradually apply a 15-lbf (67-N) force in the direction that would normally be associated with the removal of the protective component over a 5-s period and hold for an additional 10 s.

7.10 The unit shall be tested by tipping it over three times (front, rear, and one side). Push the unit slowly past its center of balance and allow the unit to fall onto testing surface (see 4.1).

#### 7.11 Impact Test Method:

7.11.1 Attach the car seat in accordance with the manufacturer's instructions into the unit, and restrain the CAMI Dummy, Mark II (see Fig. 13) in the car seat. In the cases of multiple occupancy units, use a car seat attached in any and all the manufacturer's recommended use positions in accordance with the instructions with the CAMI Dummy, Mark II in each place intended to be occupied by a car seat.

7.11.2 Attach a 5-lb (2.3-kg) weight to the center of the unit's handle at the grip area. For products with separate gripping handles, attach 2.5 lb (1.15 kg) to each handle. The weight shall not be allowed to swing.

7.11.3 Position the unit as shown in Fig. 25 with any swivel wheels as they would be if the unit was moving forward. Lock the swivel(s) if the unit has this feature.

7.11.4 Release the unit, allowing it to run freely down the slope against a rigid steel stop, which is at least equal to the height of the unit's front wheel axle(s).

7.11.5 Repeat the test for a total of three times. If the weight moves during the test, reposition the weight to its original position before repeating. During the test, the unit should be restrained from tipping over.

7.11.6 With the unit's seat in the upright position, place a 40-lb (18.1-kg) bag weight (6 to 8-in. (150 to 200-mm) diameter using steel shot as the mass) or manufacturer's recommended maximum weight, whichever is greater, in the restraint system. For carriages without restraint systems, position the weight in the center of the carriage and secure the weight with wedges of negligible mass (styrofoam or similar) to prevent movement. If the unit is designed for more than one child, use a 40-lb (18.1-kg) weight or manufacturer's recommended maximum weight, whichever is greater, in each place intended to be occupied by a child. Test in accordance with 7.11.2 – 7.11.4, except repeat the test for a total of five times. If the weight moves during the test, reposition weight to original position before repeating.

#### 7.12 Passive Containment/Foot Opening Test Method:

7.12.1 Secure the front wheels of the unit in their normal standing position so that the unit cannot move forward. Attach the tray(s) or grab bar(s) in the position that creates the bounded opening(s). Per the manufacturer's instructions, position any adjustable features (that is, calf supports, foot rests, etc.) that may affect the bounded opening(s) to create the minimum opening(s) size.

7.12.2 Place the head probe (Fig. 10) adjacent to the opening(s) most likely to allow the head probe to pass through. With the harness restraint system unbuckled, place the buckle portion of the crotch belt beneath the head probe. Gradually rotate the unit 90° with the front wheels as a stationary pivot

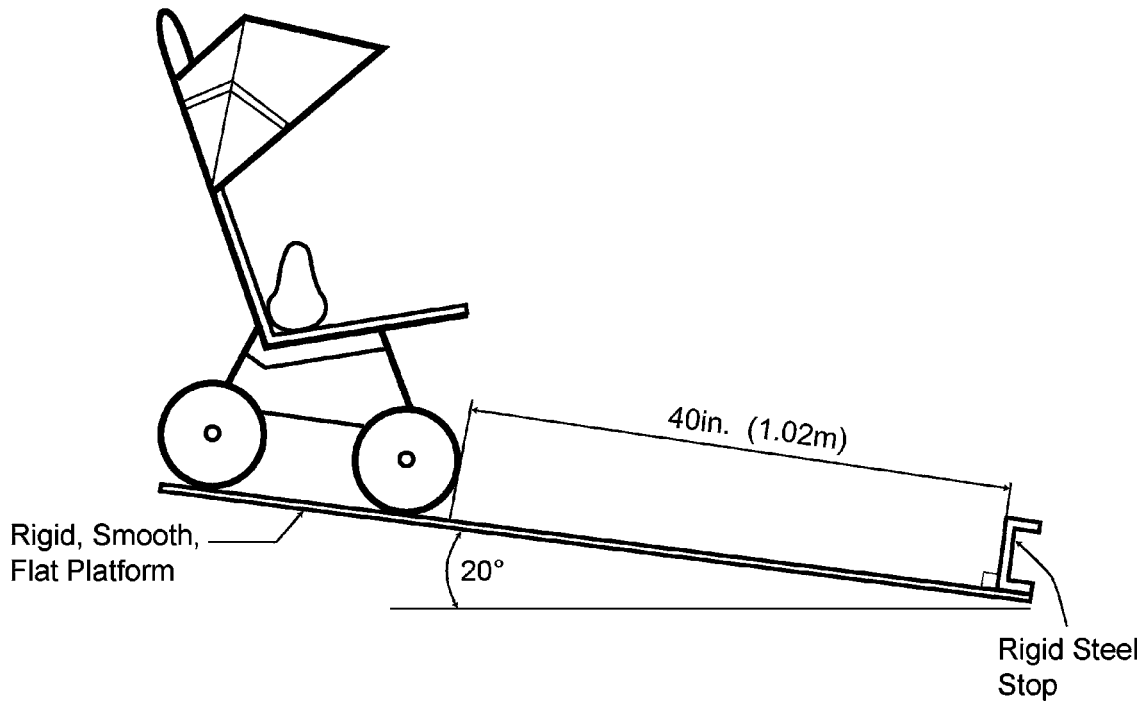


FIG. 25 Impact Test

within a period of 5 s and maintain for an additional 10 s. The head probe shall remain in contact with seat during the test. If the head probe passes completely through the bounded opening (a) without detaching the tray(s) or grab bar(s), or (b) by completely detaching the tray(s) or grab bar(s), or (c) by moving the tray(s) or grab bar(s) out of the manufacturer's recommended use position, then the stroller meets the criteria of 6.8. If the sample does not meet any of the criteria listed in (a), (b), or (c) above, then proceed to 7.12.3.

7.12.3 If necessary, reattach/reposition tray(s) grab bar(s) to the manufacturer's recommended use position, then perform the torso probe test per 7.12.4. Per the manufacturer's instructions, position any adjustable features (that is, calf supports, foot rests, etc.) that may affect the bounded opening(s), to create the maximum opening(s) size.

7.12.4 Secure the unit in its normal standing position so that it cannot move in the direction of the force being applied. From the occupant's area, insert the tapered end of the torso probe (Fig. 11) into the opening(s) between the tray(s) or grab bar(s) and the seat bottom of the unit in the most adverse orientation. With the harness restraint system unbuckled, place the buckle portion of the crotch belt away from the torso probe. Gradually apply 25 lbf (111 N) perpendicular to the base of the probe within a period of 5 s and maintain for an additional 10 s. Apply this test to all openings that do not allow the passage of the head probe. If the torso probe does not pass through any of the bounded openings, then the stroller meets the criteria of 6.8.

### 7.13 Wheel and Swivel Assemblies Detachment Testing:

#### 7.13.1 Wheel detachment from an axle testing:

7.13.1.1 Wheels contained on both sides by a fork are exempt from this requirement.

7.13.1.2 Test one rear and one front wheel for detachment from an axle in accordance with 7.13.1.3 and 7.13.1.4 for non-swivel wheel assemblies and with 7.13.1.3 and 7.13.1.5 for swivel wheel assemblies.

7.13.1.3 Secure the unit on its side on a table so that a hanging weight may be applied to the unit's wheel without impeding their removal.

7.13.1.4 For a non-swivel wheel hang a 100 lb (45 kg) weight on the wheel along the axle centerline so that it pulls against the wheel fastener, Fig. 26. The weight may be applied by means of a fixture/clamping device that can be adjusted to fit different size wheels. The fixture/clamping device shall be made to minimize damage to the wheel and to not impede the force being applied through the wheel to the fastener. Gradually apply the weight within a period of 5 s and then rotate the wheel clockwise 360°, then counterclockwise 360° for 10 cycles (1 cycle equals turning 1 time clockwise 360° and 1 time counterclockwise 360°), Fig. 27. Each cycle shall not be less than 12 s or greater than 18 s.

7.13.1.5 For a swivel wheel hang a 50 lb (23 kg) weight on the wheel along the axle centerline so that it pulls against the wheel fastener, Fig. 26. The weight may be applied by means of a fixture/clamping device that can be adjusted to fit different size wheels. The fixture/clamping device shall be made to minimize damage to the wheel and not to impede the force being applied through the wheel to the fastener. Gradually apply the weight within a period of 5 s and then rotate the wheel clockwise 360°, then counterclockwise 360° for 10



FIG. 26 Hanging Weight



FIG. 27 Turning the Wheel

cycles (1 cycle equals turning 1 time clockwise 360° and 1 time counterclockwise 360°), Fig. 27. Each cycle shall not be less than 12 s or greater than 18 s. If needed secure the swivel wheel assembly from swiveling using the manufacturer's swivel locks or other means as necessary to keep it from swiveling.

NOTE 7—Product swivel locks may not be sufficient to secure the front wheel from swiveling. If possible, the swivel wheel assembly may be disassembled from the unit for ease of testing.

#### 7.13.2 Swivel Assembly Detachment from the Frame Testing:

7.13.2.1 Test one swivel assembly. If the unit contains swivel assemblies on the front and rear, test one of each.

7.13.2.2 Secure the unit in such a way that removal of the swivel wheel assembly(s) is not impeded.

7.13.2.3 Apply a pull force of 45 lbf (200 N) to the swivel assembly in line with the direction normally associated with removal of the swivel assembly, Fig. 28. Gradually apply the pull force within a period of 5 s and maintain for an additional 10 s.

7.14 Wheel Detachment from a Removable Wheel Fork Assembly Testing—Test each removable-wheel fork assembly of the unit as follows:

7.14.1 Release the primary locking device(s) of the quick release mechanism or other manually operated mechanism that does not require the use of tools for installation or removal.

7.14.2 Apply a separation pull force of 25 lbf (111 N) to the wheel on a line along the slots in the fork ends or the direction most likely to cause detachment.

#### 7.15 Frame Folding, Scissoring, Shearing, and Pinching:

7.15.1 2D Fold Stroller and Convertible Carriage/Stroller Evaluation—Place the unit's seatback in the most upright position. Identify and mark the portion of the unit's rigid frame members and hinges that have potential scissoring, shearing, or pinching action during folding of the unit and are within or penetrate the access zone shown in Fig. 29 anywhere within the width of the stroller. All marked portions of the frame shall be evaluated per 7.15.2 or 7.15.3 as applicable. For units that feature two or more folding operations that are able to be carried out independently of each other, each operation must be independently evaluated per the test methods in 7.15.2 or 7.15.3, or both, as applicable. This includes all seat-facing positions as recommended by the manufacturer and each occupant position on multiple occupancy units. Tray and front grab bar movements not a result of unfolding operation are excluded from this evaluation.

7.15.2 For units where the front and rear wheels move toward each other during folding—Measure the distance (distance A, see Fig. 30) between the front and rear wheel axle centers when the product is in the manufacturer's recommended use position. The measurement shall be taken with any swivel wheels in the locked position and in the plane where the axle centerlines are perpendicular to the fore/aft horizontal axis of the stroller. To determine the starting point for testing, start folding the unit from erect to folded/"closed" position until the distance between the wheel axle centers is  $\frac{2}{3}$  of the total travel distance A (see Fig. 30 for an example). From this point check the marked portions identified in 7.15.1 for scissoring, shearing, and pinching in accordance with 5.7.4 while moving the stroller from this partially folded position to the fully erect and locked position.

7.15.3 For units where the front and rear wheels axle centers move away from each other or do not change distance during folding—Place the unit in a partially erect position so the handle tube is rotated 90° from the fully erect and locked position. From this point assess the marked portions identified in 7.15.1 for scissoring, shearing, and pinching in accordance with 5.7.4 while moving the unit from this partially folded position to the fully erect and locked position.

#### 7.16 Cord and Strap:

7.16.1 Establish the occupant space to check for cords and straps:

7.16.1.1 For a carriage the occupant space is determined as the volume created by projecting the inside area of the pad surface 22 in. (550 mm) in the upwards direction (Fig. 31).

7.16.1.2 For a stroller or a convertible carriage/stroller the occupant space is determined by extending 5 in. (127 mm) in left and right directions from seat/backrest surface edges in accordance with Fig. 32.

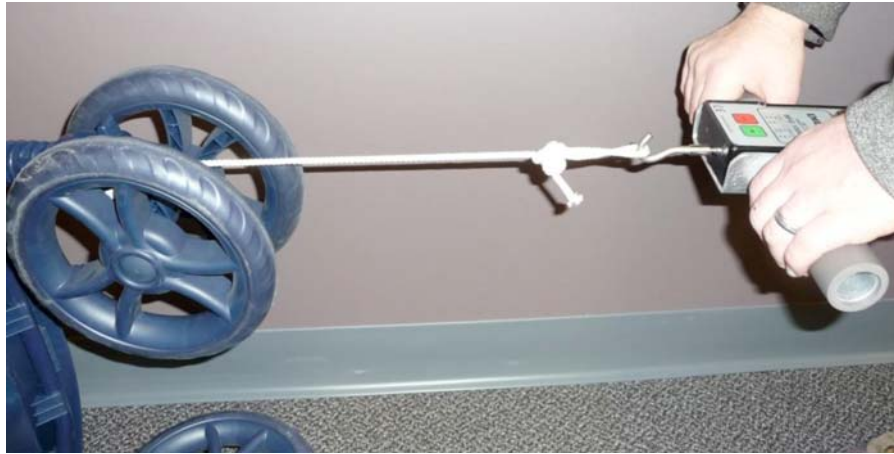


FIG. 28 Swivel Assembly

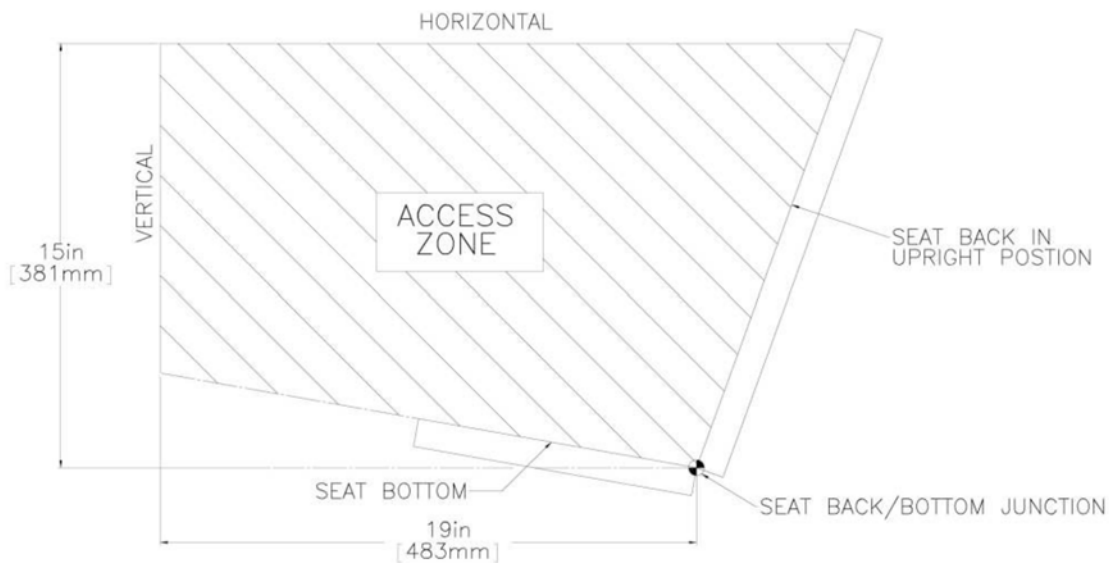


FIG. 29 Access Zone

7.16.1.3 Evaluate a carriage, stroller, and convertible carriage/stroller per 7.16.1.4 and 7.16.1.5. Stroller and convertible carriage/stroller shall be evaluated in full recline position.

7.16.1.4 *Evaluation of Loops*—Measure the cord/strap loop perimeter when stretched by a force of 5 lbf (22 N).

7.16.1.5 *Evaluation of Free Length*—Measure the cord/strap length while stretched by a force of 5 lbf (22 N).

**7.17 Scissoring, Shearing, and Pinching Test Method:**

7.17.1 Place the stroller in a partially erect position such that one of the tubes is rotated 90° from the fully erect and locked position. Check for scissoring, shearing, or pinching between the saddle hinge and rotated tube while moving the stroller from the partially erect (90°) position to the fully erect and locked position.

7.17.2 Check for scissoring, shearing, or pinching created by canopy pivot and exposed rigid canopy frame members within a 4 in. radius of the canopy pivot while moving the canopy frame members throughout their full range of motion (see Fig. 33).

**7.18 Head Entrapment with Car Seat on a Stroller or Convertible Carriage/Stroller Test Method:**

7.18.1 Attach the rear-facing car seat into the unit in accordance with the manufacturer's instructions.

7.18.2 Apply a 5 lb (2.27 kg) static downward vertical load over a 2 in. length in the center of the top edge of the bounded external wall or opening. (See Fig. 34.)

7.18.3 Place opening template (Fig. 35) on the foot end of the car seat oriented as shown in Fig. 34. Level and slide the template toward the bounded external wall or opening. Test any completely bounded external opening that is below the template's 5 in. (127 mm) height and across the complete back. The 5 lb load described in 7.18.2 shall be removed prior to testing in accordance with 7.18.4 and 7.18.6.

7.18.4 Into each opening found in 7.18.3, insert the tapered end of the torso probe (Fig. 11) in the most adverse orientation in the rearward direction of the unit. Apply a pull force of 25 lbf (90 N) to the tapered end of the probe in any direction away

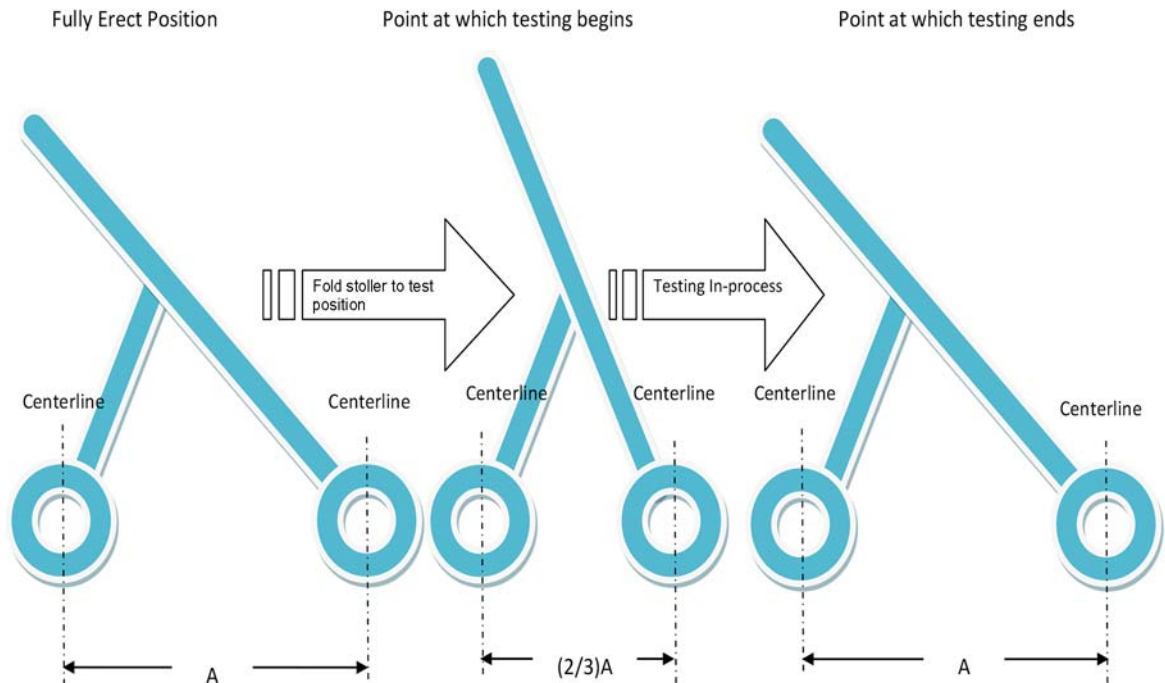


FIG. 30 Example of Travel Distance Between Axles

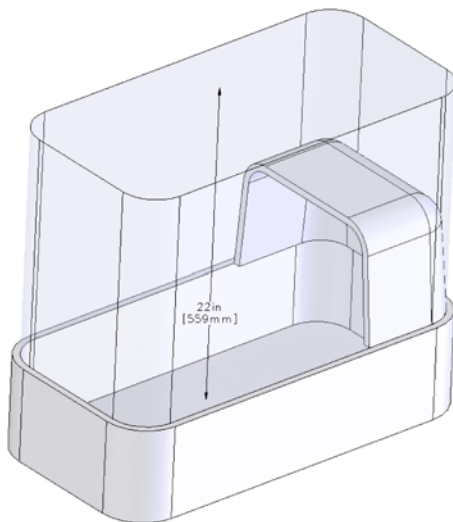


FIG. 31 Occupant Space of Carriage

providing the handle clearance necessary to bring the opening parallel to the floor.

## 8. Marking and Labeling

8.1 Each product and its retail package shall be marked or labeled clearly and legibly to indicate the following:

8.1.1 The name of the manufacturer, distributor, or seller and either the place of business (city, state, and mailing address, including zip code) or telephone number, or both.

8.1.2 A code mark or other means that identifies the date (month and year as a minimum) of manufacture.

8.1.3 The markings on the product shall be permanent.

8.1.4 Any upholstery label required by law shall not be used to meet the requirements of 8.1.

8.2 Each product shall have warning statements. The warning statements shall be in contrasting color(s), permanent, conspicuous, and sans serif style font.

8.2.1 In warning statements, the safety alert symbol “ $\Delta$ ” and the word “**WARNING**” shall not be less than 0.2 in. (5 mm) high. The remainder of the text shall be characters whose upper case shall be at least 0.1 in. (2.5 mm) high except as specified.

8.2.2 The product shall have the following warning statements and symbols as stated in 8.2.2.1, 8.2.2.2, and 8.2.2.3 as a minimum.

8.2.2.1  $\Delta$  **WARNING** Never leave child unattended.

8.2.2.2 A product manufactured with a restraint system must include a permanent warning such that it is visible whenever a child is placed in the product. The warning shall read: “ $\Delta$  **WARNING** Avoid serious injury from falling or sliding out. Always use seat belt (or manufacturer may insert another word(s) to describe their restraint system).”

from the foot end of the car seat. Apply the force gradually over 5 s and maintain for an additional 10 s.

7.18.5 All openings that allowed the complete passage of the torso probe (Fig. 11) when tested according to 7.18.4 shall also be tested according to 7.18.6.

7.18.6 Gradually rotate the unit with the rear wheels as a stationary pivot so that the opening being tested is parallel with the floor. Position the head probe (Fig. 10) in any openings that allowed the passage of the torso probe. Gradually apply the head probe within 5 s and maintain for an additional 10 s.

NOTE 8—If the unit handle touches the floor before the opening is parallel to the floor, the unit will need to be positioned on a raised platform

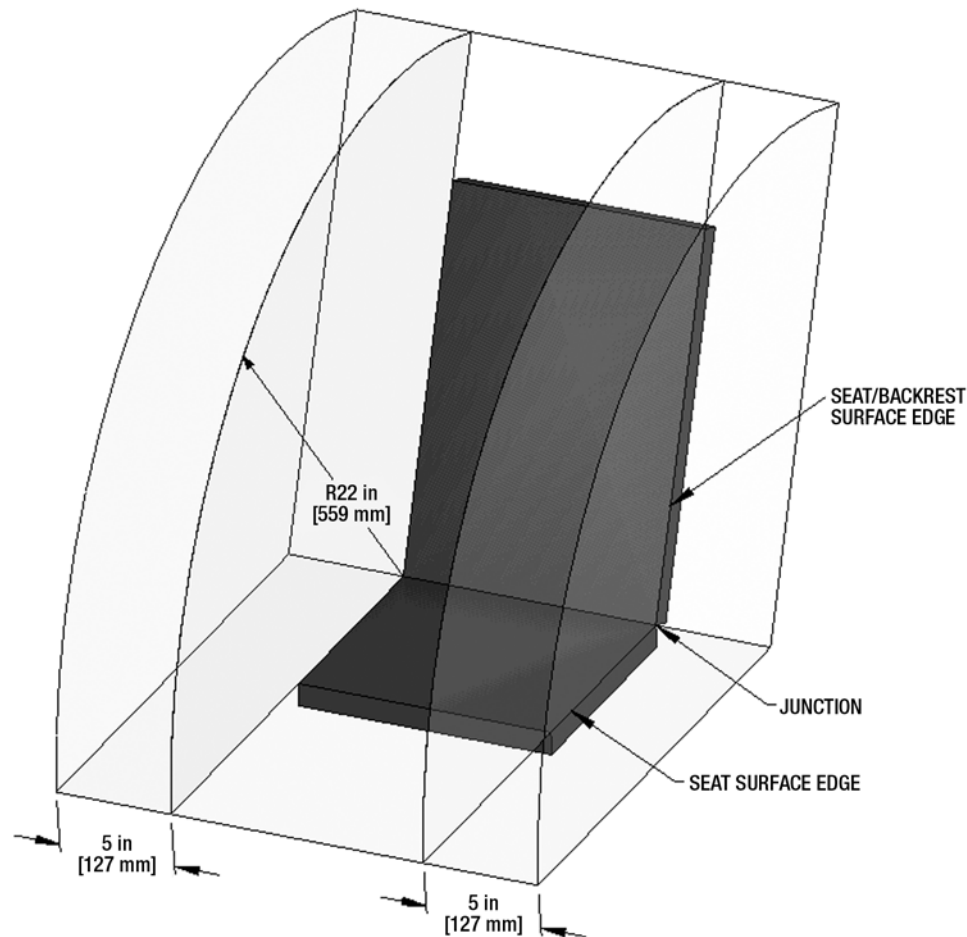


FIG. 32 Occupant Space of Stroller or Convertible Carriage/Stroller

8.2.2.3 Products with reclined carriage position(s) shall have a warning that is visible as a child is placed into the product stating:

△ **WARNING** Child may slip into leg openings and strangle. Never use in reclined carriage position(s) unless (manufacturer to insert product specific instructions). This warning is not required on units that do not have openings or that automatically reduce the size of all openings to comply with 6.5.

8.2.2.4 Products with a removable-wheel fork assembly shall contain the warning statements and symbols as stated in (1) and (2) below.

(1) The following warning shall be located on the front wheel fork. The warning shall remain visible after complete assembly of the product. The warning shall read:

△ **WARNING:**  
**FALL HAZARD**

Wheel can detach and cause tip over. Pull on the wheel to assure it is securely attached (or manufacturer may insert another word(s) to describe product specific instructions).

(2) Three wheeled strollers that (1) contain a front swivel wheel (such as a jogging stroller), (2) are intended by the manufacturer to be used for running, jogging or walking fast, and (3) require the front swivel wheel to be locked during running, jogging or walking fast shall have a warning located to be visible as a person is pushing the unit. The warning shall

read:

△ **WARNING:**

**FALL HAZARD** from tip over

Before running, jogging, or walking fast, LOCK the front wheel from swiveling (or manufacturer may insert another word(s) to describe product specific instructions).

8.2.2.5 If warning statements in 8.2.2.1, 8.2.2.2, and 8.2.2.3 are combined into one or two labels, the safety alert symbol “△” and the word “WARNING” are only needed once per label.

8.2.3 The retail product package, if provided, shall state the maximum weight of the intended user.

## 9. Instructional Literature

9.1 Instructions provided with the carriage, stroller, or convertible carriage/stroller, whether on the package or in leaflet form, shall be easy to read and understand. These instructions clearly shall include assembly, maintenance, cleaning, and operating (including folding) information.

9.2 *Warning Statements within the Instructional Literature:*

9.2.1 In warning statements, the symbol “△” and the word “WARNING” shall not be less than 0.2 in. (5 mm) high. The remainder of the text shall be in characters whose upper case shall be at least 0.1 in. (2.5 mm) high.

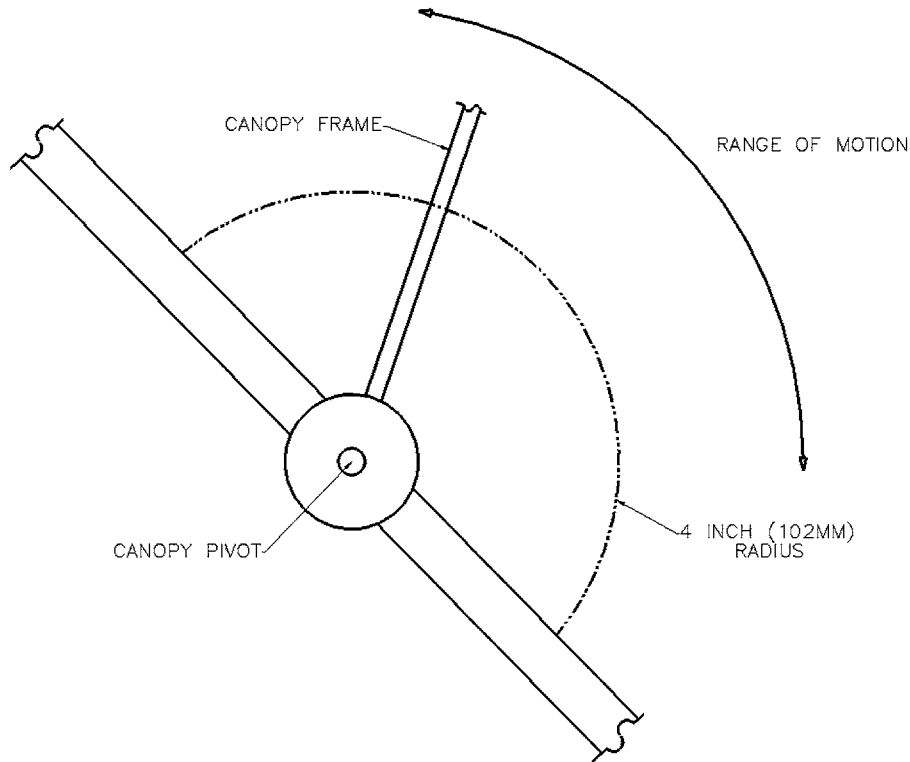


FIG. 33 Canopy Pivot

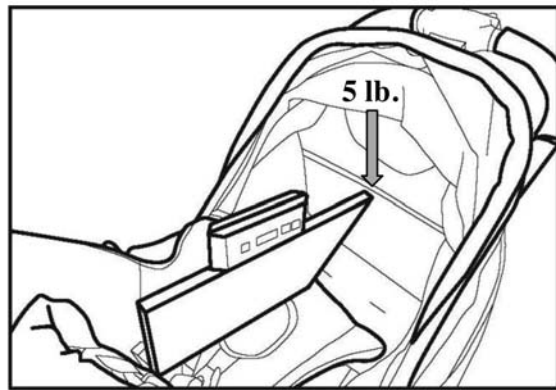
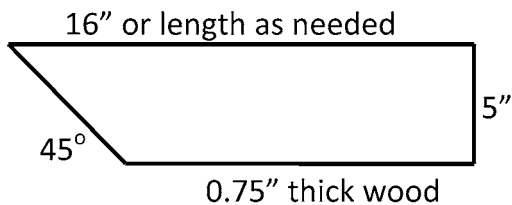


FIG. 34 Completely Bounded External Opening Evaluation



NOTE 1—The length of the template may be shorter or longer depending on the distance between the car seat and the unit canopy or back.

FIG. 35 Opening Template

9.2.2 If the unit is manufactured with a restraint system, the instructional literature shall adequately describe the procedure for the use of the restraint system and repeat the warning contained in 8.2.2.2.

9.2.3 The instructions shall advise that parcels or accessory items, or both, placed on the unit may cause the unit to become unstable.

9.2.4 The instructions shall advise that a child should never be left unattended.

9.2.5 For convertible carriage/strollers requiring a manual operation to comply with 6.5, the instructions shall contain the following warning: **⚠WARNING** Child may slip into leg openings and strangle. Never use in reclined carriage position(s) unless (manufacturer to insert product specific instructions).

9.2.6 Products with a removable wheel fork assembly shall adequately describe the procedure for proper assembly and maintenance of these mechanisms and assemblies.

9.3 Instructions for products supplied with package carrying accessories as part of the original equipment state the maximum weight the manufacturer recommends. These instructions must also warn that excessive weight may cause a hazardous unstable condition to exist. The instructions for products not supplied with package carrying accessories shall include warnings that unstable hazardous conditions may exist if package carrying accessories are added onto the product.

9.4 The instructions shall state the maximum weight of the intended user.

## 10. Keywords

10.1 carriages; strollers

## APPENDIX

### (Nonmandatory Information)

#### X1. RATIONALE

X1.1 *Rationale for Impact Test*—This test is to simulate a user hitting a curb with a stroller at approximately 6 mph.

X1.2 *Rationale for Fig. 14*—The 1.5-in. (38-mm) disk surface diameter was developmentally determined when children are able to stand alone and would be capable of climbing into a stroller. This occurs at about 10 months. The foot breadth of a 5th percentile 10 to 12 month old child is 1.5 in. (38 mm). The 0.25 R (6 mm) is a toe hold go/no go gauge to determine capability of stepping on a part of the stroller. See 16 CFR 1508.07 (c), last sentence, for similar application.

X1.3 *Rationale for Fig. 10*—The 5 lb (2.3 kg) weight is to allow for soft goods to compress. The 8 in. (200 mm) measurement is the 95th percentile tip-of-chin to back-of-head of 13 month old child.

X1.4 *Rationale for 6.4.6.1*—The anchor point location range of 2 in. (50 mm) to 5 in. (127 mm) was derived from anthropometric data on thigh depth (see Fig. 8) measurements to provide better positioning of the waist straps. A thigh depth criterion was used so that the waist strap would encircle a child higher up on the body, rather than ride lower over the thighs. Mean thigh depths for the typical age range of users are:

0 to 3 months: 2.1 in. (53 mm) (5th percentile of users)

3 to 4 years: 4.0 in. (102 mm) (95th percentile of users).

An additional inch was added to the anchor point so that the waist strap would be positioned higher to better support the child against the seat. These measurements were also confirmed by CPSC and manufacturers' studies.

X1.5 *Rationale for 6.4.6.3 and 7.5.4.5, Crotch Strap and Seat Surface Junction*—The real concern is the point where the crotch strap comes out of the seating surface in relation to the test cylinder. The crotch strap anchor point is irrelevant as it can be anywhere on the unit, even forward of the crotch strap slot in the seating surface.

X1.6 *Rationale for 6.4.6.4, Length of the Crotch Restraint*—The rationale for the length of the crotch restraint between the 4.5-in. (114-mm) to the 7.5-in. (190-mm) line on the test cylinder is based on the mean measurements for abdominal depth plus thigh depth of typical users minus the test cylinder

diameter which represents the child sitting on part of the crotch strap. The 4.5 in. (114 mm) is the mean of a 0 to 3 month old child's abdominal depth of 6.9 in. (175 mm) plus the mean of a 0 to 3 month old child's thigh depth of 2.1 in. (53 mm) minus the test cylinder diameter of 5.37 in. (136 mm). An additional inch was added to the crotch restraint to allow the waist restraint to be positioned higher for supporting the child against the seat. The 7.5 in. (190 mm) is the mean of a 3-year-old child's abdominal depth of 9.5 in. (241 mm) plus the mean of a 3-year-old child's thigh depth of 3.3 in. (84 mm) minus the test cylinder diameter of 5.37 in. (136 mm). These measurements were confirmed by CPSC and manufacturers' studies.

X1.7 *Rationale for 6.7.1.1, Impact Test*—As currently written, a car seat could flip out of the stroller frame and as long as one attachment point remained secured, the unit would pass this requirement. The new proposal would require all attachment points to remain secure. These attachment points are provided by the manufacturer to secure the car seat to the unit.

X1.8 *Rationale for 7.4.1.1, Stability Test*—Clarification for testing for units with a rotating seat.

X1.9 *Rationale for 5.5.1.2*—Permanent deformation of the unit's frame at a force less than that which is specified in 7.2 limits the forces that can be applied to the locking device(s) both during testing and during consumer use of the unit. Deformation would render the unit non-functional for further consumer use which is why the test is discontinued if deformation occurs provided that the locking device remains engaged.

X1.10 *Rationale for 6.10, Head Entrapment with Car Seat on a Stroller or Convertible Carriage/Stroller*—Requirement developed to address the fatality of a six-month-old who was suspended by the head in an external opening, created and bounded by the car seat's foot end and unit's frame components (EIR 101130CNE0753). The 5-in. barrier height was established through review of international stroller standards. Australia standard AS/NZS 2088 for Prams and Strollers evaluates head end barrier using a 3-in. diameter probe in contact with the support surface applying 20.25 lbf to the opening. The foot end barrier is evaluated using a 3.5-in.

diameter probe in contact with the support surface applying 11.25 lbf to the opening. European standard EN 1888 for Prams and Pushchairs evaluates seat barriers using a 4.75-in. diameter ball weighing 11 lb in contact with the support surface. Evaluating within 5-in. of the carrier support surface is more stringent than the existing retention evaluation for Australia and Europe. Any opening within the 5-in. height is evaluated using the method that addresses entrapment through the leg openings of the stroller seat.

**X1.11 Rationale for 7.4.2.3**—If the disk slides off the footrest or step, the child's foot likely would also slide off the footrest or step, resulting in not being a foot hold.

**X1.12 Rationale for Test Weight in 7.13.1.4**—The 100 lb weight comes from the Canada Test Method for Carriages and Strollers for testing attachment of wheels to the product. The addition of rotating the wheels 360° ten times identified and separated incident strollers from non-incident strollers.

**X1.13 Rationale for Quick Release Mechanism, 3.1.16, and Related Information**—Comes from Specification **F2680**.

**X1.14 Rationale for 3.1.6 and 3.1.21**—Definitions for cord and strap were taken from Consumer Safety Specification **F406**.

**X1.15 Rationale for 7.16**—Occupant space concept was taken from EN 1888.

**X1.16 Rationale for 6.1 and 7.6, Parking Brake Requirements**—The procedure has been changed to eliminate the use of the inclined plane and increase the severity of the performance requirement. Increasing the severity of the test by increasing the angle of the inclined plane was not possible since many strollers would just slide on the inclined plane. The test force applied to the unit on the horizontal plane closely approximates the force that would be applied to the parking brake if the 12° inclined plane were increased to 20°.

The weight of the product,  $W_1$ , plus the weight placed in the unit,  $W_2$ , multiplied by 0.34 results in a pull force virtually the same as the force result from braking on a 20° plane. The 0.34 value is the sine of 20° rounded to two decimal places.

**X1.17 Rationale for 7.2.3**—The latching and locking mechanism force requirement was increased from 45 to 67 lb. These tests were amplified to address incidents involving strollers with durability issues where the latching mechanism failed over repeated uses. The combination of the increased force and number of trials is intended to test the reliability of products over repeated destructive cycles.

**X1.18 Rationale for 7.15**—A 3-year-old child's sitting shoulder height is 15 in. and upper limb length is 19 in. based on 95th percentile 3-year-old child's measurements.<sup>6</sup> The access zone covers a child sitting in the most upright position reaching forward hence the reason for defining 19 in. from the seat back junction.

**X1.19 Rationale for 7.15.2**—Products are evaluated the last 1/3 of travel for a predefined access zone. Based on the incident data distributed by the CPSC, the task group hypothesized that the last 1/3 of travel is considered the most hazardous condition due to opportunity for an anxious child to climb into the stroller and begin adjusting their body for a comfortable fit while the caregiver is preoccupied with the final stages of erecting the stroller. At that moment in time the child may be in a seated position with their hands vulnerable to scissoring, shearing and pinching within the access zone while the final stages of stroller setup are completed. Although this theory does not fit all scenarios or cover all the stroller designs and mechanisms on the market today, it does address those folds that were involved in the incidents consequently representing the vast majority of types of folds at the time this requirement was created.

<sup>6</sup> Pheasant, S.T., *Bodyspace: Anthropometrics, Ergonomics and the Design of Work* (2nd ed.), Taylor & Francis, London, UK, 1996.

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