



Designation: F2373 – 11 (Reapproved 2017)

# Standard Consumer Safety Performance Specification for Public Use Play Equipment for Children 6 Months through 23 Months<sup>1</sup>

This standard is issued under the fixed designation F2373; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This consumer safety performance specification provides safety and performance requirements for various types of public use play equipment such as, but not limited to, composite play structures, climbing structures, to-fro swings, spring rocking equipment, and slides. It is intended to apply to play equipment that is used in places of public assembly, including early care and education facilities, parks, or playgrounds. Public use play areas for children in this age range include both indoor (classroom) settings and outdoor playgrounds. Where appropriate, distinctions will be made between indoor and outdoor settings where there is supervision (for example, a play area that is part of an early care and education facility), and settings with unlimited access (for example, public playgrounds and parks).

1.2 The range of users encompassed by this consumer safety performance specification is the 5th percentile 6 month old through the 95th percentile 23 month old.

1.3 The purpose of this specification is to reduce the potential for life threatening and debilitating injuries.

1.4 Accessory toys attached to play equipment must meet all relevant standards including this consumer safety performance specification.

1.5 Home playground equipment, amusement park equipment, sports equipment, fitness equipment, soft contained play equipment, tricycles, toys, juvenile care products such as, but not limited to, infant swings, play yards, expansion gates, and expandable enclosures, furniture (including child-sized house play furnishings and sand/water tables intended primarily for indoor use), bassinets and cradles, infant walkers, bouncer seats, jumpers, infant stationary activity centers, and infant carriers are not included in the scope of this specification.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.44 on Play Equipment for Children Under Two.

Current edition approved Aug. 1, 2017. Published August 2017. Originally approved in 2005. Last previous edition approved in 2011 as F2373 – 11. DOI: 10.1520/F2373-11R17.

1.6 This consumer safety performance specification includes the following sections:

Title	Section
Scope	1
Referenced Documents	2
ASTM Standards	2.1
ANSI Standards	2.2
Federal Standards	2.3
CPSC Documents	2.4
UL Standard	2.5
European Standard	2.6
Terminology	3
Materials and Manufacture	4
General Requirements	4.1
Fasteners	4.2
Toxic or Hazardous Substances	4.3
Stuffing, Loose Fillers, and Padding Materials	4.4
General Requirements	5
Compliance Documentation	5.1
Small Parts	5.2
Asphyxiation Hazard	5.3
Performance Requirements	6
Head and Neck Entrapment	6.1
Sharp Points and Sharp Edges	6.2
Protrusions	6.3
Entanglement Hazards	6.4
Crush and Shear Points	6.5
Ventilation	6.6
Closures	6.7
Suspended Hazards	6.8
Requirements for Access and Egress	7
Access and Egress Components That Shall Not Be Used	7.1
Adjacent Platforms	7.2
Step Ladders, Stairways, Flexible Access Components, and Access Ramps	7.3
Climbing Equipment Used for Access and Egress	7.4
Handrails and Other Means of Hand Support	7.5
Requirements for Platforms, Landings, and Other Designated Play Surfaces	8
Platforms and Similar Surfaces	8.1
Adjacent Platforms	8.2
Protective Barriers	8.3
Equipment Specifications	9
Equipment That Shall Not Be Used	9.1
Climbing Equipment	9.2
Slides	9.3
Spring Rocking Equipment Intended for Use Without Adult Assistance	9.4
To-Fro Swings	9.5
Structural Integrity and Stability	10
General Requirements	10.1
Structural Integrity Tests for Rungs, Steps, and Horizontal Supporting Members	10.2

Title	Section
Structural Integrity and Stability Tests for Platforms and Ramps	10.3
Test for Dynamic Strength of Barriers and Handrails	10.4
Structural Integrity and Stability Tests for Slides	10.5
Structural Integrity Test for Spring Rocking Equipment	10.6
Structural Integrity and Stability Tests for Swings	10.7
Play Equipment Use Zones, Non-Encroachment Zones, and Placement	11
General Use Zone Requirements	11.1
Exemptions from Use Zone Requirements	11.2
General Non-Encroachment Zone Requirements	11.3
Use Zones for Play Structures Having No Moving Components	11.4
Use Zones for Slides	11.5
Use Zones for Spring Rocking Equipment	11.6
Use Zones and Non-Encroachment Zones for To-Fro Swings	11.7
Surfacing Materials for Use Zones	11.8
Fences and Gates	11.9
Placement of Play Equipment	11.10
Labels and Signs	12
Compliance Requirements for Labels and Signs	12.1
Specifications for All Labels and Signs	12.2
Label Requirements on Play Equipment and Structures	12.3
Signs Required for Play Equipment/Structures in Settings with Unlimited Access	12.4
Replacement	12.5
Installation	13
Designer's or Manufacturer's Responsibilities	13.1
Owner's/Operator's Responsibilities	13.2
Maintenance	14
Equipment	14.1
Play Area Surfacing	14.2
Records	14.3
Keywords	15
Annex A1—Figures	Annex A1
Appendix X1—Rationale	Appendix X1

### 1.7 General Measures, Tolerances, and Conversions:

1.7.1 The general tolerances for this specification are as follows unless otherwise specified.

Dimension	Tolerance
X. in	±0.5 in.
X.X in.	±0.05 in.
X.XX in.	±0.005 in.

These tolerances still apply to a dimension even when terms like greater than, less than, minimum, or maximum are used.

1.7.2 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.

1.7.3 The conversion factor from imperial to metric units are:

- 1 in. = 25.4 mm
- 1 in.<sup>2</sup> = 6.45 cm<sup>2</sup>
- 1 in.<sup>3</sup> = 16.39 cm<sup>3</sup>
- 1 lb = 0.454 kg
- 1 lbf (pound force) = 4.45 Newtons

1.8 See **Annex A1** for figures referenced throughout this specification.

1.9 The text of this specification references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

1.10 *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 appro-*

*priate safety, health and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.11 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the 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:<sup>2</sup>

- D2240 Test Method for Rubber Property—Durometer Hardness
- F406 Consumer Safety Specification for Non-Full-Size Baby Cribs/Play Yards
- F963 Consumer Safety Specification for Toy Safety
- F1077 Guide for Selection of Committee F16 Fastener Specifications (Withdrawn 2014)<sup>3</sup>
- F1148 Consumer Safety Performance Specification for Home Playground Equipment
- F1292 Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment
- F1487 Consumer Safety Performance Specification for Playground Equipment for Public Use
- F2075 Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment

### 2.2 ANSI Standards:<sup>4</sup>

- Z535.1 Safety Color Code
- Z535.4 Product Safety Signs and Labels

### 2.3 Federal Standards:<sup>5</sup>

- 16 CFR 1303 Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint
- 16 CFR 1500 Hazardous Substances Act Regulations, including Sections:
- 16 CFR 1500.18(a)(16)(i) Banned Toys and Other Banned Articles Intended for Use by Children—Infant Cushion or Infant Pillow
- 6 CFR 1500.48 Technical Requirements for Determining a Sharp Point in Toys and Other Articles Intended for Use by Children Under 8 Years of Age
- 6 CFR 1500.49 Technical Requirements for Determining a Sharp Metal or Glass Edge in Toys and Other Articles Intended for Use by Children Under 8 Years of Age
- 16 CFR 1501 Method for Identifying Toys and Other Articles Intended for Use by Children Under 3 Years of Age Which Present Choking, Aspiration or Ingestion Hazards Because of Small Parts

<sup>2</sup> 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.

<sup>3</sup> The last approved version of this historical standard is referenced on www.astm.org.

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

<sup>5</sup> Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

**16 CFR 1610 Standard for the Flammability of Clothing Textiles**

**2.4 CPSC Documents:<sup>6</sup>**

**U.S. Consumer Product Safety Commission, Handbook for Public Playground Safety**

**U.S. Consumer Product Safety Commission, Never Put Children’s Climbing Gyms On Hard Surfaces, Indoors or Outdoors**

**2.5 UL Standard:<sup>7</sup>**

**UL 969 Standard for Safety: Marking and Labeling Systems**

**2.6 European Standard:<sup>8</sup>**

**EN 71-1 Safety of Toys—Part I: Mechanical and Physical Properties**

**3. Terminology**

**3.1 Definitions of Terms Specific to This Standard:**

**3.1.1 access ramp, n**—ramp used to move onto or into a piece of play equipment.

**3.1.2 accessible, adj**—relating to a part or portion of the play equipment (1) that can be contacted by any body part, or (2) that a user can enter, leave, play on, in, or under.

**3.1.3 accessory toy, n**—toy attached to, removable from, or sold with a piece of play equipment, as well as the means of attachment.

**3.1.4 adjacent platforms, n**—two platforms with some deviation in their heights having a common vertical plane.

**3.1.5 anchor(s), n**—accessories used to minimize possible tipping of the play equipment, or lifting of the support legs during normal use.

**3.1.6 cable, n**—strands of metallic wire, twisted or laid together.

**3.1.7 climbing equipment, n**—play equipment or equipment parts that require the user to maintain three points of contact while moving about.

**3.1.8 completely bounded non-rigid opening, n**—any opening in a piece of equipment that is totally enclosed by flexible boundaries which can deform or deflect during normal use (for example, the openings in a flexible net or lattice of webbing).

**3.1.9 completely bounded rigid opening, n**—any opening in a piece of play equipment that is totally enclosed by fixed, inflexible boundaries so that the perimeter of the opening is continuous.

**3.1.10 component, n**—any portion of the play equipment that generates specific activity and cannot stand alone.

**3.1.11 composite play equipment, n**—two or more pieces of play equipment attached or functionally linked, to create one integral unit that provides more than one play activity (for example, a combination slide and climbing equipment).

**3.1.12 crush and shear point, n**—juncture at which the user could suffer contusion, laceration, abrasion, amputation, or fracture during use of the play equipment.

**3.1.13 designated play surface, n**—any elevated surface for standing, walking, crawling, sitting, or climbing, or any elevated flat surface larger than 2.0 in. (51 mm) wide by 2.0 in. (51 mm) long, having less than a 30° angle from horizontal.

**3.1.14 early care and education facility, n**—setting in which out of home care is provided for eleven or more children.

**3.1.15 entanglement, n**—condition in which the user’s clothes or something around the user’s neck becomes caught or entwined on a component of play equipment.

**3.1.16 entrapment, n**—any condition which impedes withdrawal of a body or body part that has penetrated an opening.

**3.1.17 fall height, n**—vertical distance (1) between a designated play surface and the surface beneath it; or (2) between specified parts of a play structure; or (3) between a specified part of a play structure and the ground.

**3.1.18 fully enclosed swing seat, n**—suspended device upon which a user sits which has non-removable supports on all sides and between the legs of a user. The supports are intended to prevent a user from falling out of the device while it is in motion (for example, a fully enclosed bucket seat, see Fig. A1.1).

**3.1.19 functionally linked play structures, n**—play structure that acts as a single unit in its physical form or sense of function as continuous play, even if the components are not physically attached.

**3.1.20 hand-support component, n**—component, such as a handrail, intended to steady a user or support a user’s body weight.

**3.1.21 handrail, n**—rigid linear device, following the path of access or egress, that, when grasped, provides balance and support in maintaining a specific body posture.

**3.1.22 impact attenuating surfacing, n**—material(s) that comply with Specification F1292.

**3.1.23 maximum user, n**—23-month-old child; measurement characteristics are the 95th percentile values for combined sexes.

**3.1.24 minimum user, n**—6-month-old child; measurement characteristics are the 5th percentile values for combined sexes.

**3.1.25 moving component, n**—portion of the play equipment that imparts movement to the equipment or the user, for example, swing or spring-mounted rocker.

**3.1.26 non-encroachment zone, n**—obstacle-free area designated for unrestricted circulation.

**3.1.27 partially bounded opening, n**—any opening that is not totally enclosed by boundaries on all sides so that the perimeter of the opening is discontinuous.

**3.1.28 partially enclosed swing seat, n**—single occupant suspended device upon which a user sits which has non-removable supports on all sides, but not between the user’s legs.

<sup>6</sup> Available from U.S. Consumer Product Safety Commission (CPSC), Washington, D.C. 20207-0001.

<sup>7</sup> Available from Underwriters Laboratories (UL), Corporate Progress, 333 Pfingsten Rd., Northbrook, IL 60062.

<sup>8</sup> Available from British Standards Institute (BSI), 389 Chiswick High Rd., London W4 4AL, U.K.

3.1.29 *permanently anchored equipment, n*—play structures designed to be installed in a fixed location (for example, with in-ground footings or concrete anchoring), and not intended to be relocated for the usable life of the equipment. Permanently anchored equipment may or may not have moving components.

3.1.30 *platform, n*—any flat, elevated surface intended to support the weight of one or more users and upon which the user(s) can move freely.

3.1.31 *play area, n*—designated space intended for a user’s play.

3.1.32 *play ramp, n*—surface forming an inclined plane that functions as a play event, providing opportunity for climbing up to or down from a platform and on which a child cannot maintain movement while in a sitting position while relying on gravity as the propelling force.

3.1.33 *play structure, n*—freestanding structure with one or more components and their supporting members.

3.1.34 *portable equipment, n*—play structures designed to be easily carried and relocated. Portable equipment may require simple assembly (for example, foam climber or tunnel).

3.1.35 *preventive maintenance, n*—planned program of inspections and maintenance intended to keep equipment functioning properly and to forestall equipment failures.

3.1.36 *projection, n*—condition that, due to its physical nature, must be tested to the requirements of this specification to determine whether it is a protrusion or an entanglement hazard, or both.

3.1.37 *protective barrier, n*—device (1) enclosing an elevated surface, or (2) along the boundary of a use zone or non-encroachment zone that permits children to be visible at all times, but prevents both inadvertent and deliberate attempts to pass through or over the device.

3.1.38 *protrusion, n*—projection which, when tested in accordance with the requirements of this specification, is found to be a hazard having the potential to cause bodily injury to a user who impacts it.

3.1.39 *public use play equipment, n*—play structure that is intended for use in play areas of schools, parks, early care and education facilities, institutions, multiple-family dwellings, private resorts and recreation developments, restaurants, and other areas of public use.

3.1.40 *rope, metal cored, n*—cable covered with a non-metallic sheath.

3.1.41 *rung, n*—crosspiece in a ladder or other climbing equipment used for supporting the user’s feet or for gripping by the user’s hands, or both.

3.1.42 *setting with limited access, n*—indoor and outdoor play areas open only to users enrolled in the licensed or regulated program at that site and where adult caregivers of that program who are trained to oversee children in play settings are present at all times.

3.1.43 *settings with unlimited access, n*—indoor and outdoor play areas not located in a licensed or regulated site or

where adult caregivers trained to supervise children in play settings are not present at all times when users have access to the play equipment.

3.1.44 *shaded play area, n*—outdoor area protected from direct sunlight.

3.1.45 *signal word, n*—word that designates a degree or level of hazard.

3.1.46 *slide, n*—surface forming an inclined plane on which a user can maintain movement propelled by gravity.

3.1.47 *small part, n*—object that presents a choking, aspiration, or ingestion hazard to the user.

3.1.48 *spring rocking equipment, n*—any play structure that rocks about a fixed base.

3.1.49 *stairway, n*—device having a slope of 35° or less from a horizontal plane and consisting of a series of steps that can be used for ascending or descending.

3.1.50 *step, n*—horizontal flat crosspiece of a ladder or stairway used primarily as a foot support.

3.1.51 *swing bay, n*—space bounded by the overhead beam to which the swing assembly or assemblies are attached and the support(s) for that beam.

3.1.52 *temporarily fixed equipment, n*—play structures designed to permit installation at more than one location during the usable life of the equipment. Temporarily fixed equipment may be installed with or without anchors. Temporarily fixed equipment may or may not have moving components.

3.1.53 *to-fro swing, n*—play structure with at least one suspended component designed for swinging by the user in a single vertical plane.

3.1.54 *trip hazard, n*—abrupt change in elevation that is not clear and obvious to the user.

3.1.55 *use zone, n*—obstacle free area under and around a piece of play equipment onto which a child falling from the equipment would be expected to land.

3.1.56 *warning, n*—notice or communication to indicate a potentially hazardous situation that, if not avoided, could result in death or serious injury.

## 4. Materials and Manufacture

4.1 *General Requirements*—Play equipment shall be manufactured and constructed only of materials that have a demonstrated durability and ability to be maintained in a sanitary condition in the appropriate setting in which the play equipment is intended to be used. The play equipment manufacturer shall test and document any new material for durability and ability to be maintained in a sanitary condition appropriate to the setting where the equipment is intended to be used.

4.1.1 Metals subject to structural degradation such as rust or corrosion shall be painted, galvanized, or otherwise treated. Woods intended for outdoor use shall be naturally rot- and insect-resistant or treated to avoid such deterioration. Plastics and other materials shall be protected against degradation due to ultraviolet (UV) light or extreme weather conditions.

4.1.2 Regardless of the material or the treatment process, the manufacturer shall ensure that the users of the play

equipment cannot ingest, inhale, or absorb any potentially hazardous amounts of substances through the body surfaces as a result of contact with the equipment.

4.1.3 Wood not naturally rot- and insect-resistant, which has any fabrication up to 6 in. (150 mm) above the surface of the play area, shall be treated after wood fabrication. Creosote, pentachlorophenol, tributyl tin oxide, arsenic compounds, and surface coatings that contain pesticides shall not be used for play equipment. Wood treaters and play equipment manufacturers shall use technologies and procedures that minimize the level of dislodgeable toxin.

4.2 *Fasteners*—All fasteners used to construct public use play equipment shall be manufactured in accordance with Guide **F1077**.

4.2.1 All fasteners, connecting, and covering devices shall be inherently corrosion resistant or be provided with a corrosion-resistant coating.

4.2.2 When installed in accordance with the manufacturer's instructions, fasteners, connecting, and covering devices shall not loosen or be removable without the use of tools. Lock washers, self-locking nuts, or other locking means shall be provided for all nuts and bolts to protect them from detachment. Hardware in moving joints shall also be secured against unintentional loosening.

4.2.3 Suspended elements which move shall be connected to the fixed support with bearings or bearing surfaces that serve to reduce friction and wear.

4.2.3.1 Cable that is permanently affixed to a hanger assembly performs as a bearing surface. Cable ends shall be inaccessible or capped to prevent injury from frayed wires. Cables shall be protected to prevent fraying, loosening, unraveling, or excessive shifting of strands.

#### 4.3 *Toxic or Hazardous Substances:*

4.3.1 *Paint or Similar Surface-Coating Materials*—Paint and other surface-coating materials applied to equipment shall comply with the lead content provisions of 16 CFR 1303, issued under the Consumer Product Safety Act (CPSA).

4.3.1.1 The 16 CFR 1303 regulation prohibits the use of paints or similar surface coating materials that contain lead or lead compounds and in which the lead content (calculated as lead metal (Pb)) is in excess of 0.06 % (600 ppm) of the weight of the *total* nonvolatile content of the paint or the weight of the dried paint film.

4.3.1.2 Surface materials and substrate materials shall be evaluated in accordance with the requirements of Consumer Safety Specification **F963**. The migration of elements shall comply with the limits given in Consumer Safety Specification **F963**. The analytical result shall be adjusted by subtracting the analytical correction factor to obtain an adjusted analytical result. Materials are deemed to comply with the requirements of this specification if the adjusted analytical result is less than or equal to the limits in **Table 1**.

4.4 *Stuffing, Loose Fillers, and Padding Materials*—To the extent possible in good manufacturing practice, stuffing, loose fillers, and padding shall be free of: (1) objectionable matter (for example, matter originating from insect, bird, rodent, or other animal infestation), and (2) contaminants (for example, splinters and metal chips).

## 5. General Requirements

5.1 *Compliance Documentation*—Play equipment represented as complying with this consumer safety performance specification shall meet all applicable requirements specified herein. Anyone representing compliance with this specification shall keep such essential records as are necessary to document any claim that the requirements within this specification have been met.

5.2 *Small Parts*—These requirements are intended to minimize the choking, ingestion, or aspiration hazards to children created by small objects. In general, this section is guided by 16 CFR 1501 which states, in part, that no removable or liberated component or fragment of equipment shall be small enough without being compressed to fit entirely within a cylinder of the specified dimensions as shown in Fig. 1 of 16 CFR 1501. Loose fill surfacing is exempt from this requirement.

5.3 *Asphyxiation Hazard*—Any soft components having characteristics defined by 16 CFR 1500.18(a)(16)(i) (infant pillows) are banned under the FHSA (Federal Hazardous Substances Act). This would include, but not be limited to, an item having all of the following characteristics: (1) has a flexible fabric covering; the term fabric includes those materials covered by the definition of fabric in the Flammable Fabrics Act, 16 CFR 1610; (2) is loosely filled with granular material, including but not limited to, polystyrene beads or pellets; (3) is easily flattened; and (4) is capable of conforming to the body or face of an infant.

## 6. Performance Requirements

6.1 *Head and Neck Entrapment*—Play equipment shall be designed and constructed or assembled so that any accessible opening shall meet the following performance requirements to reduce the risk of head or neck entrapment by either a head-first or feet-first entry into the opening. The dimensions of the infant torso probe, the head probe, and the infant template (see **Figs. A1.2-A1.4**) are based on anthropometric measurements of the minimum and maximum users. Openings between the surface and the bottom edge of the equipment (that is, rails, platforms, steps, and so forth) are exempt from this requirement as indicated in **Fig. A1.5**.

6.1.1 *Completely Bounded Rigid Openings*—A completely bounded rigid opening is accessible when an infant torso test probe (see **Fig. A1.2**) can be inserted into the opening to a depth of 3.0 in. (76 mm) or more when tested in accordance

**TABLE 1 Maximum Soluble Migrated Element in ppm (mg/kg)**

Antimony (Sb)	Arsenic (As)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Lead (Pb)	Mercury (Hg)	Selenium (Se)
60	25	1000	75	60	90	60	500

with the test procedure outlined in 6.1.1.1. Closed risers of step ladders are exempt from this requirement (see 7.3.4).

**6.1.1.1 Test Procedures for Completely Bounded Rigid Openings**—Rotate the infant torso probe to its most adverse orientation (that is, the major axis of the base of the probe parallel to the major axis of the opening). Then place the infant torso probe (see Fig. A1.2) in the opening with the plane of the base of the probe parallel to the plane of the opening. If the infant torso probe can be inserted into the opening to a depth of 3.0 in. (76 mm) or more, place the head probe (see Fig. A1.3) in the opening with the plane of the base of the probe parallel to the plane of the opening. An opening passes this test if (1) the opening does not admit the infant torso probe in any orientation about its own axis, or (2) the opening admits the infant torso probe and also admits the head probe. An opening fails the test if the opening admits the infant torso probe but does not admit the infant head probe.

**6.1.2 Completely Bounded Non-Rigid Openings**—A non-rigid opening is considered accessible if an infant torso probe will penetrate the opening to a depth of 3.0 in. (76 mm) or more when tested in accordance with the test procedure outlined in 6.1.2.1 (see Figs. A1.2 and A1.3).

**6.1.2.1 Test Procedure for Completely Bounded Non-Rigid Openings**—Rotate the infant torso probe (see Fig. A1.2) to its most adverse orientation (that is, the major axis of the base of the probe parallel to the major axis of the opening). Place the infant torso probe in the opening, tapered-end first, with the plane of its base parallel to the plane of the opening and apply a force of 30 lbf (135 N) to the probe to attempt to pass it through the opening. If the base of the probe passes through the opening, place the head probe (see Fig. A1.3) in the opening, tapered end first, with the plane of its base parallel to the plane of the opening. Apply a force of 30 lbf (135 N) to the probe to attempt to pass it through the opening. A non-rigid opening passes the test if: (1) the opening does not allow the infant torso probe to be inserted so deep that the opening admits the base of the probe in any orientation about its own axis, or (2) the opening allows full passage of the infant torso probe and also allows the infant head probe to pass completely through. A non-rigid opening fails the test if the opening allows full passage of the infant torso probe but does not admit the head probe.

**6.1.3 Boundaries of Large Openings**—If an opening admits the 9 in. (229 mm) head probe (see Fig. A1.3), each portion of its boundary shall be evaluated for the partially bounded openings requirements of 6.1.4.

**6.1.4 Partially Bounded Openings**—A partially bounded opening having a width greater than 1.4 in. (36 mm) and a depth greater than 0.6 in. (15 mm) presents a potential neck entrapment hazard and shall be tested in accordance with the procedures in 6.1.4.1 and 6.1.4.2.

**6.1.4.1 Test Procedure for Partially Bounded Openings**—Insert the A section of the infant template (see Fig. A1.4) into the opening with its centerline aligned with the centerline of the opening and the plane of the template parallel to the plane of the opening (see Fig. A1.6). Continue inserting the template into the opening until motion is arrested by contact between the template and the boundaries of the opening. Visually inspect to

determine if there is simultaneous contact between the sides of the template that are on opposing sides of its centerline and the sides of the opening. If simultaneous contact occurs, insert the B section of the infant template into the opening with the plane of the template perpendicular to the plane of the opening (see Fig. A1.7). If the full thickness of the template (0.6 in. (15 mm)) can be inserted into the opening, the opening is considered to present a neck entrapment hazard and fails the test.

**6.1.4.2 Exemption**—Any partially bounded opening that is inverted is exempt from the requirements of 6.1.4. A partially bounded opening is considered inverted if its lowest boundary adjacent to the opening slopes downward at 45° or more from the narrowest part of the opening that the child's neck can reach to the part of the opening that will freely pass the head probe. (see Fig. A1.3 and Fig. A1.8).

**6.2 Sharp Points and Sharp Edges**—There shall be no accessible sharp points or sharp edges on play equipment.

**6.2.1 Test Procedure for Points, Corners, and Edges:**

**6.2.1.1** All points and edges on play equipment shall be tested for sharpness in accordance with the requirements in 16 CFR 1500.48 (sharp points) and 16 CFR 1500.49 (sharp edges).

**6.2.1.2** All corners and edges on rigid materials shall have a minimum radius of 0.25 in. (6.4 mm) unless the material thickness is less than 0.5 in. (13 mm) in which case the radius shall be half the thickness of the material. This requirement does not apply to swing seats, straps, ropes, chains, connectors, and other flexible components.

**6.2.1.3** A bolt end shall not project more than two full threads beyond the face of the nut and shall be free of burrs, sharp points, and sharp edges.

**6.2.2** Open ends of metal tubing used in play equipment shall be covered with caps or plugs that cannot be removed without the use of tools.

**6.3 Protrusions**—There shall be no protrusions on play equipment. Four protrusion test gages (shown in Figs. A1.9 and A1.10) are required to determine whether projections are protrusions.

**6.3.1 Test Procedure for Protrusions:**

**6.3.1.1** Successively place each of three gages (see Fig. A1.9) over each accessible projection (see Fig. A1.11). The projection is a protrusion if it extends beyond the face of any of the three gages (see Fig. A1.12).

**6.3.1.2** A projection is not accessible and is not a protrusion when it is recessed or located in such a manner that will not allow any of the protrusion gages to be placed over it.

**6.3.1.3** Test projections on swing seats with test gage D. Any projection on the suspended member which extends beyond the face of the test gage D is a protrusion (see Fig. A1.10).

**6.4 Entanglement Hazards**—There shall be no entanglement hazards on play equipment. Procedures for determining entanglement hazards are described below.

**6.4.1 Test Procedure for Slides**—The following requirements apply to slides in the areas shown in Fig. A1.13. Examples are shown in Figs. A1.14-A1.16.

6.4.1.1 A projection that meets both of the following conditions is an entanglement hazard:

(1) One of the three protrusion gages (A, B, or C) (see Fig. A1.9) passes over the projection and contacts the initial surface.

(2) The projection extends perpendicular ( $\pm 5^\circ$ ) from the initial surface more than 0.12 in. (3.0 mm), the thickness of protrusion gage D (see Fig. A1.10).

6.4.1.2 Slides shall be constructed in such a manner as to provide a smooth continuous sliding surface and have no gaps or spaces that might create an entanglement hazard such as but not limited to spaces created (1) between sidewalls when two single slides are combined to create a doublewide slide, (2) where a hood is attached to the sidewalls of a slide, or (3) where the slide is attached to the platform.

6.4.2 *Test Procedure for Projections from a Horizontal Plane*—A projection that meets the conditions of 6.4.1.1(1) and (2) and which also projects upwards from a horizontal plane (see Fig. A1.14 and Fig. A1.15) is an entanglement hazard.

6.4.3 *Test Procedure for Exposed Bolt End Projections*—Any accessible bolt end projecting beyond the face of the nut more than two full threads is an entanglement hazard. A bolt end is inaccessible and not an entanglement hazard when the bolt end is recessed and the 3.5 in. (89 mm) protrusion test gage (gage C) (see Fig. A1.9) cannot be made to contact the bolt end when the outside curve of the gage is placed flat against the recessed area (see Fig. A1.16).

6.4.4 *Test Procedure for Projections Which Increase in Size*—Any projection which fits within any of the three protrusion test gages (see Fig. A1.9) and increases in size or diameter from the initial surface to the outer end (see Fig. A1.14(7)) is an entanglement hazard.

6.4.5 *Test Procedure for Connecting Devices*—Connecting devices such as, but not limited to, S-hooks, pelican hooks, and C-hooks, when properly closed, are not entanglement hazards. These connectors are considered closed when there is no gap or space greater than 0.04 in. (1.0 mm) when measured with a feeler gage (see Fig. A1.17(1)).

6.4.5.1 S-hook connectors are subject to these further requirements. If any of the following requirements are not met, an entanglement hazard exists:

(1) No portion of the closed end of an S-hook lower loop shall project beyond the vertical boundary established by the upper loop (see Fig. A1.17(2)).

(2) An S-hook upper loop can be installed to align with, partially overlap, or completely overlap, the connector body. If the upper loop completely overlaps the connector body, it shall not extend past the connector body (see Fig. A1.17(3)).

(3) An S-hook lower loop shall align with the connector body and not overlap it in any way (see Fig. A1.17(4)).

6.5 *Crush and Shear Points*—There shall be no crush or shear points caused by junctures of two components moving relative to one another.

6.5.1 *Test Procedure for Crush and Shear:*

6.5.1.1 A crush or shear point is any point that allows a 0.19 in. (5 mm) diameter neoprene rod to enter at one or more positions and entraps at one or more positions a 0.5 in. (13 mm) diameter neoprene rod in accordance with Test Method D2240.

Entrapment shall mean that a force of more than 2 lbf (9 N) is required to pull out the rod. The neoprene rods shall have a hardness reading between 50 and 60 as determined by a Type A durometer.

6.5.1.2 To reduce the likelihood of unintentional contact with a crush or shear point, an opening shall comply with the accessibility requirements of 16 CFR 1500.48 and 16 CFR 1500.49.

6.5.2 *Hinge Line Clearance*—Equipment having a gap or clearance along the hinge line between a stationary portion and a movable portion weighing more than 0.5 lb (0.2 kg) shall be constructed so that, if the accessible gap at the hinge line will admit a 0.19 in. (5 mm) diameter rod, it will also admit a 0.5 in. (13 mm) diameter rod at all positions of the hinge (see Fig. A1.18).

6.6 *Ventilation:*

6.6.1 Any equipment having a door or lid that encloses a continuous volume greater than 1900 in.<sup>3</sup> (31 140 cm<sup>3</sup>) and in which all internal dimensions are 6 in. (150 mm) or more, shall provide an unobstructed ventilation area of greater than a total of 2 in.<sup>2</sup> (13 cm<sup>2</sup>) over two or more separate openings situated at least 6 in. (150 mm) apart. The ventilation area shall be provided when the equipment is placed on the floor in any position and adjacent to two vertical plane surfaces meeting at a 90° angle, so as to simulate the corner of a room.

6.6.2 The ventilation areas shall not be required if a permanent partition or bars (two or more) are used to subdivide a continuous space, effectively limiting the continuous space by making the largest internal dimension less than 6 in. (150 mm).

6.7 *Closures*—Closures such as lids, covers, and doors to enclosures falling within the scope of 6.6 shall not be fitted with automatic locking devices. Closures shall be of a type that can be opened with a force of 10 lbf (45 N) or less when tested in accordance with the procedure in 6.7.1.

6.7.1 *Test Procedure for Closure*—With the closure in a closed position, apply the force in an outward direction perpendicular to the plane of travel of the closure and anywhere within 1 in. (25 mm) from the geometric center of the closure. The force measurement shall be made by means of a force gage with a calibrated accuracy within  $\pm 0.1$  lbf (0.44 N).

6.8 *Suspended Hazards*—There shall be no single non-rigid component (cable, wire, rope, or other similar component) suspended between play units unless it is above 84 in. (2130 mm) from the playground or floor surface and has a cross section dimension of 1.0 in. (25 mm) or greater. It is recommended that the suspended elements be either brightly colored or contrast with surrounding equipment to add to visibility.

6.8.1 *Rope, Cable, or Chain*, shall be fixed at both ends and not be capable of being looped back on itself, creating an inside loop perimeter greater than 5 in. (130 mm).

6.8.1.1 Rope shall be constructed such that its braiding cannot open to admit a 0.19 in. (5 mm) diameter rod.

6.8.2 *Exemptions for Suspended Components (Rigid or Flexible):*

6.8.2.1 Chain or cable used to support a swing is exempt from the requirements in 6.8.1. Rope shall not be used as a method for suspending swings.

6.8.2.2 Rope, cable, or chain with a length of 7 in. (180 mm) or less shall be permitted to be attached at one end only. Multiple lengths of such materials that can be attached to each other shall be treated as one length.

**7. Requirements for Access and Egress**

*7.1 Access and Egress Components That Shall Not Be Used:*

7.1.1 Arch ladders and rung ladders shall not be used as access and egress components.

*7.2 Adjacent Platforms:*

7.2.1 Vertical height of 7 in. (180 mm) or less between adjacent platforms shall have infill to reduce any openings to dimensions that preclude entry of the infant torso probe (see Fig. A1.2).

7.2.2 Adjacent platforms between which access is intended that have a height difference greater than 7 in. (180 mm) shall require a ramp or stairway.

*7.3 Step Ladders, Stairways, Flexible Access Components, and Access Ramps (for play ramps, see Section 9):*

7.3.1 Steps shall be evenly spaced within a tolerance of ±0.25 in. (±6.4 mm) and horizontal within a tolerance of ±2°.

7.3.2 Steps and access ramps shall not trap water (that is, no standing water) and shall be constructed to minimize the accumulation of debris.

7.3.3 See Table 2 for access slope, tread or ramp width, tread depth, and vertical rise.

7.3.4 All step ladders and stairways shall have completely closed risers. Entrapment provisions of Section 6 do not apply to closed riser configurations.

7.3.5 Step ladders are not recommended for children less than 15 months old.

7.3.6 Flexible access components are not recommended as the sole means of access and egress.

7.3.7 Spiral stairways shall not be used as the sole means of access and egress.

*7.4 Climbing Equipment Used for Access and Egress:*

7.4.1 Climbing equipment used for access to or egress from other components of equipment shall provide user with a means of hand support.

7.4.2 Climbing equipment used as access to or egress from other components of equipment shall readily allow users to bring both feet to the same level before ascending or descending to the next level.

7.4.3 Climbing equipment used as access to or egress from other components shall be securely connected at both ends. When one end is connected to the ground, the anchoring devices shall be beneath the surface of the use zone or the non-encroachment zone.

7.4.4 Climbing equipment shall not be used as the sole means of access to other components of equipment.

*7.5 Handrails and Other Means of Hand Support:*

7.5.1 Access components for platforms, landings, or other designated play surfaces shall have some means of hand support.

7.5.2 Continuous handrails or other means of hand support shall be provided on both sides of stairways and step ladders. Continuous handrails or other means of hand support shall also be required on access ramps which are the sole means of access.

7.5.3 Handrails or other means of hand support shall be available for use at the beginning of a ramp or the first step except as noted in 7.5.6.

7.5.4 The handrail shall be no less than 0.6 in. (15 mm) and no greater than 1.2 in. (30 mm) in the maximum cross-section dimension measured perpendicular to the longest dimension.

7.5.5 Handrail height (the vertical distance between the top edge of a step or, if used on an access ramp, the top of the ramp surface, and the top of the handrail above it) shall be between 15 in. (370 mm) and 20 in. (510 mm).

7.5.6 Stairways or access ramps used in an indoor setting where one side is against a wall are allowed to be exempt from having a handrail on that wall, provided that the wall is smooth and meets the requirements of Section 6 (see 11.2.2).

**TABLE 2 Step Ladders, Stairways, and Access Ramps<sup>A</sup>  
(Access Slope; Tread and Ramp Width; Tread Depth;  
and Vertical Rise)**

Type of Access	
<b>Step Ladders</b>	
Slope	35° to less than or equal to 65°
Tread Width—single file	12 in. (300 mm) to 21 in. (530 mm)
Tread Depth—closed riser only	8 in. (200 mm)
Vertical Rise—top of step to top of step	Greater than 5 in. (130 mm) and less than or equal to 7 in. (180 mm)
<b>Stairways</b>	
Slope	Less than or equal to 35°
Tread Width	
Single File	12 in. (300 mm) to 21 in. (530 mm)
Two Abreast	Greater than or equal to 30 in. (760 mm)
Tread Depth—closed riser only	Greater than or equal to 8 in. (200 mm)
Vertical Rise—top of step to top of step	Less than or equal to 7 in. (180 mm)
<b>Access Ramps—does NOT address wheelchair use</b>	
Slope (vertical : horizontal)	Less than 1:8
Width	
Single file	Greater than or equal to 19 in. (480 mm)
Two abreast	Greater than or equal to 30 in. (760 mm)

<sup>A</sup> Entrapment provisions of Section 6, Performance Requirements, shall apply with the exception of closed risers (see 7.3.4).

**8. Requirements for Platforms, Landings, and Other Designated Play Surfaces**

*8.1 Platforms and Similar Surfaces:*

8.1.1 Platform surfaces shall have a maximum height of 32 in. (810 mm) measured from finish grade for outdoor settings and from the finished floor for indoor settings.

8.1.2 Platform surfaces shall be horizontal within a tolerance of ±2°.

8.1.3 Platforms and similar surfaces shall not trap water and shall be constructed to minimize the accumulation of debris.

8.1.4 The fall height from a platform shall be measured from the platform surface to the adjacent lower surface.

8.1.5 See Table 3 for requirements for protective barriers and use zone surfacing. Where required, impact attenuating surfacing shall comply with the requirements of Specification F1292. Protective barriers shall comply with the requirements of 8.3.

*8.2 Adjacent Platforms:*



**TABLE 3 Use Zone Surfacing, and Protective Barrier Requirements for Platform Fall Heights**

Platform Fall Heights	Surfacing and Protective Barrier Requirements	
	Indoor or Outdoor, Supervised Setting	Unlimited Access Setting (for example, park)
Fall height 18 in. (460 mm) or less	Surfacing consistent with <b>11.8.1</b>	Surfacing meeting the requirements of Specification <b>F1292</b>
Fall height more than 18 in. (460 mm) and no greater than 32 in. (810 mm) <sup>4</sup>	Surfacing meeting the requirements of Specification <b>F1292</b> OR protective barriers consistent with <b>8.3</b>	Surfacing meeting requirements of Specification <b>F1292</b> AND protective barriers consistent with <b>8.3</b>
Unacceptable Surfaces	Hard or abrasive surfaces such as: concrete and asphalt or other surfaces having similar characteristics	Surfaces not meeting requirements of Specification <b>F1292</b>

<sup>4</sup> The maximum platform surface fall height permitted is 32 in. (810 mm) (see **8.1.1**).

8.2.1 Vertical height of 7 in. (180 mm) or less between adjacent platforms shall have infill to reduce any openings to dimensions that preclude entry of the infant torso probe (see **Fig. A1.2**).

8.2.2 Adjacent platforms between which access is intended shall comply with **7.2**.

### 8.3 Protective Barriers:

8.3.1 In an unlimited access setting, any platform with a fall height which is more than 18 in. (460 mm) shall have a protective barrier.

8.3.2 Where required, protective barriers shall completely surround the elevated surface except for entrance and exit openings necessary for each play event. Those openings shall be limited to the width of the access and egress components.

8.3.3 Protective barriers shall contain no designated play surfaces.

8.3.4 The top surface of the protective barrier shall have a height of 24 in. (610 mm) or greater above the platform.

8.3.5 Openings within protective barriers or between the platform surface and the barrier shall preclude passage of the infant torso probe (see **Fig. A1.2**).

8.3.6 Protective barriers shall be constructed to allow caregivers visual contact with users of the equipment.

## 9. Equipment Specifications

### 9.1 Equipment That Shall Not be Used:

9.1.1 The following types of equipment are not appropriate for children 6 through 23 months of age and shall not be used: (1) chain or cable walk, (2) freestanding arch climbing equipment, (3) freestanding climbing equipment with flexible components, (4) fulcrum seesaws, (5) horizontal ladders, (6) log rolls, (7) merry-go-rounds, (8) parallel bars, (9) ring treks, (10) swinging gates, (11) rotating tire swings, (12) track rides, and (13) vertical sliding poles.

### 9.2 Climbing Equipment:

9.2.1 Any hand support component used during ascent and descent of climbing equipment shall meet the requirements of **7.5.3**, **7.5.4**, and **7.5.5** and shall not twist/rotate about the handrail axis.

9.2.2 The fall height of freestanding climbing equipment and climbing equipment used for access/egress from or to composite structures shall be the distance between the highest part of the climbing equipment intended for foot support and the use zone surface. The maximum fall height is 32 in. (810 mm).

9.2.3 *Step Ladders*, which are components of climbing equipment, must conform to all requirements of Section **7**.

### 9.2.4 Play Ramps (for access ramps, see Section 7):

9.2.4.1 Play ramps shall have slopes no greater than 19° (1:3 vertical to horizontal).

9.2.4.2 Play ramps shall have a minimum width of 19 in. (480 mm).

9.2.4.3 Soft foam play structures shall be exempt from the requirements for play ramps.

### 9.3 Slides:

#### 9.3.1 Slides—General:

9.3.1.1 Means of access to slides shall meet the same requirements as access components for play equipment in general as specified in Section **7** (embankment slides excepted).

9.3.1.2 Soft foam play structures shall be exempt from the requirements for slides.

#### 9.3.2 Slide Transition Platform:

9.3.2.1 Slide transition platforms shall meet the same requirements for orientation, drainage, and protective barriers as those specified for platforms on other play equipment in Sections **8** and **11**.

9.3.2.2 The depth of the slide transition platform shall be 19 in. (480 mm) or greater.

9.3.2.3 The transition platform shall have a width equal to or greater than the width of the slide chute.

#### 9.3.3 Slide Chute Entrance:

9.3.3.1 Hand support components shall be provided at the slide chute entrance to facilitate the transition from standing to sitting.

9.3.3.2 There shall be a means to channel the user into a sitting position at the slide chute entrance (for example, a rail or hood).

#### 9.3.4 Slide Chute:

9.3.4.1 The overall height to length ratio of the entire sliding surface, including any inclined surface and exit region, but not including the transition platform, shall not exceed 0.445 as measured in **Fig. A1.19**.

9.3.4.2 No span of the sliding surface shall have a slope that exceeds 30° (see **Fig. A1.19**).

9.3.4.3 The slide chute width shall be no less than 8 in. (200 mm) and no greater than 12 in. (300 mm) (see **Fig. A1.20**).

9.3.4.4 Slides with flat, open chutes shall have sidewalls with a height of 4 in. (100 mm) or greater that extend along both sides of the chute for the entire sliding surface.

9.3.4.5 Any straight slide with a chute with a circular, semicircular, or curved cross section shall have vertical sidewalls, the height of which (*H*) shall be a minimum of 4 in.

(100 mm) minus two times the width of the chute ( $W$ ) divided by the radius ( $R$ ) of the bedway curvature, as follows (see Fig. A1.20):

$$H \text{ (in.)} = 4 - (2W/R) \quad (1)$$

9.3.4.6 All slides with a curved sliding surface shall minimize the likelihood of lateral discharge.

9.3.5 *Slide Exit*—The exit region shall be that portion of the bottom end of the slide chute where a user exits the slide. The slope of the exit region shall be between 0 and  $-4^\circ$  measured from a plane parallel to the finished grade in outdoor settings or parallel to the finished floor in indoor settings (see Fig. A1.21). If no exit region as previously defined exists, then the bottom end of the slide chute shall be considered the exit region.

9.3.5.1 The exit height of the end of the slide chute shall be no greater than 6 in. (150 mm) above the impact attenuating surfacing (see Fig. A1.22).

9.3.5.2 A slide exit region shall be required at the lower end of the slide if the slope of any portion of the sliding surface exceeds  $24^\circ$ . The length of the slide exit region shall be no less than 7 in. (180 mm) and no greater than 10 in. (250 mm) (see Fig. A1.22).

9.3.5.3 Slide exit edges shall be rounded or curved.

9.3.5.4 The radius of curvature of the transition between the sliding surface and the exit region shall be a minimum of 18 in. (460 mm) (see Fig. A1.21).

9.3.6 *Slide Clearance Zones:*

9.3.6.1 A clear area, free of equipment, shall surround the slide chute. This area is defined in Fig. A1.23. The clear area shall extend through the exit section.

9.3.6.2 The fall height of slides shall be measured from the slide transition platform to the surface below (see also 11.5 for surfacing requirements).

9.4 *Spring Rocking Equipment Intended for Use Without Adult Assistance:*

9.4.1 *Single Occupancy Spring Rocking Equipment:*

9.4.1.1 Seats shall accommodate no more than one user.

9.4.1.2 Each seating position shall be provided with handgrips that comply with the general requirements for protrusions in 6.3 and shall be no less than 0.6 in. (15 mm) and no greater than 1.2 in. (30 mm) in maximum cross-sectional dimension. Handgrips intended to be gripped by one hand shall have a minimum length of 3 in. (76 mm). Handgrips intended to be gripped by both hands shall have a minimum length of 6 in. (150 mm).

9.4.1.3 Footrests that have a minimum width of 3.5 in. (89 mm) shall be provided for each seating position. Footrests shall conform to the general requirements for footrests (see 10.2.3) and for protrusions (see 6.3).

9.4.1.4 Spring mechanisms shall conform to the general requirements for crush and shear points (Section 6) and the requirements for labeling (Section 12).

9.4.1.5 After installation, the height of the seat while unloaded and at rest shall not be less than 12 in. (300 mm) nor more than 16 in. (400 mm) above the use zone surface.

9.4.2 *Multiple Occupancy Spring Rocking Equipment:*

9.4.2.1 For multiple occupancy spring rocking equipment with opposing seats, the minimum distance from center of seat to center of seat shall be 37 in. (940 mm).

9.4.2.2 Multiple occupancy spring rocking equipment shall comply with the requirements of 9.4.1.2 – 9.4.1.5.

9.5 *To-Fro (Single Axis) Swings* (see Figs. A1.24-A1.28):

9.5.1 *General Requirements:*

9.5.1.1 *Placement:*

(1) To-fro swings shall be located away from other play structures and circulation areas.

(2) To-fro swings shall not be attached to a composite structure.

(3) To-fro swings shall be located in use zones which comply with 11.7.

(4) To-fro swings used in settings with unlimited access shall be permanently anchored.

9.5.1.2 *Support Structure*—The support structure shall be designed to discourage climbing and shall have no designated play surfaces.

9.5.1.3 *Hangers*—At the pivot point, hangers shall have bearings, bushings, or other means of reducing friction and wear on all moving parts and surfaces when the hangers are moving in the intended direction of travel. A cable that it permanently affixed to a hanger assembly performs as a bearing surface (see 4.2.3.1).

9.5.2 *To-Fro Swings Intended for Use Without Adult Assistance* (see Fig. A1.24):

9.5.2.1 *Pivot Point*—The pivot point shall be no more than 47 in. (1190 mm) above the impact attenuating surface.

9.5.2.2 *Seats:*

(1) No more than two to-fro swing seats shall be located in one bay of a swing structure with a top beam. There shall be no limit to the number of bays provided in a single structure.

(2) To-fro swing seats shall be smoothly finished with blunt or rounded edges. Seats shall conform to Section 6. Hard or heavy seats, such as those made of wood or metal, shall not be used.

(3) Fully enclosed seats shall not be used for to-fro (single axis) swings with a pivot point height of 47 in. (1190 mm) or less.

9.5.2.3 *Clearances for Swing Structures with a Top Beam:*

(1) The horizontal distance between adjacent swings at rest, when occupied by the maximum user, shall be no less than 20 in. (510 mm) when measured along the top beam.

(2) The horizontal distance between the supporting structure and the adjacent swing seat, when occupied by the maximum user, shall be no less than 20 in. (510 mm).

(3) The horizontal distance between hangers supporting a to-fro swing seat shall be greater than the width of the seat when occupied by the maximum user, but shall not be less than 20 in. (510 mm).

(4) The vertical distance between the bottom of the unoccupied swing seat and the impact attenuating surface shall not be less than 6 in. (150 mm) or greater than 8 in. (200 mm).

(5) The fall height of the swings shall be the distance from the pivot point to the ground.

9.5.2.4 *Clearances For Swing Structures With No Top Beam:*

(1) The horizontal distance between hangers supporting a to-fro swing seat shall be greater than the width of the seat when occupied by the minimum user and shall be splayed at an angle to prevent side to side motion of the swing seat.

(2) The vertical distance between the bottom of the unoccupied swing seat and the impact attenuating surface shall not be less than 6 in. (150 mm) or greater than 8 in. (200 mm).

(3) The fall height of the swings shall be the distance from the pivot point to the ground.

9.5.2.5 *Protective Barriers*—Swing areas for swings with a maximum pivot point height of 47 in. (1190 mm) are not required to have protective barriers. If a barrier is installed, it shall comply with the requirements of 9.5.4.

9.5.3 *To-Fro Swings Intended For Use With Adult Assistance* (see Figs. A1.25-A1.28):

9.5.3.1 *Pivot Point*—The pivot point shall be no more than 95 in. (2410 mm) above the impact attenuating surface.

9.5.3.2 *Seats*:

(1) No more than two to-fro swing seats shall be located within one bay. There shall be no limit to the number of bays provided in a single structure.

(2) To-fro swing seats shall accommodate no more than one user.

(3) To-fro swing seats shall be smoothly finished with blunt or rounded edges. Seats shall conform to Section 6. Hard or heavy seats, such as those made of wood or metal, shall not be used.

(4) To-fro swing seats shall be fully enclosed seats.

(5) Openings in fully enclosed, to-fro swing seats shall preclude a child from inadvertently falling through the openings. The openings shall prevent the passage of the infant torso probe (see Fig. A1.2).

(6) Swing seats intended for children who cannot sit up unaided shall offer back support which is a minimum of 18 in. (460 mm) in length from seat to top of back support.

(7) Swing seats intended for children who cannot sit up unaided must be labeled: “Intended for Children Who Cannot Sit Up Unaided”. Labels shall be placed on the front and back of each swing seat and shall conform to all the requirements of Section 12.

9.5.3.3 *Clearances* (see Fig. A1.25):

(1) The horizontal distance between adjacent swings at rest, when occupied by the maximum user, shall be no less than 20 in. (510 mm) when measured at 60 in. (1520 mm) above the impact attenuating surface.

(2) The horizontal distance between the supporting structure and the adjacent swing seat, when occupied by the maximum user, shall be no less than 20 in. (510 mm) when measured 60 in. (1520 mm) above the impact attenuating surface.

(3) The horizontal distance between hangers supporting a to-fro swing seat shall be greater than the width of the seat when occupied by the maximum user, but shall not be less than 20 in. (510 mm).

(4) The vertical distance between the bottom of the unoccupied swing seat and the impact attenuating surface shall not be less than 24 in. (610 mm).

(5) The fall height of the swings shall be the distance from the pivot point to the ground.

9.5.3.4 *Protective Barriers*—A protective barrier shall completely surround the swing area for swings with a pivot point higher than 47 in. (1190 mm) (see Figs. A1.26-A1.28). Barriers shall comply with the requirements of 9.5.4.

9.5.4 *Protective Barriers Around Swing Areas*:

9.5.4.1 Protective barriers shall not encroach on the to-fro use zones of the swing.

9.5.4.2 There shall be two access/egress points through the barrier.

9.5.4.3 All protective barriers shall comply with the requirements of 8.3.3 – 8.3.6.

9.5.4.4 *In Indoor and Outdoor Supervised Settings* (see Fig. A1.26 and Fig. A1.27):

(1) If a barrier is installed adjacent to the side supports of the swing, the distance between the side supports and the protective barrier shall be 3 in. (76 mm) or less.

(2) If the protective barrier is not installed 3 in. (76 mm) or less from the side supports of the swing, a minimum 36 in. (920 mm) use zone shall be provided.

(3) With to-fro T swings, the protective barrier shall be installed a minimum of 36 in. (920 mm) from the end of the horizontal swing support (see Fig. A1.27)

9.5.4.5 *In Settings with Unlimited Access* (see Fig. A1.28):

(1) The distance between the side supports of the swing structure and the protective barrier shall be 72 in. (1830 mm).

(2) With to-fro T-swings, the distance from the end of the horizontal swing support to the protective barrier shall be 72 in. (1830 mm).

## 10. Structural Integrity and Stability

10.1 *General Requirements*:

10.1.1 Structural integrity and stability tests are intended to be conducted on pilot production equipment at a test site prior to distribution. They are not intended to be performed on equipment installed on a playground or in an indoor play area. They are not intended to be performed as part of a routine maintenance program.

10.1.2 There shall be no loosening, instability of the equipment, or structural failure of any component or assembly during or immediately upon completion of the tests in sections 10.2 through 10.7. There shall be no visible crack, breakage, or any form of permanent deformation of any component that would have the potential for adversely affecting the structural integrity or safe use of the equipment. After the load has been removed any hooks, shackles, rings, or links shall not have opened to more than 0.04 in. (1.0 mm).

10.1.3 *Tests for Structural Integrity*:

10.1.3.1 The structural integrity tests specified in this section shall be performed on units assembled in accordance with the manufacturer’s installation instructions.

10.1.3.2 Where equipment in 10.2 – 10.7 is designed for multiple users, the load shall be applied to each user position and all user positions shall be tested simultaneously.

10.1.4 *Tests for Stability of Temporarily Fixed and Portable Play Equipment*:

10.1.4.1 The stability tests performed in this section shall be performed on units assembled in accordance with the manufacturer's installation instructions. They shall be performed with the equipment placed on a 10° inclined plane. The equipment shall be tested in the most adverse position with regard to stability, including any angle between perpendicularly (front to back) and horizontally (side to side) in relation to the inclined plane.

10.1.4.2 The test load(s) used for stability shall be a 22.5 lb (12.5 kg) weight that is 5.9 in. (150 mm) + 0.4 (10 mm) – 0 in. in diameter, 11.8 in. (300 mm) + 0.4 (10 mm) – 0 in. tall with a center of gravity that is located in the geometric center of the weight (see Fig. A1.29).

10.1.4.3 Where equipment is designed for multiple users, the load shall be applied to each user position and all user positions shall be tested simultaneously unless otherwise specified.

10.1.4.4 The equipment shall not overturn during testing.

10.1.5 *Stability Test Exemption*—Permanently anchored play equipment shall be exempt from stability testing.

10.1.6 *Test Blocks for Application of Loads*—Unless otherwise specified, blocks used for the application of loads during testing shall be 3.5 in. (89 mm) square, at least 0.75 in. (19 mm) thick, and made of a rigid material (for example, lumber or hard plastic).

10.2 *Structural Integrity Tests for Rungs, Steps, and Horizontal Supporting Members:*

10.2.1 *Steps and Other Horizontal Supporting Members 24 in. (610 mm) or Less in Length*, except for footrests, shall be capable of sustaining a vertical load (gradually applied) of 360 lb (164 kg) applied for 5 min to a test block resting on the center of the member. The test block shall conform to the requirements of 10.1.6.

10.2.2 *Horizontal Members Greater than 24 in. (610 mm) in Length*, shall be capable of sustaining a vertical load gradually applied of 240 lb (109 kg) applied simultaneously for 5 min to each of two test blocks, made to conform to the requirements of 10.1.6. One half of the load shall be applied at the 1/3 point and the other half at the 2/3 point between the ends of the horizontal member. The load (or loads) shall be applied to one member at a time, unless otherwise specified for the particular equipment.

10.2.3 *Footrests*, shall be capable of sustaining a vertical load (gradually applied) of 180 lb (82 kg) applied for 5 min to a test block made to conform to the requirements of 10.1.6 and located at the center of one (or the other) footrest.

10.3 *Structural Integrity and Stability Tests for Platforms and Ramps:*

10.3.1 *Structural Integrity Test for Platforms and Ramps:*

10.3.1.1 A total load computed using the formula in 10.3.1.4 shall be divided and applied in five equal segments. The total load shall be applied vertically without shock to the platform or ramp and shall remain in position for 5 min. The platform shall be divided into four equal area quadrants and the load shall be located in equal portions, in the center of each quadrant and at the center point of the platform or ramp, a total of five points (see Fig. A1.30).

10.3.1.2 When the square foot area of a platform is smaller than the square foot area for the maximum number of intended users, the total load shall be applied at the center point of the platform.

10.3.1.3 For this test, weights shall be placed on load distribution devices. Each device shall be a 6 in. (150 mm) by 6 in. (150 mm) by at least 0.75 in. (19 mm) thick test block made from lumber or other rigid material.

10.3.1.4 The total load shall be the sum of the following:

(1) Based on the area of the platform, determine the maximum number of users, as follows:

$$\frac{\text{area of platform (ft}^2 \text{ (cm}^2\text{))}}{X} = N \quad (2)$$

where:

$N$  = maximum number of users, and

$X$  = 0.7 ft<sup>2</sup> (651 cm<sup>2</sup>).

Round to the nearest whole number.

(2) Apply 120 lb (54.4 kg) for each of the first two users then add 28 lb (12.7 kg) for each of the remaining ( $N - 2$ ) users follows:

$$(2 \times 120) + (N - 2) \times 28 = \text{total load (lb)} \quad (3)$$

10.3.2 *Stability Test for Equipment with Platforms:*

10.3.2.1 Equipment with platforms shall be tested for the maximum number of users as derived from the area formula in 10.3.1.4(1), rounded to the nearest whole user. Apply one loading weight as defined in 10.1.4.2 for every user.

10.3.2.2 Place the product across the slope of a surface inclined 10° to the horizontal plane. The platform shall be in its most adverse position with regard to its stability. Align all the loading weights along the outermost allowable downward position of the platform to simulate a worst-case loading condition.

10.3.2.3 For equipment with multiple platforms, each area and load shall be calculated independently but loaded simultaneously.

10.4 *Test for Dynamic Strength of Barriers and Handrails:*

10.4.1 Barriers and handrails shall be tested for sudden horizontal impact using the dynamic load test apparatus and test procedures specified in 10.4.2 and 10.4.4.

10.4.2 *Dynamic Load Test Apparatus*—Use a test block made from lumber or other rigid material with a length of 8 in. (200 mm), a height of 2 in. (51 mm), and a thickness of at least 0.75 in. (19 mm). Attach a 55 ± 2 lb (25 ± 0.9 kg) weight to a 0.25 in. (6.4 mm) diameter steel cable through a pulley such that a horizontal impact can be applied to the test block through free fall of the weight (see Fig. A1.31).

10.4.3 *Dynamic Load Test Procedure:*

10.4.3.1 Place the play equipment on a rigid horizontal surface. Center the test block on the top rail of the barrier or handrail in such a way that it is secured in place and the force is applied through the centerline of the test block. If there is no individual top rail, position the top of the test block 1 in. (25 mm) from the top of the barrier. Apply the force through the centerline of the test block.

10.4.3.2 Arrange the cable and the pulley so that the load hangs freely. Raise the load vertically  $5.0 \pm 0.5$  in. ( $130 \pm 13$  mm) and let it drop freely. After 10 s remove all tension from the barrier.

10.4.4 *Push Out Test Procedure*—Gradually apply a horizontal force of  $55 \pm 2$  lbf ( $245 \pm 9$  N) within 1 in. (25 mm) of the geometric center of each individual barrier panel. Apply the load over a period of 5 s, and maintain it for 10 s using a rigid test block 6 in. (180 mm) square by at least 0.75 in. (19 mm) thick.

#### 10.5 *Structural Integrity and Stability Tests for Slides:*

10.5.1 *Structural Integrity Test*—Loads of 360 lb (164 kg) shall be applied simultaneously at a distance of  $\frac{1}{3}$  and  $\frac{2}{3}$  of the distance from the top of the slide (see Fig. A1.19). The loads shall be gradually applied and shall remain in position for 5 min.

10.5.2 *Stability Test*—Stand alone slides shall be tested for stability. The slide shall be placed on a  $10^\circ$  inclined surface in the most adverse orientation with regard to stability. The loading weight specified in 10.1.4.2 (see Fig. A1.29) shall be placed along the outermost allowable downward position of the platform to simulate worst case loading conditions for a period of 5 min.

10.6 *Structural Integrity Test for Spring Rocking Equipment*—A load of 180 lb (82 kg) shall be applied vertically, without shock, using a rigid test block conforming to the requirements of 10.1.6, to each position that would normally be occupied by a child at play. All the loads shall remain in position simultaneously for 5 min.

#### 10.7 *Structural Integrity and Stability Tests for Swings:*

10.7.1 For this test, weights shall be placed on load distribution devices. Each device shall be a 6 in. (150 mm) by 6 in. (150 mm) by at least 0.75 in. (19 mm) thick test block made from lumber or other rigid material.

10.7.2 *Tests for To-Fro (Single Axis) Swings with a Maximum Pivot Point Height of 47 in. (1190 mm):*

10.7.2.1 *Structural Integrity Test*—A load of 180 lb (82 kg) shall be applied simultaneously to each swing seat through the load distribution device specified in 10.7.1. There shall be no evidence of structural failure to the unit or its supporting system. The loads shall be gradually applied. Each unit shall be loaded for 5 min.

10.7.2.2 *Stability Test for Swing Support Structure*—Place the swing on a  $10^\circ$  incline so that the forward swinging direction is directed downward on the inclined surface. Anchors shall be installed in accordance with the manufacturer's installation instructions. The loading weight as described in 10.1.4.2 shall be placed and secured in the approximate geometric center of each swing seat. Swing all loads in unison through a maximum angle of  $45^\circ$  of either side of vertical ( $90^\circ$  of total angle) for three full swings.

(1) The loading device shall conform to the requirements of 10.7.1.

(2) The equipment shall be rotated  $180^\circ$  so that the front of the swing is facing up the incline and the tests of 10.7.2.2 shall be repeated.

10.7.2.3 *Stability Test for Partially Enclosed Swing Seat*—Partially enclosed swing seats shall remain stable when tested

in accordance with the stability test set-up and method in 10.7.2.4 and 10.7.2.5. A swing is considered unstable and fails this requirement if, during any of the six swing attempts, the pendulum test apparatus (see Fig. A1.32) tips or falls forward or backward and causes the horizontal reference line of the swing seat to hang at an angle greater than  $30^\circ$  from its original position (see Fig. A1.33).

#### 10.7.2.4 *Stability Test Setup—Partially Enclosed Swing Seat:*

(1) Partially enclosed swing seats shall be tested for stability utilizing a pendulum test apparatus constructed in accordance with the dimensions and materials specified in the drawing shown in Fig. A1.32. The pendulum test apparatus consists of a 10 lb (4.5 kg) barbell weight at the top of a freely pivoting bar and a 10 lb (4.5 kg) barbell weight affixed to the bottom of the test apparatus. The barbell weights shall have a maximum diameter of 8.25 in. (210 mm). The total weight of the pendulum test apparatus shall not exceed 24.0 lb (10.9 kg) (see Fig. A1.32).

(2) Suspend the partially enclosed swing seat in accordance with the manufacturer's instructions. If the swing seat height is adjustable, perform the test at both 6 in. (150 mm) and 8 in. (200 mm) above the surface. With the swing at rest, establish a horizontal reference line on the swing seat.

(3) Secure the complete pendulum test apparatus within 0.5 in. (13 mm) of the geometric center of the swing seating surface with the direction of travel of the pendulum arm the same as the swing direction.

(4) If the seating area of the partially enclosed swing seat is made of a flexible material, additional bracing material is allowed to be added to the exterior bottom of the swing seat to aid in securing the pendulum test apparatus. Care shall be taken to assure the additional bracing material does not influence the test results.

(5) The center of gravity (cg) of the top weight of the pendulum test apparatus shall be at a height of 16 in. (400 mm) from the top of the seating surface when the pivot arm is positioned vertically.

#### 10.7.2.5 *Stability Test Method—Partially Enclosed Swing Seat:*

(1) While holding the pendulum test apparatus to the rear of the seat, raise the swing seat in the rear direction to an angle of  $60^\circ +5/-0^\circ$  as measured from vertical to a line that connects the swing hanger pivot point with the geometric center of the seating surface.

(2) Simultaneously release the swing and pendulum test apparatus and allow it to swing freely until the swing arc is within  $15^\circ$  from vertical in either direction. At this point, stop the swinging motion by slowly returning the swing to its at-rest condition while being careful not to disturb the position of the pendulum test apparatus. Measure the angle of the reference line on the swing seat from the horizontal.

(3) Perform steps (1) and (2) three times.

(4) Repeat steps (1) through (3), except that the pendulum test apparatus shall be held in the forward direction.

(5) If after any of the six swing attempts the angle of the swing in its at-rest condition exceeds  $30^\circ$  as noted in 10.7.2.3, the swing is considered unstable and fails.

10.7.3 *Tests For Swings With Fully Enclosed Swing Seats (Maximum Pivot Point Height of 95 in. (2410 mm)):*

10.7.3.1 *Structural Integrity Test*—A load of 360 lb (164 kg) shall be applied simultaneously to each swing seat through the load distribution device specified in 10.7.1. There shall be no evidence of structural failure to the unit or its supporting system. The loads shall be gradually applied. Each unit shall be loaded for 5 min.

10.7.3.2 *Stability Test for Swing Support Structure*—Place the swing on a 10° incline so that the forward swinging direction is directed downward on the inclined surface. Anchors shall be installed in accordance with the manufacturer's installation instructions. The loading weight as described in 10.1.4.2 shall be placed and secured in the approximate geometric center of each swing seat. Swing all loads through a maximum angle of 45° of either side of vertical (90° of total angle) for three full swings.

(1) The loading device shall conform to the requirements of 10.7.1.

(2) The equipment shall be rotated 180° so that the front of the swing is facing up the incline and the tests of 10.7.3.2 shall be repeated.

10.7.3.3 *Stability Test for Fully Enclosed Swing Seat*—Fully enclosed swing seats shall remain stable when tested in accordance with the stability test set-up and method in 10.7.3.4 and 10.7.3.5. A swing is considered unstable and fails this requirement if, during any of the six swing attempts, the pendulum test apparatus (see Fig. A1.32) tips or falls forward or backward and causes the horizontal reference line of the swing to hang at an angle greater than 30° from its original position (see Fig. A1.33).

10.7.3.4 *Stability Test Setup—Fully Enclosed Swing Seat:*

(1) Fully enclosed swing seats shall be tested for stability utilizing a pendulum test apparatus constructed in accordance with the dimensions and materials specified in the drawing shown in Fig. A1.32. The pendulum test apparatus consists of a 10 lb (4.5 kg) barbell weight at the top of a freely pivoting bar and a 10 lb (4.5 kg) barbell weight affixed to the bottom of the test apparatus. The barbell weights shall have a maximum diameter of 8.25 in. (210 mm). The total weight of the pendulum test apparatus shall not exceed 24.0 lb (10.9 kg) (see Fig. A1.32).

(2) Suspend the fully enclosed swing seat in accordance with the manufacturer's instructions. If the swing seat height is adjustable, perform the test at 24 in. (610 mm) above the impact attenuating surface (see 9.5.3.3(4)) and with the seat at its highest setting. With the swing at rest, establish a horizontal reference line on the swing seat.

(3) Secure the complete pendulum test apparatus within 0.5 in. (13 mm) of the geometric center of the swing seating surface with the direction of travel of the pendulum arm the same as the swing direction.

(4) If the seating area of the fully enclosed swing seat is made of a flexible material, additional bracing material is allowed to be added to the exterior bottom of the swing seat to aid in securing the pendulum test apparatus. Care shall be taken to assure the additional bracing material does not influence the test results.

(5) The center of gravity (cg) of the top weight of the pendulum test apparatus shall be at a height of 16 in. (400 mm) from the top of the seating surface when the pivot arm is positioned vertically.

10.7.3.5 *Stability Test Method—Fully Enclosed Swing Seat:*

(1) While holding the pendulum test apparatus to the rear of the seat, raise the swing seat in the rear direction to an angle of 60° +5/-0° as measured from vertical to a line that connects the swing hanger pivot point with the geometric center of the seating surface.

(2) Simultaneously release the swing and pendulum test apparatus and allow it to swing freely until the swing arc is within 15° from vertical in either direction. At this point, stop the swinging motion by slowly returning the swing to its at-rest condition while being careful not to disturb the position of the pendulum test apparatus. Measure the angle of the reference line on the swing seat from the horizontal.

(3) Perform steps (1) and (2) three times.

(4) Repeat steps (1) through (3), except that the pendulum test apparatus shall be held in the forward direction.

(5) If after any of the six swing attempts the angle of the swing in its at-rest condition exceeds 30° as noted in 10.7.3.3, the swing is considered unstable and fails.

## 11. Play Equipment Use Zones, Non-Encroachment Zones, and Placement

11.1 *General Use Zone Requirements:*

11.1.1 A use zone shall be provided for all stationary or portable play equipment within this specification except as specified in 11.2.

11.1.2 All use zones shall be maintained free of obstacles.

11.1.3 The dimensions and configurations of the use zones shall be dependent upon the type of play equipment, as specified in 11.4 – 11.7.

11.1.4 The dimensions and configurations of the use zones shall also be determined by the location of the play equipment. For purposes of this specification, play equipment shall be deemed to be located in either: (1) an indoor supervised setting, (2) an outdoor supervised setting with limited access (such as a fenced play area at an early care and education facility), or (3) a setting with unlimited access.

11.1.5 Changes in elevation in use zones shall not create a trip hazard. Changes in level up to 0.25 in. (6.4 mm) are allowed to be vertical and need no edge treatment. Changes in elevation that are greater than 0.25 in. (6.4 mm) are allowed to be vertical to 0.25 in. (6.4 mm) and shall be beveled above that with a slope no greater than 1:2.

11.1.6 Overhead obstructions (for example, exterior obstructions such as tree limbs and interior lights) within the use zones of play structures shall be a minimum of 84 in. (2130 mm) above each designated play surface outdoors and a minimum of 48 in. (1220 mm) above each designated play surface indoors.

11.1.7 All overhead utility line clearances above outdoor supervised and outdoor unlimited access settings shall comply with all local, state, and national codes, such as the National Electrical Safety Code.

11.2 *Exemptions From Use Zone Requirements:*

11.2.1 Components that either do not have a designated play surface or require a user to maintain constant contact with the ground during play (for example, freestanding talk tubes, freestanding activity panels, ground level sandboxes, and playhouses) shall have no individual use zone requirements.

11.2.2 Requirements for use zones and non-encroachment zones (see 11.3 and Fig. A1.34) are eliminated when: (1) play equipment is placed flush against a wall(s); (2) the wall adjacent to the play event and use zone is continuous and unbroken; (3) the distance between the wall and the outer edge of the stairs, slides, or ramps running parallel to a wall is less than 3 in. (76 mm); (4) the wall is a non-breakable material; and (5) the wall shall conform with Sections 4 and 6 of this specification.

11.2.3 In indoor and outdoor supervised settings, the area adjacent to and directly below that portion of a play structure having a protective barrier with a minimum height of 24 in. (610 mm) does not require a use zone but does require a non-encroachment zone (see 11.3 and Fig. A1.34 and Fig. A1.35).

### 11.3 General Non-Encroachment Zone Requirements:

11.3.1 When a use zone is not required, there shall be a non-encroachment zone that is a minimum of 36 in. (920 mm) (see Fig. A1.24, Fig. A1.26, Fig. A1.34, Fig. A1.35, Fig. A1.36).

11.3.2 Non-encroachment zones shall be permitted to overlap to a minimum of 36 in. (920 mm) (see Fig. A1.24 and Fig. A1.26).

11.4 Use Zones for Play Structures Having No Moving Components (for example, climbing equipment, play ramps, and platforms):

#### 11.4.1 In Indoor and Outdoor Supervised Settings:

11.4.1.1 There shall be a minimum use zone of 36 in. (920 mm) around all components of a play structure.

11.4.1.2 Use zones are allowed to overlap if two play structures having no moving components are positioned adjacent to one another. In an indoor or outdoor supervised setting, the minimum distance between play structures is 36 in. (920 mm) (see Fig. A1.36).

11.4.1.3 If two or more play structures having no moving components are not physically attached, but are play functionally linked, the use zones shall be determined as if the separate pieces of equipment were parts of a composite play structure.

11.4.1.4 Any components of a play structure including access or egress components that have a fall height greater than 18 in. (460 mm) where a protective barrier is not present shall have a minimum use zone of 36 in. (920 mm) containing impact attenuating surfacing that complies with Specification F1292 appropriate for the fall height of the equipment (see Figs. A1.34-A1.36).

#### 11.4.2 In Settings with Unlimited Access:

11.4.2.1 Portable play equipment shall not be used in settings with unlimited access.

11.4.2.2 There shall be a use zone of 72 in. (1830 mm) around the perimeter of all play structures having no moving components.

11.4.2.3 Use zones are allowed to overlap if two play structures having no moving components are positioned adja-

cent to one another. In settings with unlimited access, the minimum distance between structures shall be 72 in. (1830 mm).

11.4.2.4 If two or more play structures having no moving components are not physically attached, but are play functionally linked, the use zones shall be determined as if the separate pieces of equipment were parts of a composite play structure.

11.4.2.5 All use zones of play structures having no moving components shall contain impact attenuating surfacing that complies with Specification F1292 appropriate for the fall height of the equipment.

### 11.5 Use Zones for Slides:

11.5.1 In Indoor and Outdoor Supervised Settings (see Fig. A1.37):

11.5.1.1 There shall be a minimum 36 in. (920 mm) use zone around the access components, platform, and slide chute sides of a play structure that includes a slide except when the slide is part of a composite structure.

11.5.1.2 When a slide is part of a composite structure, the minimum use zone between the access components and the side of the slide chute shall be 36 in. (920 mm) (see Fig. A1.34 and Fig. A1.35).

11.5.1.3 There shall be a minimum of a 36 in. (920 mm) use zone at the lower exit end of the slide chute and it shall extend in the direction of the descent.

11.5.1.4 The use zone of no other structure shall overlap the exit zone of a slide.

11.5.1.5 The use zone of any slide having a fall height greater than 18 in. (460 mm) shall contain impact attenuating surfacing that complies with Specification F1292 for the fall height of the slide (see 9.3.6.2).

#### 11.5.2 In Settings with Unlimited Access (see Fig. A1.37):

11.5.2.1 There shall be a minimum 72 in. (1830 mm) use zone around the access components, platform, and slide chute sides of a play structure that includes a slide, except when the slide is part of a composite structure.

11.5.2.2 When a slide is part of a composite structure, the minimum use zone between the access components and the side of the slide chute shall be 36 in. (920 mm).

11.5.2.3 There shall be a minimum of 72 in. (1830 mm) use zone at the lower exit end of a straight or wavy slide and it shall extend in the direction of the descent.

11.5.2.4 The use zone of no other structure shall overlap the exit use zone of a slide.

11.5.2.5 The use zones of all slides shall contain impact attenuating surfacing that complies with Specification F1292 appropriate for the fall height of the slide (see 9.3.6.2).

### 11.6 Use Zones for Spring Rocking Equipment:

11.6.1 In Indoor and Outdoor Supervised Settings—The use zones for spring rocking equipment upon which a user is intended to sit shall comply with the provisions in 11.4.1 (see Fig. A1.36).

11.6.2 In Settings with Unlimited Access—The use zones for spring rocking equipment upon which a user is intended to sit shall comply with the provisions in 11.4.2.

11.7 Use Zones and Non-Encroachment Zones for To-Fro Swings:

### 11.7.1 *In Indoor and Outdoor Supervised Settings:*

11.7.1.1 For swings with a maximum pivot point height of 47 in. (1190 mm), the use zone to the front and to the rear of the swing shall be a minimum distance of  $2W$  on a line continuous to both the front and back and perpendicular to the longitudinal axis of the suspending beam (or a horizontal line connecting the hangers).  $W$  shall equal the vertical distance from the top of the impact attenuating surface to the pivot point of the swing. The horizontal distance from the front to the rear of the use zone shall not be less than  $4W$  (see Fig. A1.24).

11.7.1.2 For swings with pivot point heights greater than 47 in. (1190 mm) and less than or equal to 95 in. (2410 mm) with enclosed seats, the use zone to the front and to the rear of the swing shall be a minimum distance of  $2W$  on a line continuous to both the front and back and perpendicular to the longitudinal axis of the suspending beam, where  $W$  equals the vertical distance from the bottom of the unoccupied swing seat to the pivot point on the suspending beam. The total horizontal distance from the front to the rear of the use zone shall not be less than  $4W$  (see Figs. A1.25-A1.27 and 9.5.3).

11.7.1.3 No other play equipment use zone shall overlap the front to rear use zone of a swing (see Fig. A1.26).

11.7.1.4 When a protective barrier is installed a distance of less than 3 in. (76 mm) from the side supports of the swing (see 9.5.4), a 36 in. (920 mm) non-encroachment zone shall be provided outside the protective barrier (see Fig. A1.26 and Fig. A1.36).

11.7.1.5 The support structure non-encroachment zones for adjacent to-fro swings are permitted to overlap (see Fig. A1.24 and Fig. A1.26).

11.7.1.6 The use zones for all “T” support to-fro swings shall comply with the distance requirements of 9.5 (see Fig. A1.27).

### 11.7.2 *In Settings with Unlimited Access:*

11.7.2.1 For swings with a maximum pivot point height of 47 in. (1190 mm) the use zone to the front and to the rear of the swing shall be a minimum distance of  $2W$  on a line continuous to both the front and back and perpendicular to the longitudinal axis of the suspending beam (or a horizontal line connecting the hangers).  $W$  shall equal the vertical distance from the top of the impact attenuating surface to the pivot point of the swing. The horizontal distance from the front to the rear of the use zone shall not be less than  $4W$  (see Fig. A1.24).

11.7.2.2 For swings with pivot point heights greater than 47 in. (1190 mm) and less than or equal to 95 in. (2410 mm) with enclosed seats the use zone to the front and to the rear of the swing shall be a minimum distance of  $2W$  on a line continuous to both the front and back and perpendicular to the longitudinal axis of the suspending beam, where  $W$  equals the vertical distance from the bottom of the unoccupied swing seat to the pivot point on the suspending beam. The total horizontal distance from the front to the rear of the use zone shall not be less than  $4W$  (see Fig. A1.28).

11.7.2.3 No other play equipment use zone shall overlap the front to rear use zone of a swing.

11.7.2.4 The use zone surrounding the support structure of the to-fro swing(s) shall extend a minimum of 72 in. (1830 mm) from the support structure (see Fig. A1.28).

11.7.2.5 The support structure use zones for adjacent to-fro swings are permitted to overlap to a minimum of 72 in. (1830 mm).

11.7.2.6 The use zones for all “T” support to-fro swings shall comply with the distance requirements of 9.5.

### 11.8 *Surfacing Materials for Use Zones* (see Section 8, Table 3):

#### 11.8.1 *In Indoor and Outdoor Supervised Settings:*

11.8.1.1 Use zone surfacing for play structures with fall heights greater than 18 in. (460 mm) shall meet the requirements of Specification F1292 appropriate for the fall height of the structure.

11.8.1.2 Unacceptable materials for use zones for play structures with fall heights 18 in. (460 mm) or less shall include all hard or abrasive materials such as asphalt, concrete, terrazzo, or other materials with similar characteristics.

11.8.2 *In Settings with Unlimited Access*—All use zone surfacing shall meet the requirements of Specification F1292 for the fall height of the equipment.

#### 11.9 *Fences and Gates:*

##### 11.9.1 *In Indoor and Outdoor Supervised Settings:*

11.9.1.1 Outdoor supervised settings shall be fenced and gated.

11.9.1.2 All fences and gates shall comply with the requirements of 6.1, 6.2, 6.3, and 6.5.

##### 11.9.2 *In Outdoor Settings with Unlimited Access:*

11.9.2.1 It is recommended that outdoor play areas with unlimited access be located within fenced and gated areas.

11.9.2.2 All fences and gates shall comply with the requirements of 6.1, 6.2, 6.3, and 6.5.

#### 11.10 *Placement of Play Equipment:*

11.10.1 Space for the purposes of play, circulation, and use zones shall be provided for all permanently anchored or temporarily fixed play equipment and for portable play equipment when in use.

11.10.2 Play equipment with moving components such as swings shall be located in a position away from circulation areas and near the periphery of the play area.

11.10.3 All metal platforms installed in outdoor play areas shall be shaded.

11.10.4 Slides constructed of any materials installed in outdoor play areas shall be shaded or face in a northern direction.

11.10.5 Play equipment locations shall comply with all the requirements of Section 6.

11.10.6 Where there are segments of the perimeters of play structures that do not require use zones, appropriate warning labels shall be provided to adult caregivers to not place objects adjacent to the play structure.

11.10.7 It is recommended that a portion of the outdoor play area be shaded.

## 12. Labels and Signs

### 12.1 *Compliance Requirements for Labels and Signs:*

12.1.1 All warning labels and signs shall comply with provisions of Section 12.



12.1.2 Warning labels and signs shall follow the classification system provided by ANSI Z535.1 in the areas of color specifications and visibility, and ANSI Z535.4 in the areas of legibility, type of lettering, clarity of message, symbol and word message.

#### 12.2 Specifications for all Labels and Signs:

12.2.1 *Durability*—The label/sign shall conform to UL 969. The label or sign shall be replaced by the owner/operator if it becomes illegible, is destroyed, or removed.

12.2.2 *Non-Injurious*—A label or sign shall be designed so that it will not cause injury.

#### 12.3 Label Requirements on Play Equipment and Structures:

12.3.1 *Manufacturer's Identification*—The purpose of this information is to identify the manufacturer or the custom designer of the product.

12.3.2 *Label-Warning*—The purpose of this information is to inform, alert, and educate owners/operators, installers, and those supervising children who play on the equipment about the ongoing hazard of installing equipment over hard surfaces. This label is to serve as a constant reminder to provide and maintain appropriate impact attenuating surfacing in accordance with Specification F1292 and the USCPSC Handbook for Public Playground Safety.

12.3.2.1 *Safety Alert Symbol*—Preceding the signal word, there shall be a triangle with an exclamation point inside the triangle on the warning label.

12.3.2.2 *Signal Word*—WARNING shall be in the upper panel of the label.

12.3.2.3 *Word Message on Lower Panel of the Warning Label*—**WARNING:** *Installation over a hard surface such as concrete, asphalt, or packed earth, indoor-outdoor carpet or linoleum could result in serious injury or death from falls.* Equipment that is exempt from requiring impact attenuating surfacing shall be exempt from requiring labels.

12.3.3 *Age Appropriateness*—The purpose of this information is to inform and educate the owners/operators, installers, and those supervising children who play on the equipment about the age of the user for which the equipment/structure was designed. (For example: *This structure is designed for users aged 6 months through 23 months of age.*)

12.3.4 *Supervision*—The purpose of this information is to inform and educate the owners/operators, installers, and those supervising children who play on the equipment about the recommendation to provide supervision. (For example: *Adult supervision is recommended. Failure to provide adult supervision can result in serious injuries to the users.*)

#### 12.3.5 Attachment/Placement of the Label:

12.3.5.1 *Attachment at Point of Manufacture*—If the label is installed at the point of manufacture, it shall be located so as not to be removed during the installation process.

12.3.5.2 *Attachment at Installation*—If a label cannot be attached at the point of manufacture, the label and instructions about attaching the label shall be included with the installation instructions.

12.3.5.3 *Attachment*—The label shall be attached so that it cannot be removed without the use of a tool.

12.3.5.4 *Placement*—The label shall be placed so that it is visible at the main access component of the play equipment and additional labels shall be permitted to be installed on other components of the play equipment.

12.4 *Signs Required for Play Equipment/Structures in Settings with Unlimited Access*—The purpose of the signs is to provide information regarding the play equipment/structures to those supervising the children as they enter settings with unlimited access that contain play equipment or structures.

12.4.1 *Sign-Warning*—The purpose of this information is to alert, warn, and educate those supervising the children who play on the equipment about the ongoing hazard of installing equipment over hard surfaces. This sign is to serve as a constant reminder to provide and maintain appropriate impact attenuating surfacing in accordance with Specification F1292 and USCPSC Handbook for Public Playground Safety.

12.4.1.1 *Safety Alert Symbol*—Preceding the signal word, there shall be a triangle with an exclamation point inside the triangle on the warning sign.

12.4.1.2 *Signal Word*—WARNING shall be in the upper panel of the sign.

12.4.1.3 *Word Message on Lower Panel of the Warning Sign*—**WARNING:** *Installation over a hard surface such as concrete, asphalt, or packed earth could result in serious injury or death from falls.* Equipment that is exempt from requiring impact attenuating surfacing shall be exempt from requiring a sign.

12.4.2 *Age Appropriateness*—The purpose of this information is to inform and educate those supervising the children who play on the equipment about the age of the user for which the equipment/structure was designed. (For example: *This structure is designed for users aged 6 months through 23 months of age.*)

12.4.3 *Supervision*—The purpose of this information is to inform and educate those supervising the children who play on the equipment about the recommendation to provide supervision. (For example: *Adult supervision is recommended. Failure to provide adult supervision can result in serious injuries to the users.*)

12.4.4 *Placement/Location of the Sign*—Signs shall be placed at the entry points to the play area or outside of the use zones and non-encroachment areas. Signs are allowed to be placed at more than one of these locations.

12.5 *Replacement*—The labels and signs shall be replaced by the owner/operator when they no longer meet legibility requirements. In cases where products have an extensive expected life or are exposed to extreme conditions, replacement labels or signs, or both, shall be made available by the product designer or manufacturer.

## 13. Installation

### 13.1 Designer's or Manufacturer's Responsibilities:

13.1.1 The designer or manufacturer shall provide to the owner/operator: (1) clear and concise instructions, (2) procedures for the installation of each piece of play equipment, (3) a drawing showing equipment use zone requirements, (4) a complete parts list, and (5) warning labels and their recommended placement (see Section 12).

13.1.2 For portable play equipment, installation instructions shall include recommended placement of labels for maximum visibility.

13.2 *Owner's/Operator's Responsibilities:*

13.2.1 The owner/operator shall ensure that the designer's or manufacturer's instructions and procedures for installing and placing all play structures are followed.

13.2.2 The owner/operator shall have impact attenuating surfacing installed within the use zone of each play structure as described in Section 11 to comply with the requirements of Specification F1292 appropriate for the fall height of each structure. If engineered wood fiber is used, it shall also comply with the requirements of Specification F2075.

13.2.3 The owner/operator shall comply with Section 11.

13.2.4 The owner/operator shall install protective barriers that comply with 8.3 and 9.5.4.

13.2.5 The owner/operator shall ensure that all labels are attached in a manner consistent with the manufacturer's recommendations.

## 14. Maintenance

14.1 *Equipment:*

14.1.1 The designer or manufacturer shall provide the owner/operator with clear and concise inspection, maintenance, and repair instructions, including, but not limited to, what, when, and how to inspect, maintain, and repair the equipment, including hazard alerting labels.

14.1.2 The manufacturer's maintenance instructions shall include recommendations for safe, non-flammable, non-toxic cleaning and sanitizing processes known to be compatible with the materials used in the construction of the equipment.

14.1.3 The owner/operator shall maintain the equipment so that it is free from extraneous materials or other hazards which could cause injury, infection, or disease.

14.2 *Play Area Surfacing:*

14.2.1 The owner/operator shall maintain all surfacing within the play area free from extraneous materials that could cause injury, infection, or disease.

14.2.2 The owner/operator shall ensure that all impact attenuating surfacing meets the requirements of Specification F1292.

14.2.3 The owner/operator shall maintain all impact attenuating surfacing in accordance with the use and care instructions provided by the manufacturer of that impact attenuating surfacing material.

14.3 *Records*—The owner/operator shall establish and maintain detailed installation, inspection, maintenance, and repair records for play equipment, play areas, and surfacing.

## 15. Keywords

15.1 child care center; children; children under two years; day care center; early care and education centers; impact absorbing surfacing; impact attenuating; impact attenuating surfacing; indoor surfacing; infants; labels and signs; play equipment; playground; portable public use play equipment; protective surfacing; public use play equipment; safety surfacing; surfacing; toddlers; use zones and equipment placement

ANNEX

(Mandatory Information)

A1. FIGURES

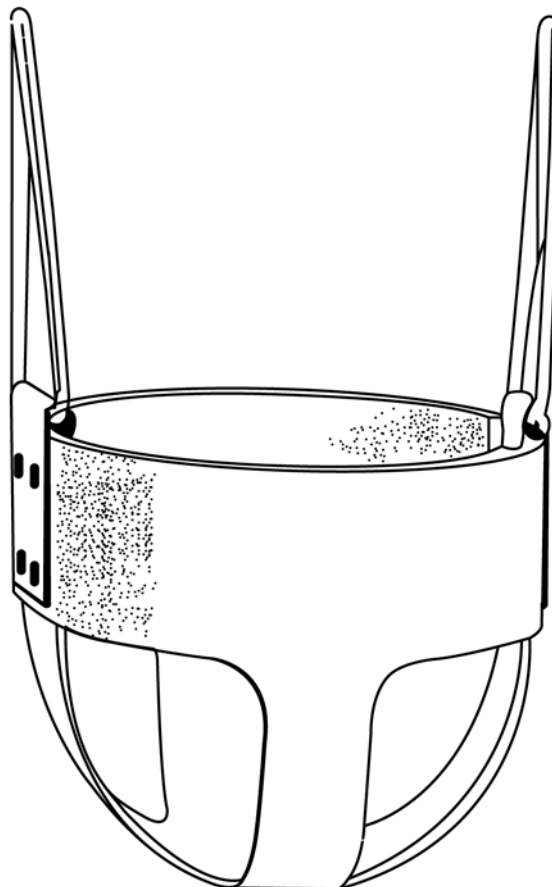
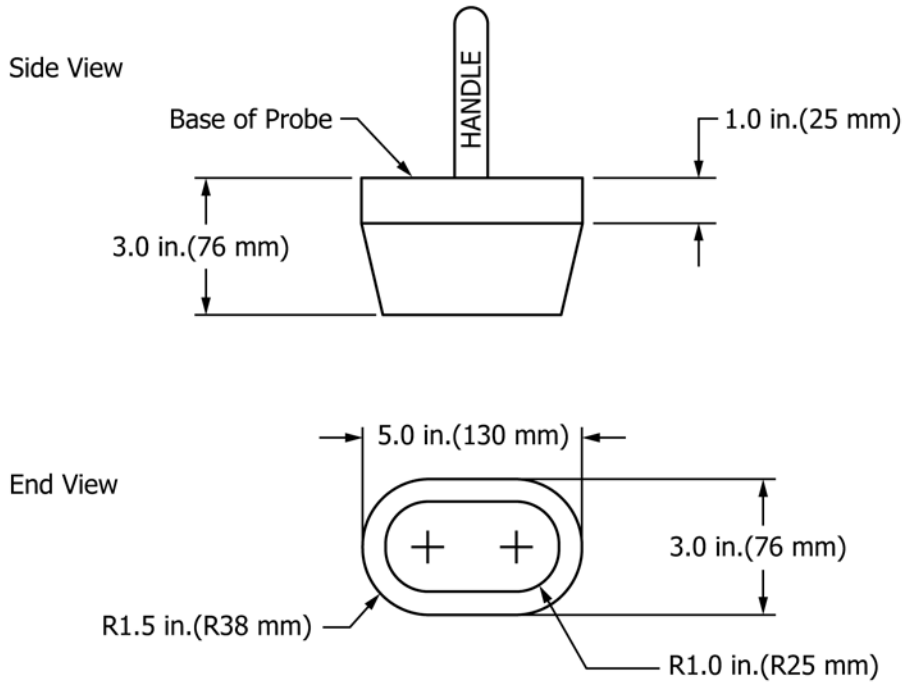


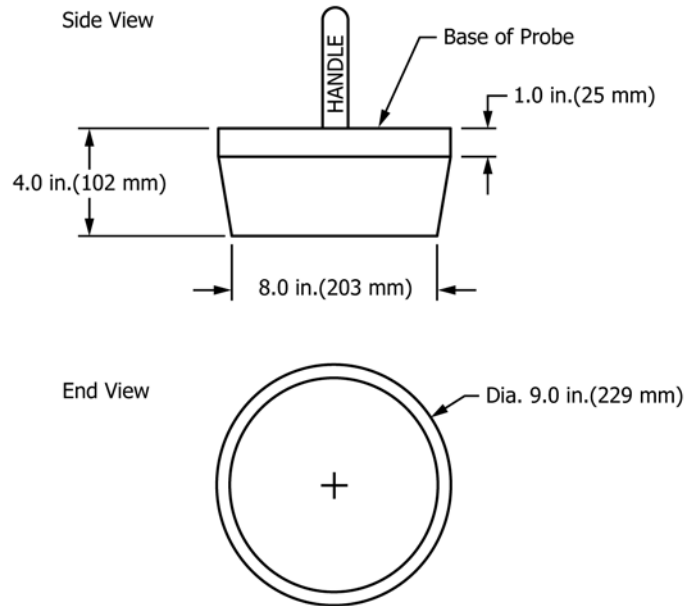
FIG. A1.1 Illustration of Fully Enclosed Swing Seat  
Reference Section 3.1.18



Probe to be made of any rigid material

**FIG. A1.2 Infant Torso Probe**

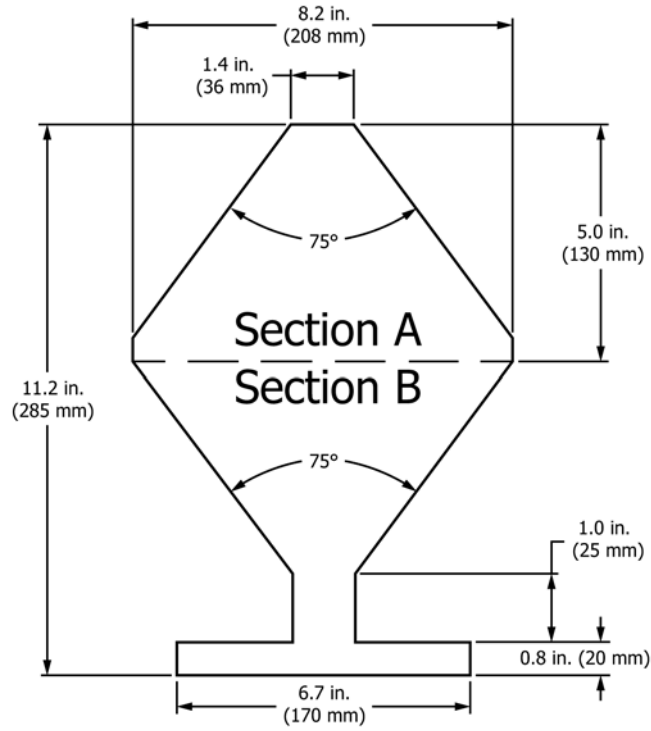
Reference Sections **6.1, 6.1.1, 6.1.1.1, 6.1.2, 6.1.2.1, 7.2.1, 8.2.1, 8.3.5, 9.5.3.2**



Material: Any Rigid Material

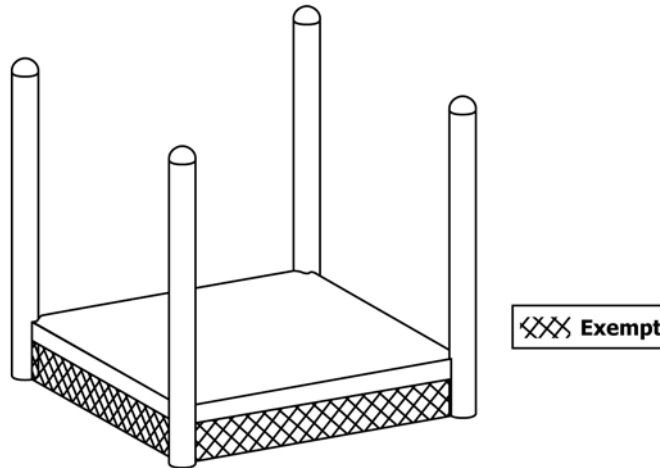
**FIG. A1.3 Head Probe**

Reference Sections **6.1, 6.1.1.1, 6.1.2, 6.1.2.1, 6.1.3, 6.1.4.2**

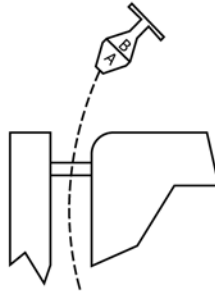


NOTE 1—Any rigid material with a thickness of 0.6 in. (15 mm).

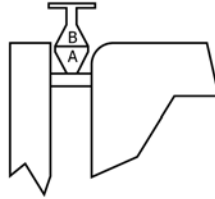
**FIG. A1.4 Infant Template for Partially Bounded Openings**  
Reference Sections 6.1, 6.1.4.1, X1.4.3



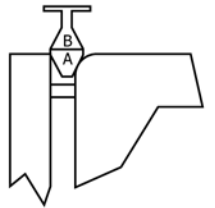
**FIG. A1.5 Exemption from Head and Neck Entrapment Requirements**  
Reference Section 6.1



Insert the "A" section of the probe into the opening with its centerline aligned with the centerline of the opening

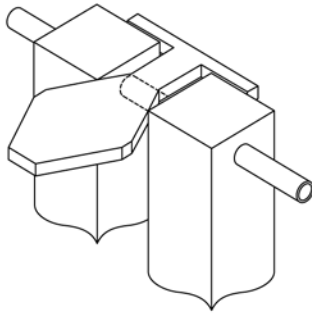


PASS - Bottom of the "A" section of the test probe has contacted the lower boundary of the opening. There is no simultaneous contact between the opposing sides of the probe and the sides of the boundaries of the opening.

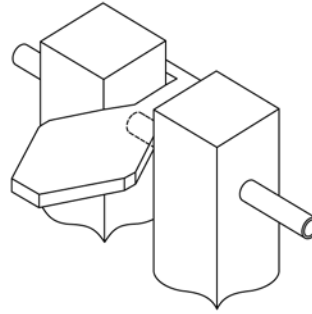


FAIL - Simultaneous contact between opposing sides of the "A" section of the test probe and the side boundaries of the opening. Test the opening using the "B" section of the probe.

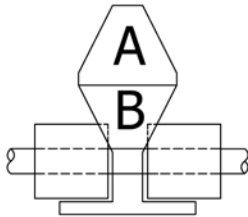
**FIG. A1.6 Inserting the Template into the Opening**  
Reference Section **6.1.4.1**



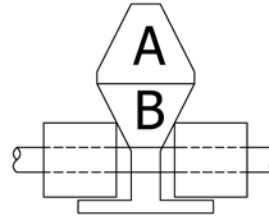
PASS - Depth of the opening is less than 0.6 in.(15 mm)



FAIL - Depth of the opening is greater than 0.6 in.(15 mm) and is considered accessible



PASS - Components forming the opening are too thick to allow the "B" section of the probe to enter the opening to a depth equal or greater than 0.6 in. (15 mm).



FAIL - Thickness of the components forming the opening allow the "B" section of the probe to pass into the opening to a depth greater than 0.6 in. (15 mm) thick.

FIG. A1.7 Determining If Opening Presents Neck Entrapment Hazards  
Reference Section 6.1.4.1

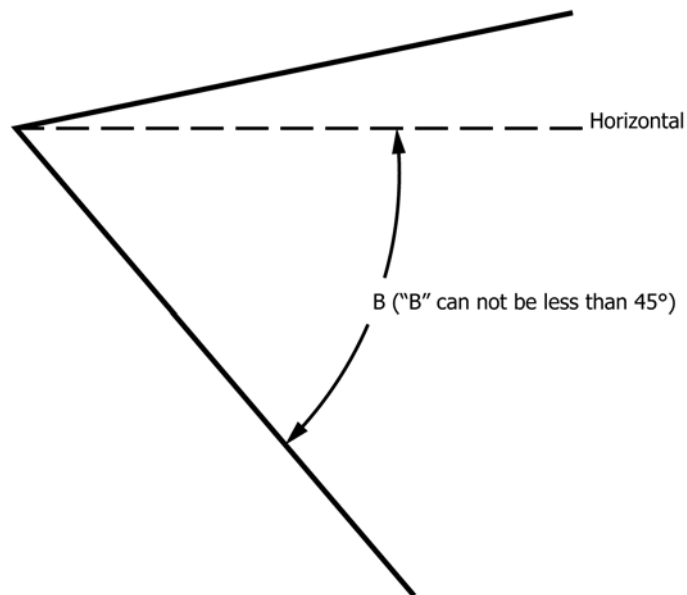
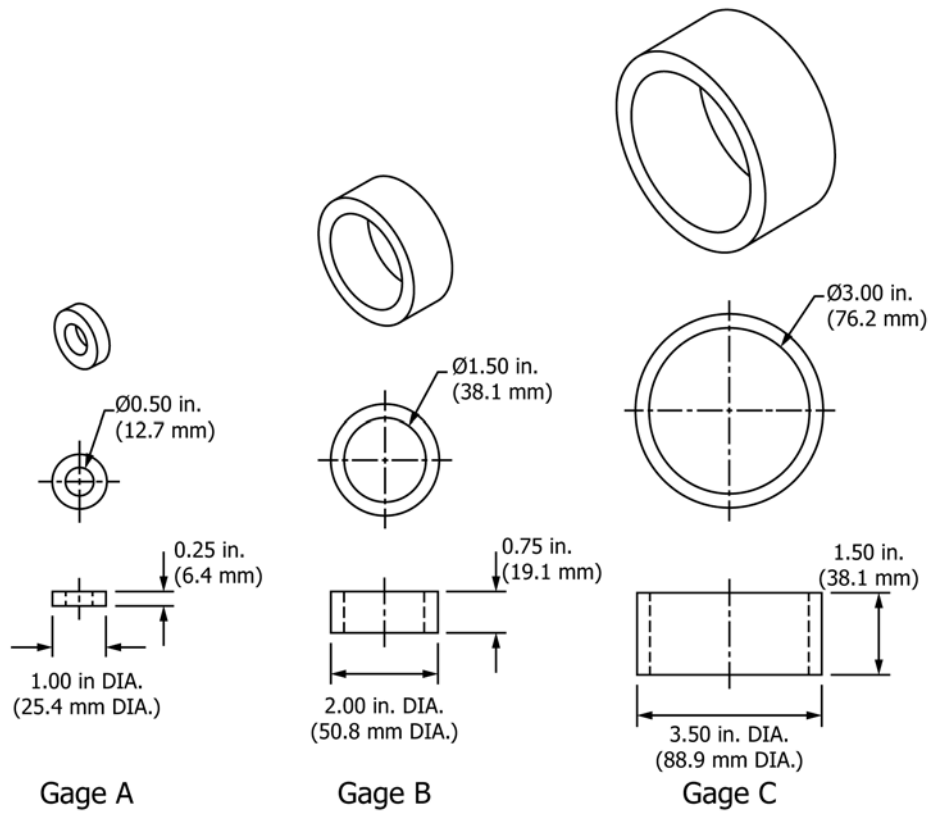
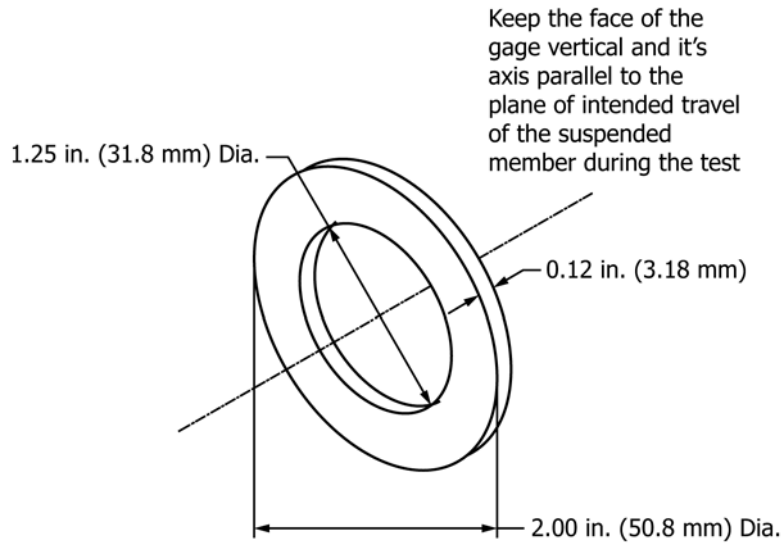


FIG. A1.8 Downward Angle Exemption for Partially Bounded Openings  
Reference Section 6.1.4.2

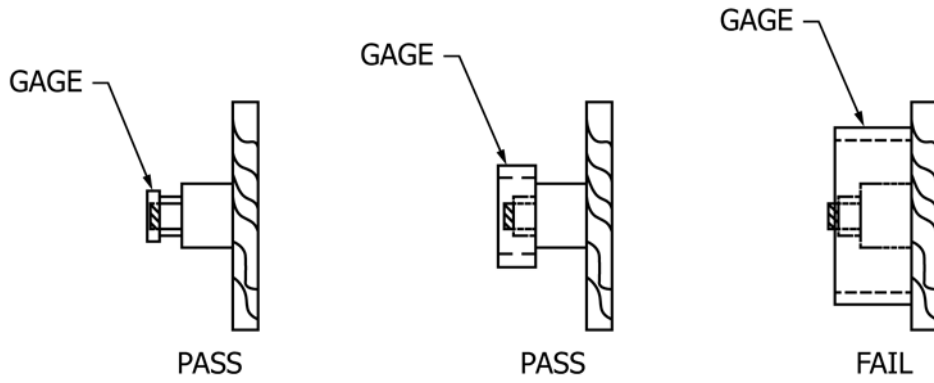


**FIG. A1.9 Protrusion Test Gages**  
 Reference Sections 6.3, 6.3.1.1, 6.4.1.1, 6.4.3, 6.4.4, Fig. A1.15, Fig. A1.16



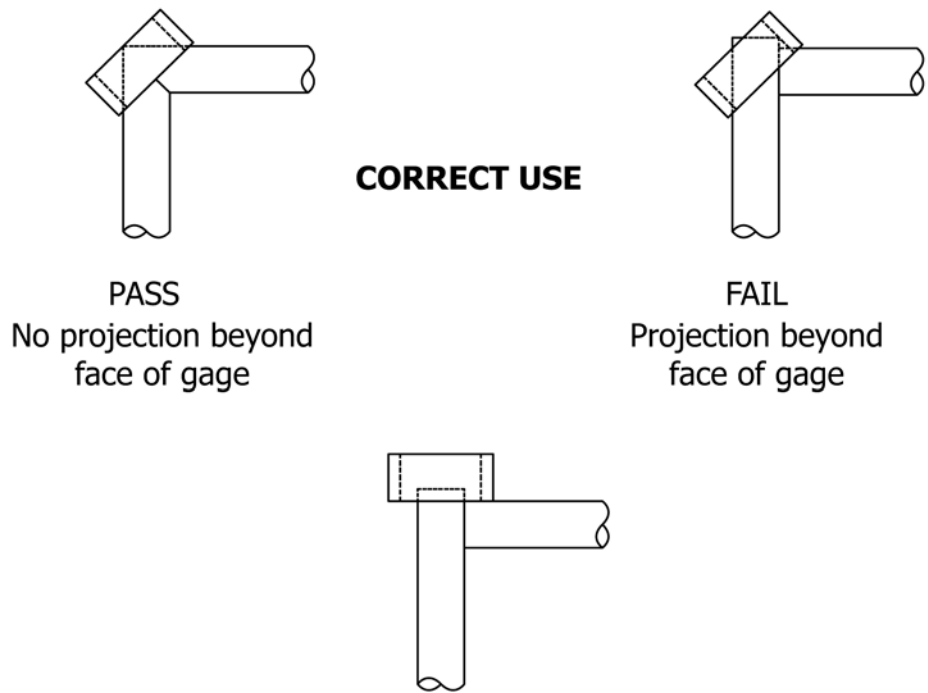
NOTE: Gage made of any rigid material.  
**FIG. A1.10 Protrusion Test Gage (Gage D)**  
 Reference Sections 6.3, 6.3.1.3, 6.4.1.1, Fig. A1.14





NOTE 1—For compound protrusions, successively place the gages over increasing diameters to determine compliance.

**FIG. A1.11 Compound Protrusion Test**  
Reference Section 6.3.1.1



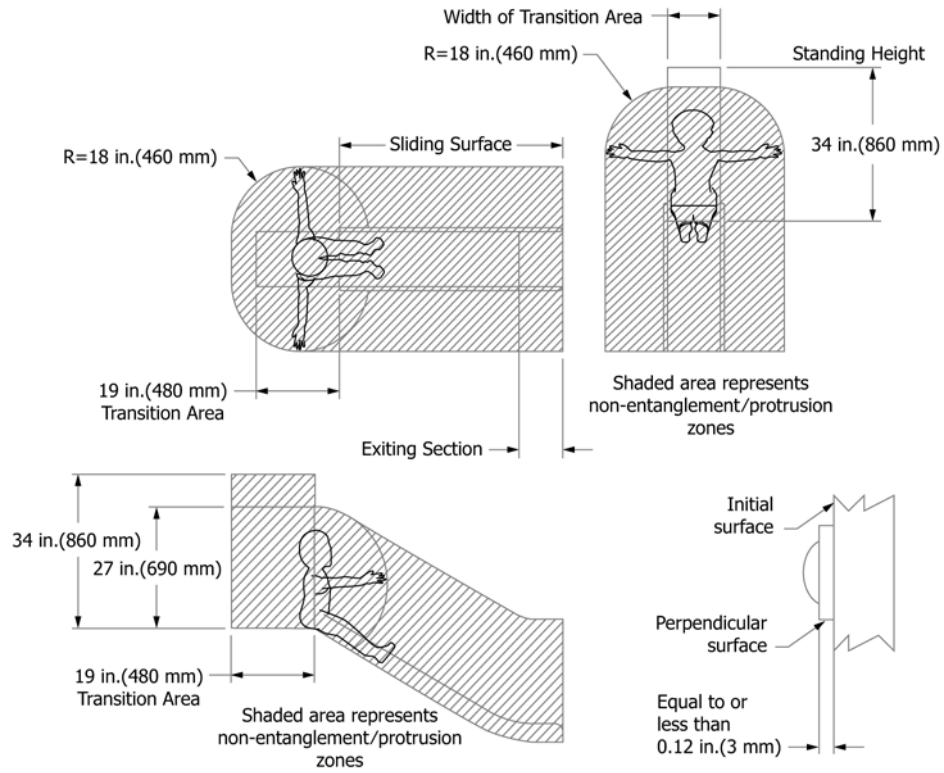
**PASS**  
No projection beyond  
face of gage

**CORRECT USE**

**FAIL**  
Projection beyond  
face of gage

**INCORRECT USE**

**FIG. A1.12 Use of Protrusion Gages**  
Reference Section 6.3.1.1



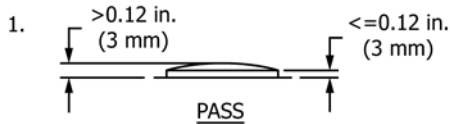
No projections shall extend perpendicular from the initial surface more than 0.12 in. (3 mm).

NOTE 1—Measurement based on 95th percentile 23 month old.

NOTE 2—Bottom of slide is exempt from requirements of the non-entanglement zone.

NOTE 3—Use Fig. A1.20 to determine the bottom of a continuously curved slide section.

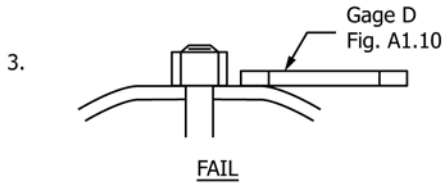
**FIG. A1.13 Area Subject to the Requirements of 6.4.1**  
Reference Section 6.4.1



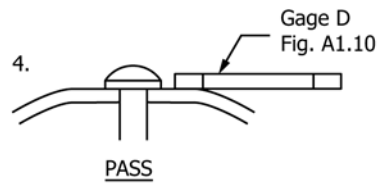
Fits within one of the (3) protrusion gages. Projects upward from a horizontal plane - perpendicular projection is  $\leq 0.12$  in.(3 mm), curved upper surface does not project perpendicular to the plane of the initial surface.



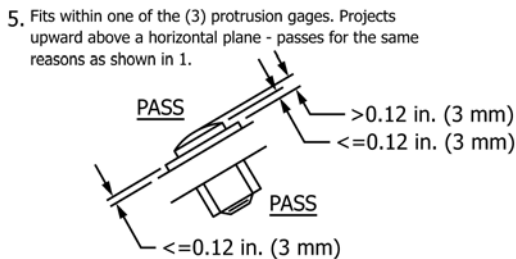
Fits within one of the (3) protrusion gages. Each of three surfaces project upwards from a horizontal plane  $\leq 0.12$  in.(3 mm) - O.K. Rivet head has the same characteristics as in 1, therefore it passes the entanglement test for projections from a horizontal plane.



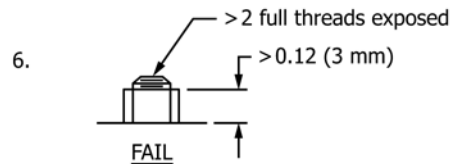
Fits within one of the (3) protrusion gages. Passes bolt end projection test -  $< 2$  threads exposed. Fails entanglement test - projection upwards from a horizontal plane perpendicular to plane of initial surface  $> 0.12$  in.(3 mm).



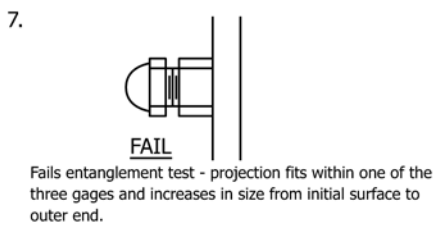
Fits within one of the (3) protrusion gages. Passes entanglement test - projection from a horizontal plane - for the same reasons shown in 1.



Passes bolt end projection test -  $\leq 2$  threads exposed. Projects downward below horizontal plane - not subject to entanglement requirement of projecting above a horizontal plane



Fits within one of the (3) protrusion gages. Fails (2) entanglement tests - Projects upward from a horizontal plane perpendicular to plane of initial surface  $> 0.12$  in.(3 mm) and fails exposed bolt end projection  $> 2$  full threads.



Fails entanglement test - projection fits within one of the three gages and increases in size from initial surface to outer end.

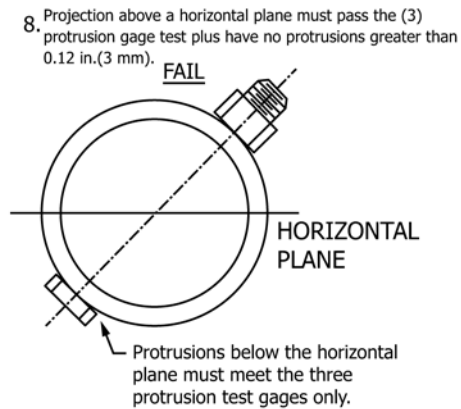
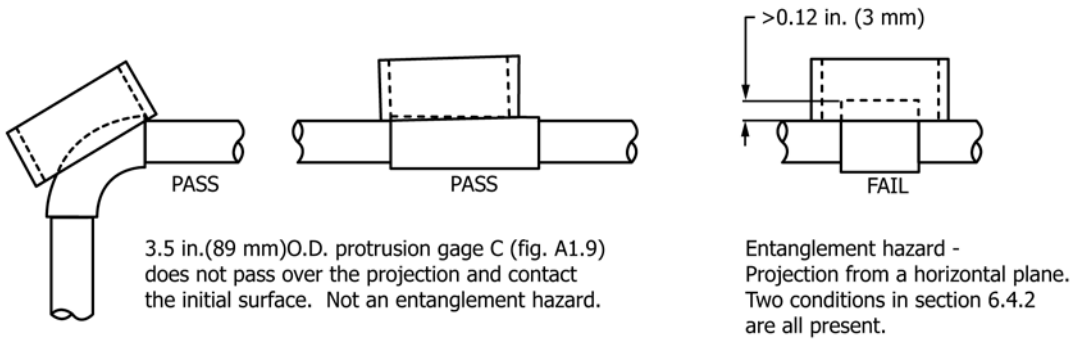
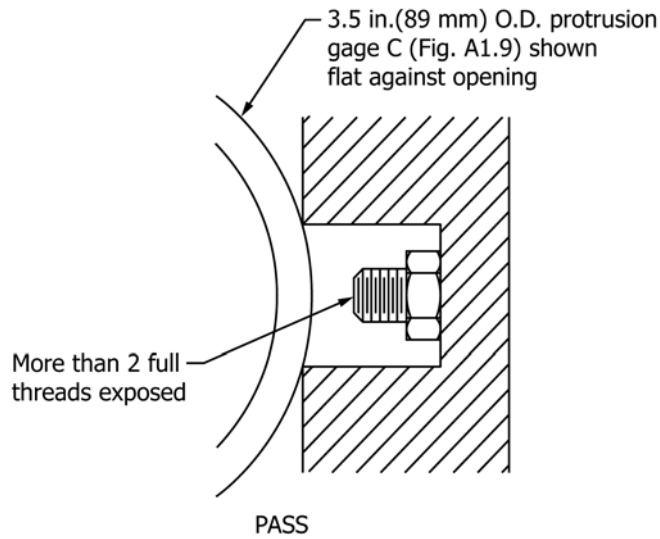


FIG. A1.14 Entanglement Test Requirement Examples  
Reference Sections 6.4.1, 6.4.2, 6.4.4, Fig. A1.10



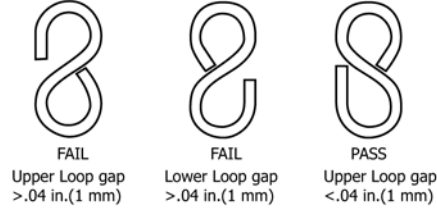
**FIG. A1.15 Entanglement Test Requirement Examples**  
Reference Sections 6.4.1, 6.4.2, Fig. A1.9



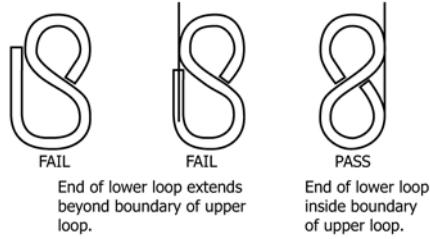
Bolt end is recessed, 3.5 in.(89 mm) O.D. protrusion gage C cannot be made to contact it - Not an entanglement hazard.

**FIG. A1.16 Entanglement Test Requirement Examples**  
Reference Sections 6.4.1, 6.4.3, Fig. A1.9

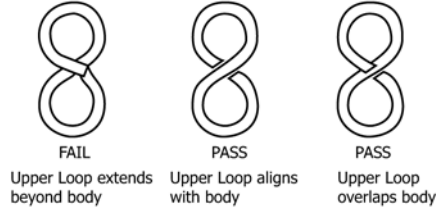
1. Checking loops for .04 in. (1 mm) gap.



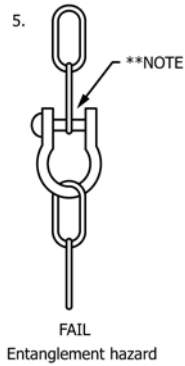
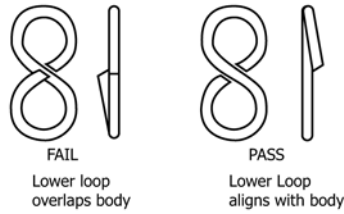
2. Both ends closed - checking lower projection.



3. Both ends closed - lower loop projection O.K. - checking upper loop

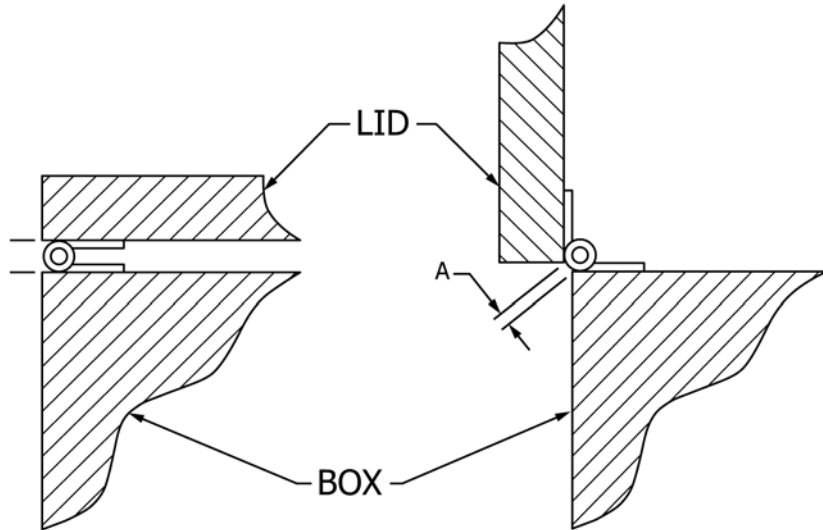


4. Both loops closed. Lower loop projection O.K. Upper loop O.K. - checking lower loop alignment.



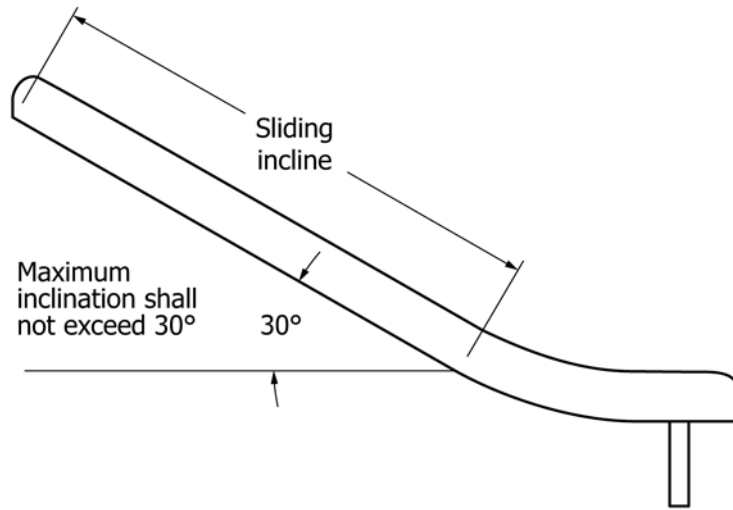
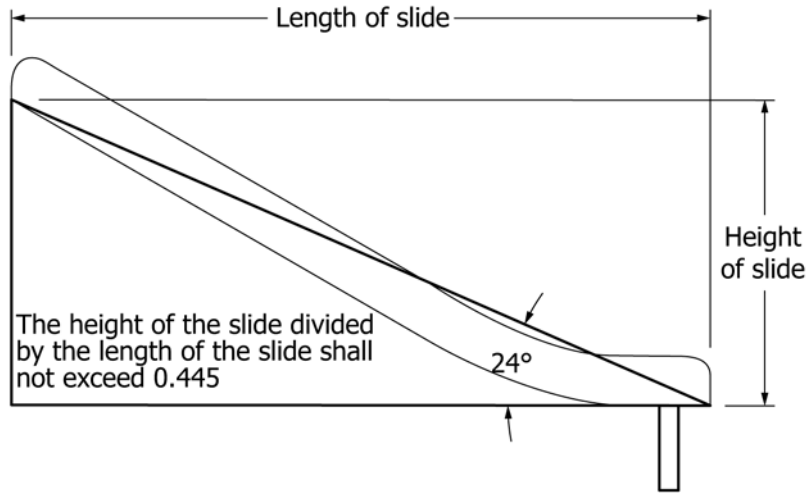
\*\*NOTE - Clearance between inside face of chain and clevis is greater than .04 in.(1 mm)

**FIG. A1.17 Requirements for Hooks**  
**Reference Sections 6.4.5, 6.4.5.1**



A=Hinge Clearance At Hinge Line

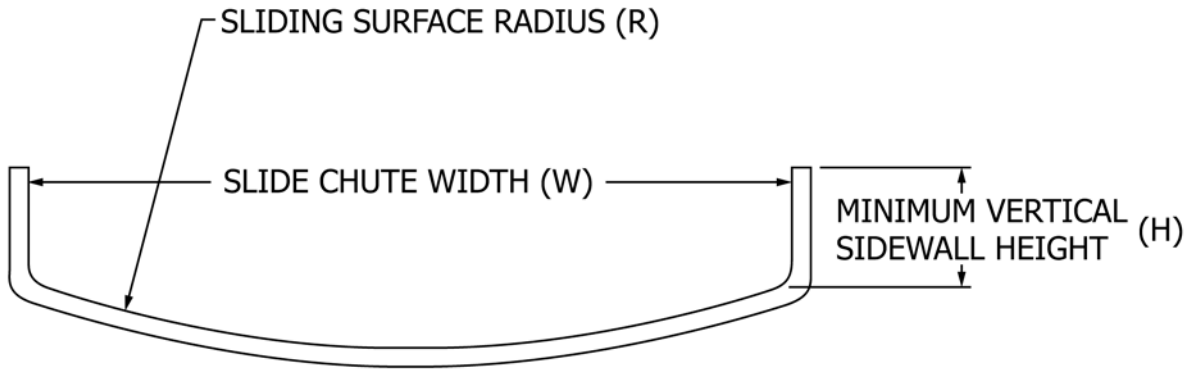
FIG. A1.18 Hinge Line Clearance  
Reference Section 6.5.2



NOTE 1—The top of the slide shall be the point where the incline exceeds 2° below the horizontal.

**FIG. A1.19 Height Length Ratio of Sliding Surfaces**

Reference Sections 9.3.4.1, 9.3.4.2, 10.5.1



$$H \text{ (IN)} = 4 - (2W/R)$$

Formula for Minimum Vertical Sidewall Height

FIG. A1.20 Formula for Minimum Vertical Sidewall  
 Reference Sections 9.3.4.3, 9.3.4.5  
 Reference Fig. A1.13, Note 3

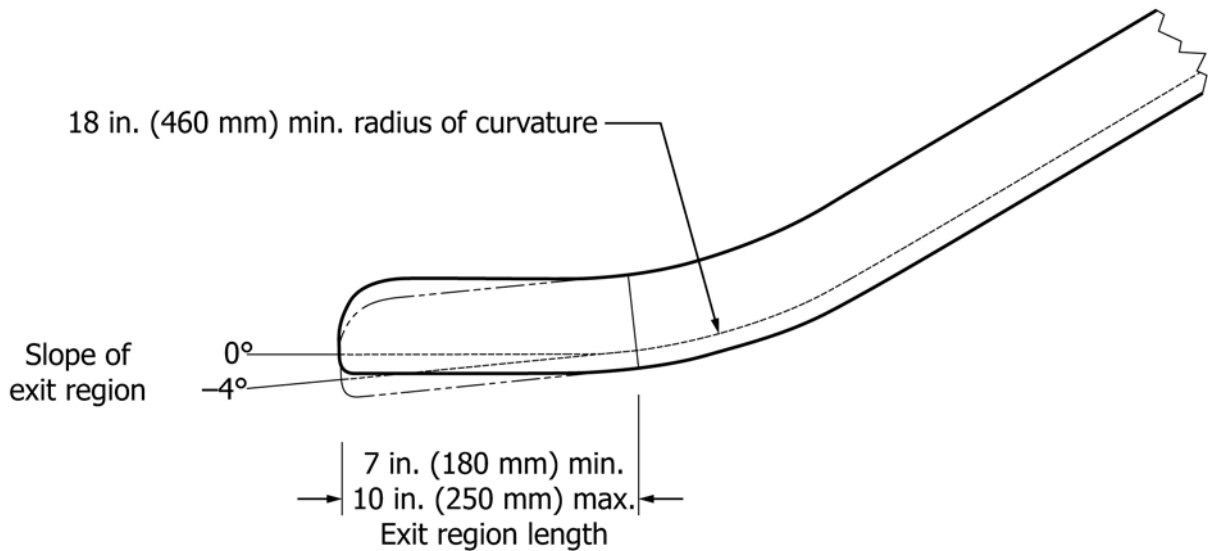


FIG. A1.21 Slide Exit Requirements  
 Reference Sections 9.3.5, 9.3.5.4



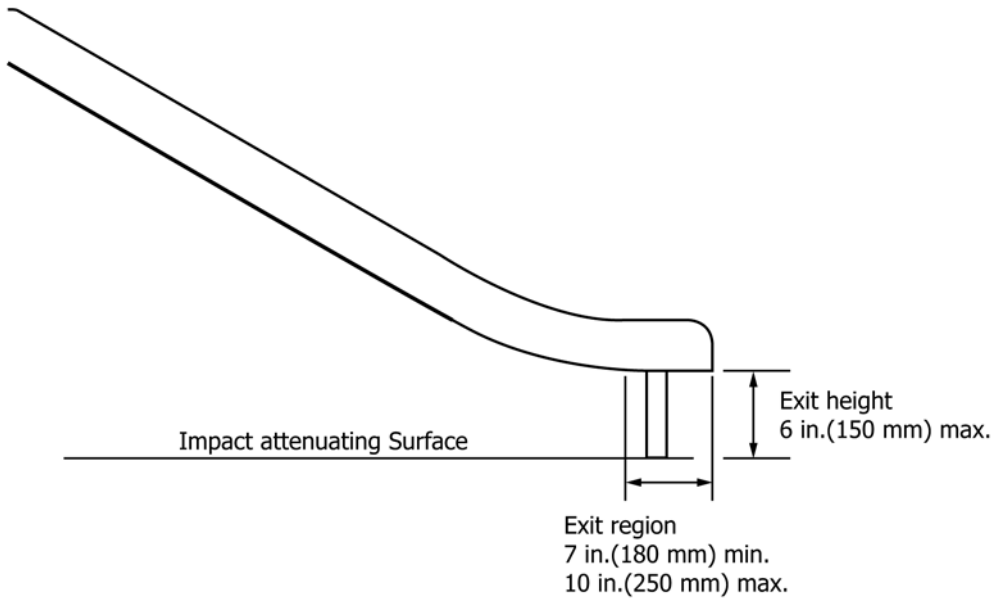
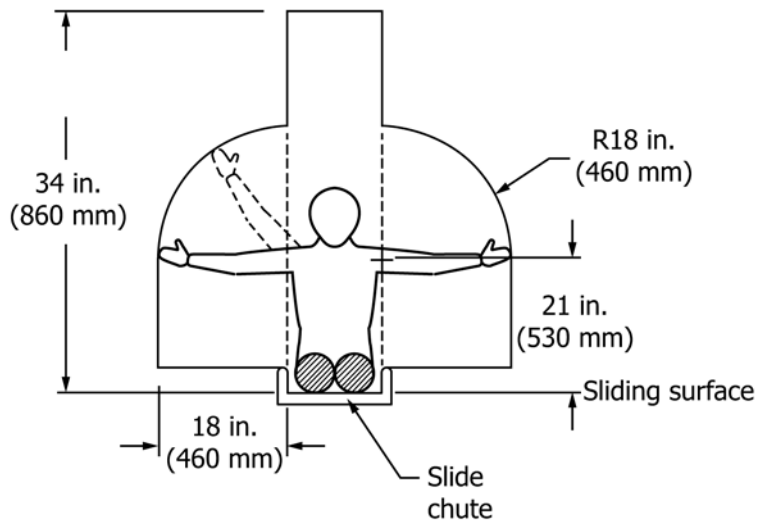
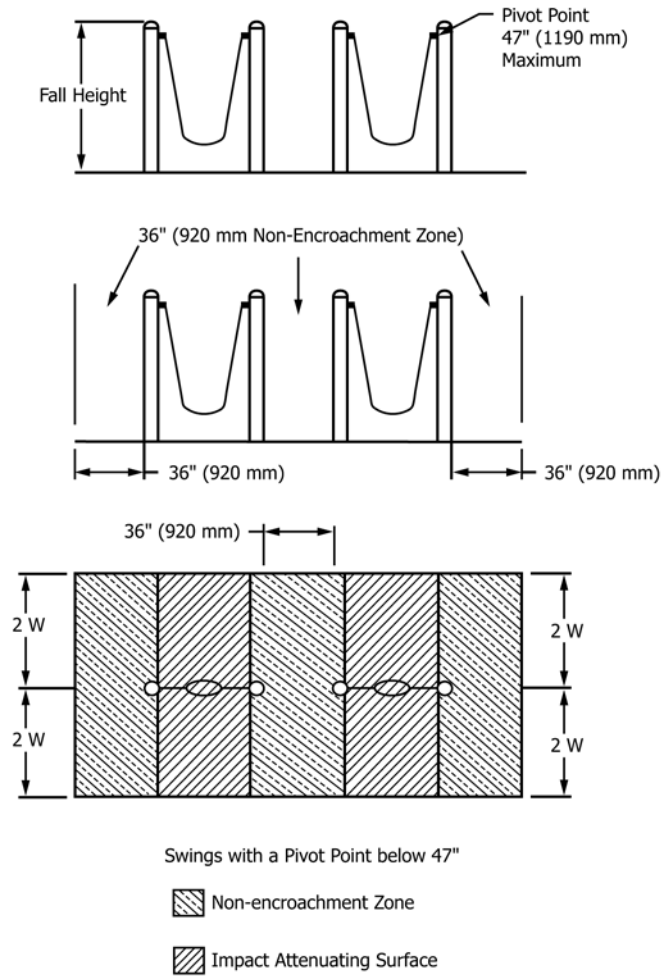


FIG. A1.22 Height and Length of Slide Exit Region  
Reference Sections 9.3.5.1, 9.3.5.2

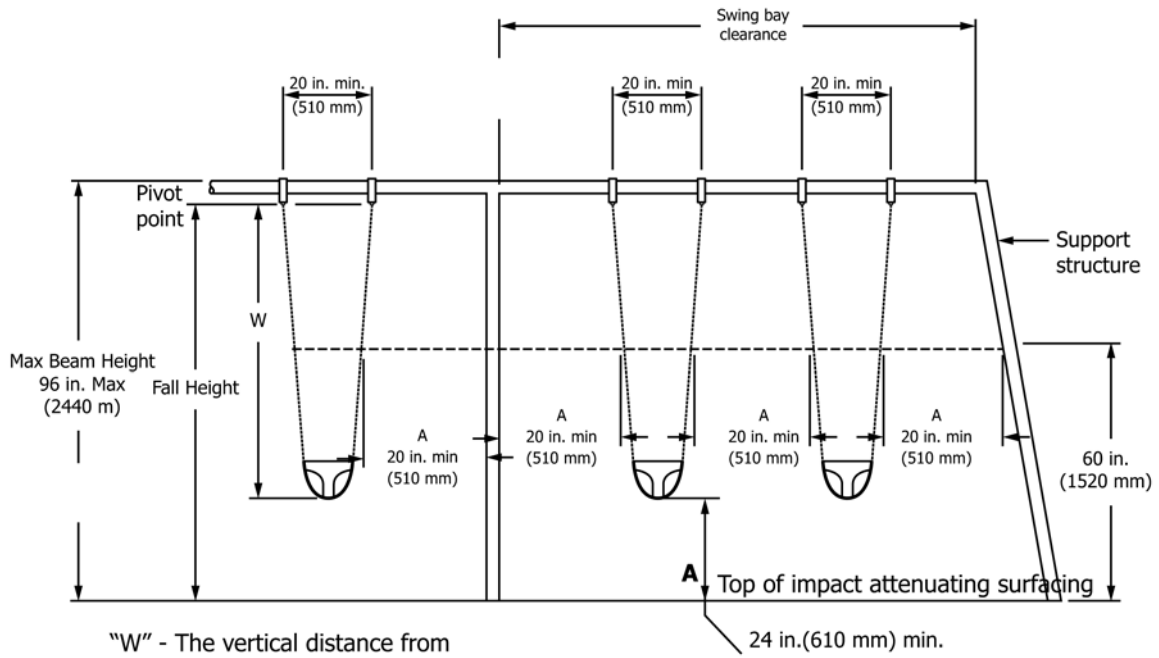


Slide clearance

FIG. A1.23 Slide Clearance Zone  
Reference Section 9.3.6.1

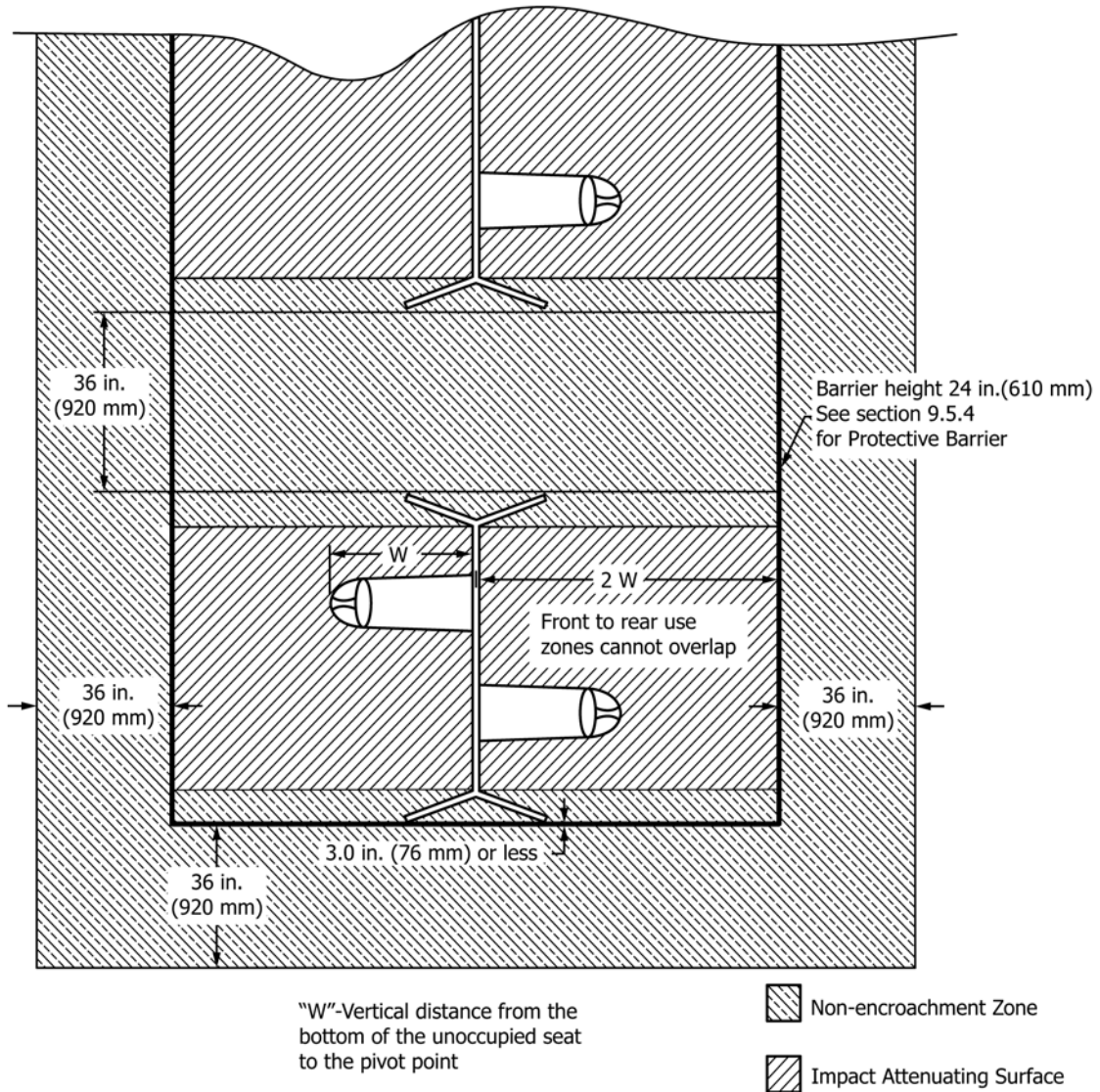


**FIG. A1.24 Swings with a Pivot Point Below 47 in. (1190 mm) without a Top Beam**  
 Reference Sections **9.5, 9.5.2, 11.3.1, 11.3.2, 11.7.1.1, 11.7.1.5, 11.7.2.1**

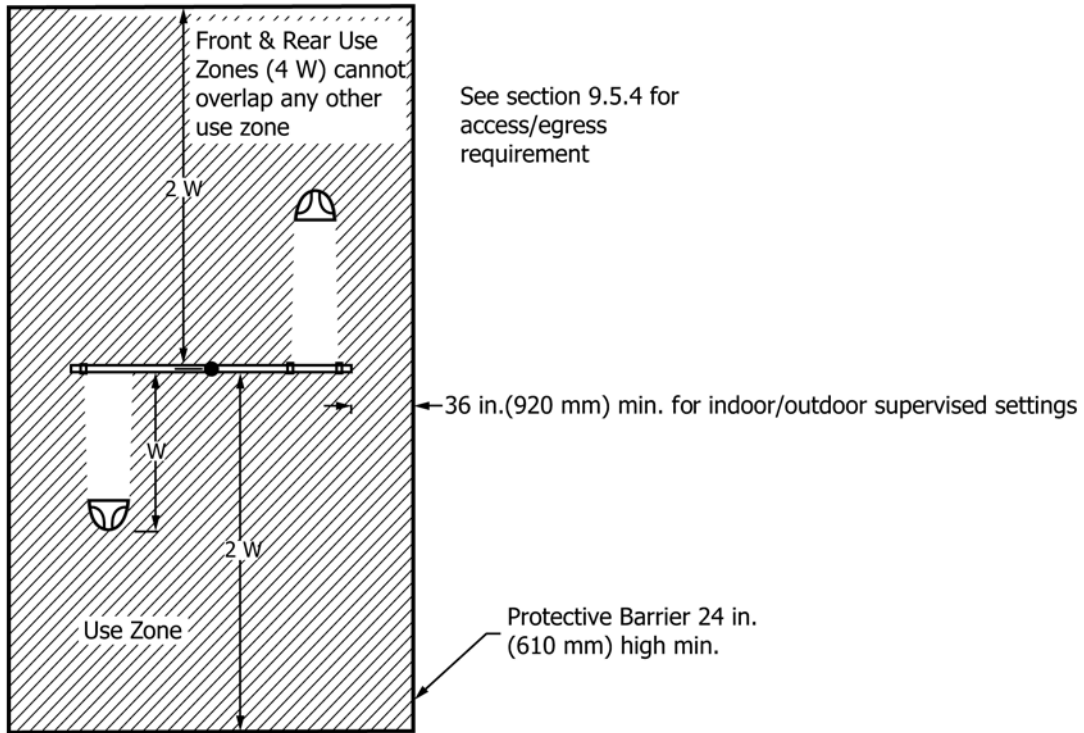


"W" - The vertical distance from the bottom of the unoccupied seat to the pivot point.

FIG. A1.25 Clearances for To-Fro Swings with Fully Enclosed Seats—Elevation View  
Reference Sections 9.5, 9.5.3, 9.5.3.3, 11.7.1.2



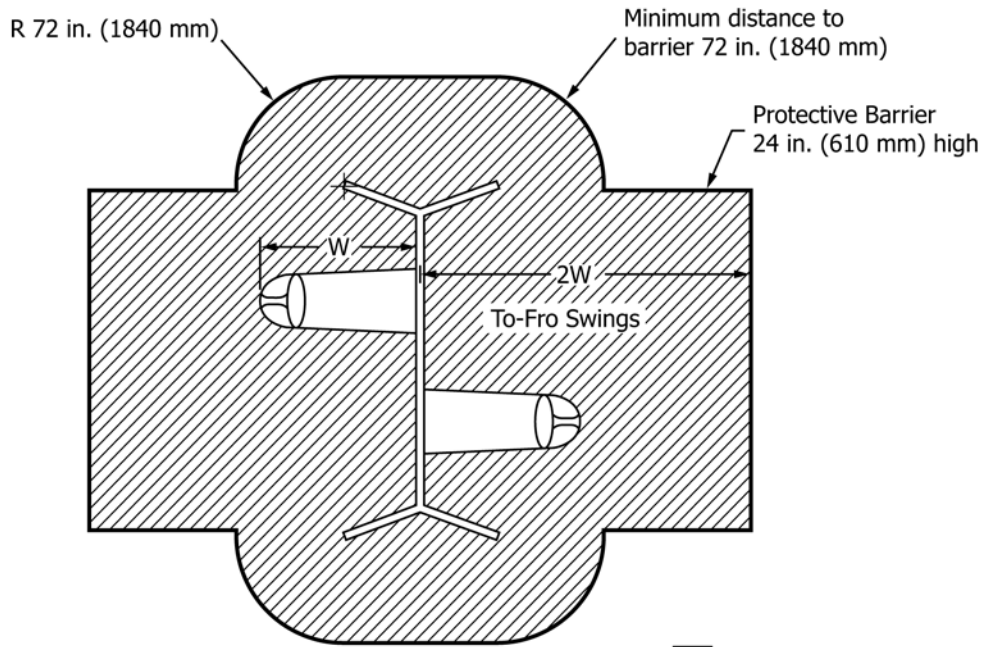
**FIG. A1.26 Indoor and Outdoor Supervised Settings: Use Zones and Non-Encroachment Zones for To-Fro Swings with a Pivot Point Higher than 47 in. (1190 mm) Plan View**  
**Reference Sections 9.5, 9.5.3, 9.5.3.4, 9.5.4.4, 11.3.1, 11.3.2, 11.7.1.2, 11.7.1.3, 11.7.1.4, 11.7.1.5**



Indoor or Outdoor Supervised Settings

 Impact Attenuating Surface

**FIG. A1.27 Indoor and Outdoor Supervised Settings: Use Zones for To-Fro T Swings with Pivot Point Higher Than 47 in. (1190 mm) Plan View**  
**Reference Sections 9.5, 9.5.3, 9.5.3.4, 9.5.4.4, 11.7.1.2, 11.7.1.6**  
**See Section 9.5.4.2 for Protective Barrier Requirements**



 Impact Attenuating Surface

FIG. A1.28 Outdoor Unlimited Access Settings: Use Zones for To-Fro Swings with a Pivot Point Higher than 47 in. (1190 mm) Plan View  
Reference Sections 9.5, 9.5.3, 9.5.3.4, 9.5.4.5, 11.7.2.2, 11.7.2.4

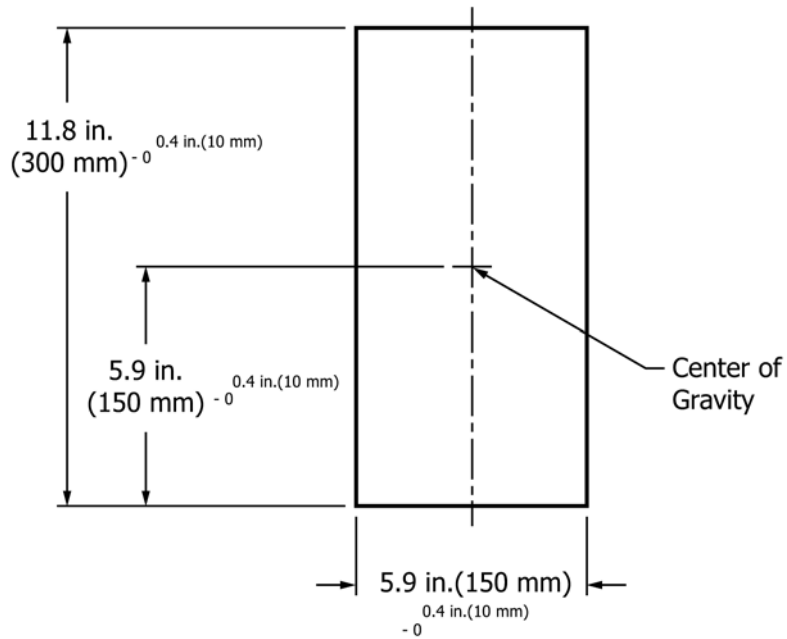


FIG. A1.29 Load for Stability Testing  
Reference Sections 10.1.4.2 and 10.5.2

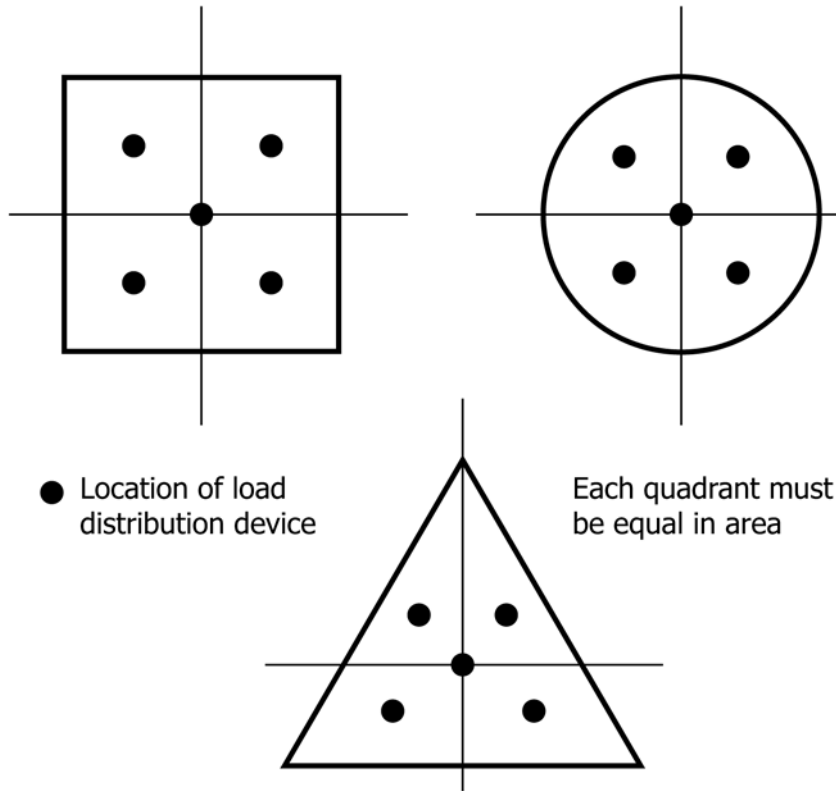


FIG. A1.30 Platform Load Test—Load Placement Layout  
Reference Section 10.3.1.1

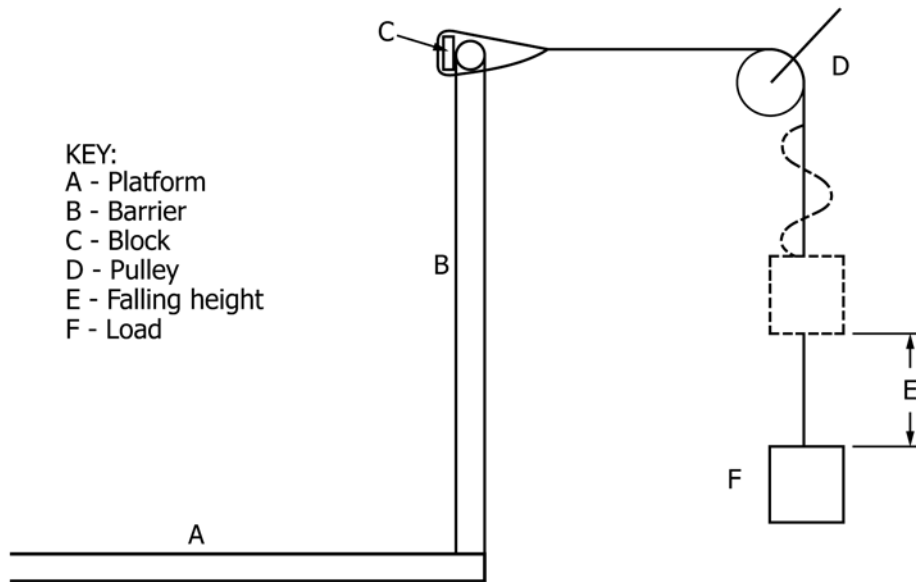


FIG. A1.31 Dynamic Load Test Apparatus  
Reference Section 10.4.2

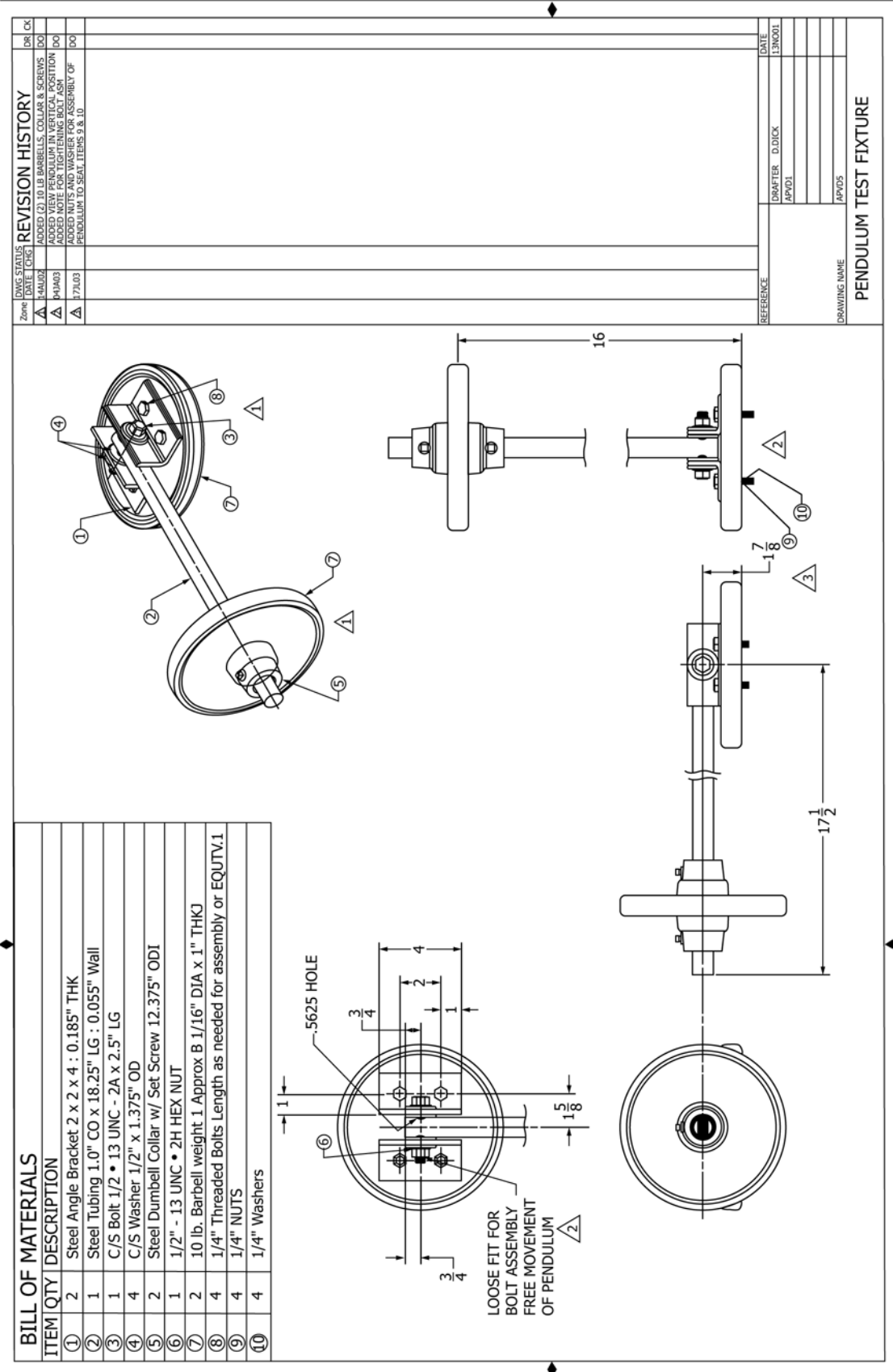


FIG. A1.32 Pendulum Test Fixture  
Reference Section 10.7.2.3, 10.7.2.4, 10.7.3.3, 10.7.3.4



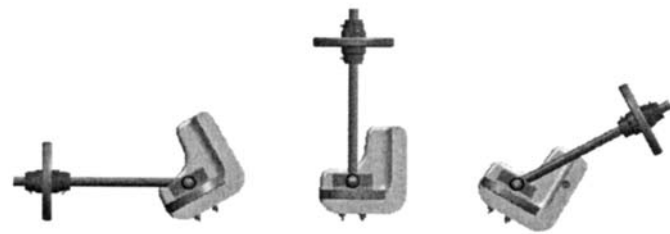
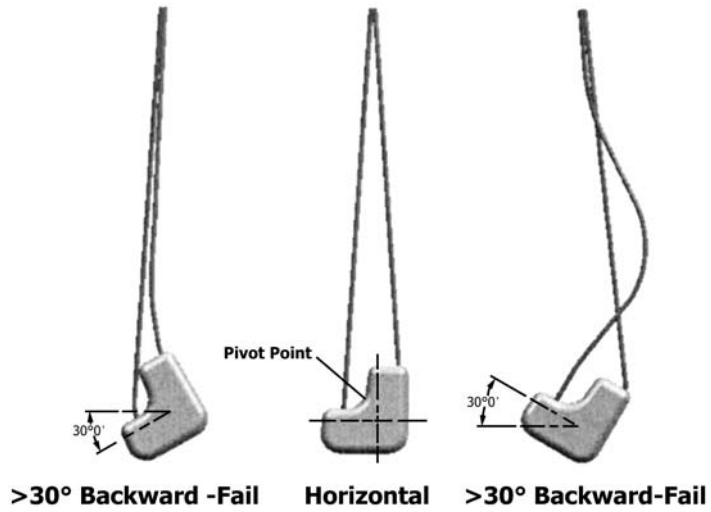


FIG. A1.33 Pass/Fail Criteria for Partially Enclosed and Fully Enclosed Swing Seats  
Reference Section 10.7.2.3, 10.7.3.3

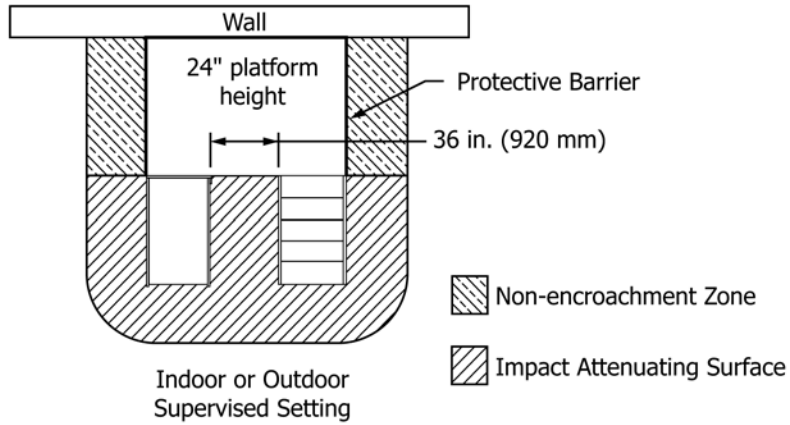


FIG. A1.34 Play Structure Against a Wall in Indoor or Outdoor Supervised Settings  
Reference Sections 11.2.2, 11.2.3, 11.3.1, 11.4.1.4, 11.5.1.2

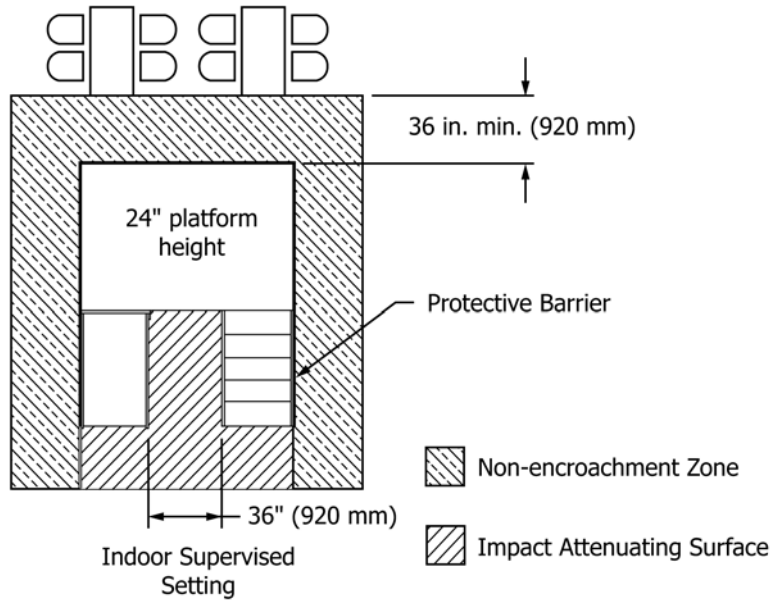
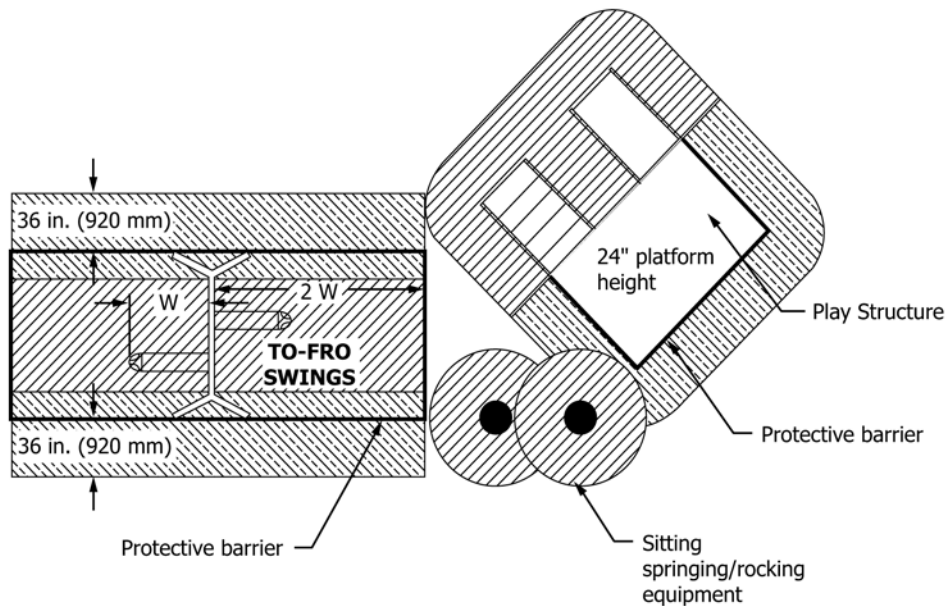


FIG. A1.35 Play Structure with Protective Barrier—Indoor Supervised Setting  
Reference Sections 11.2.3, 11.3.1, 11.4.1.4, 11.5.1.2



Note: It is recommended that shade be provided in all outdoor play areas (see Section 11.10.7).

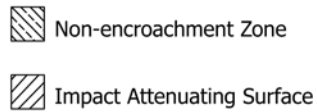
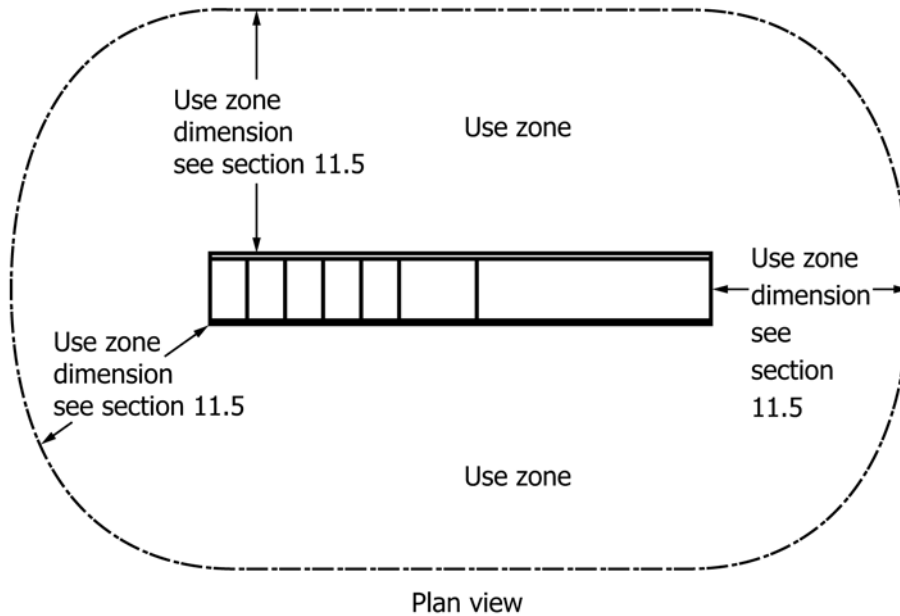


FIG. A1.36 Placement of Equipment in Outdoor Supervised Settings  
Reference Sections 11.3.1, 11.4.1.2, 11.4.1.4, 11.6.1, 11.7.1.4



Plan view  
**FIG. A1.37 Use Zones for Slides**  
 Reference Sections 11.5.1, 11.5.2

## APPENDIX

### X1. RATIONALE

#### INTRODUCTION

Unless otherwise specified, all anthropometric data referenced in this section came from Childdata (1). All references in the rationale that are not listed in Section 2 are listed in the bibliography at the end of this specification.

#### X1.1 Section 1—Scope

X1.1.1 1.1 – 1.3—Pre-walking progression, crawling, and climbing begin by 6 months and therefore children are capable of getting themselves into situations where they are exposed to potential death or debilitating injury (2).

X1.1.2 1.4—This is consistent with Consumer Safety Performance Specification F1148.

#### X1.2 Section 4—Materials and Manufacture

X1.2.1 4.2.3.1—This is consistent with Consumer Safety Performance Specification F1487 and the Code of Federal Regulations.

X1.2.2 4.3.1.2—Given the target age range for this specification, it is appropriate to consider that children will gain access not only to the paint or other surface materials, but also to the underlying (substrate) material.

X1.2.3 4.3.1.2—Table 1—This is consistent with Consumer Safety Specification F963.

X1.2.4 4.4—This is consistent with Consumer Safety Specification F963.

#### X1.3 Section 5—General Requirements

X1.3.1 5.2—This is consistent with Consumer Safety Specification F963 and the Code of Federal Regulations.

X1.3.2 5.3—This is consistent with Consumer Safety Specification F963 and the Code of Federal Regulations.

#### X1.4 Section 6—Performance Requirements

X1.4.1 6.1—The size of the infant torso probe is based on Childdata (1) that states that the 3 in. dimension of the infant torso probe is the buttock depth dimension and the 5 in. dimension is the hip breadth.

X1.4.2 6.1—The dimensions of the infant template (see Fig. A1.4) were determined as follows:

(1) The 1.4 in. (36 mm) dimension represents the neck breadth of the minimum user (1.9 in.) minus 25 % to allow for tissue compression.

(2) The 0.6 in. (15 mm) template thickness represents one-half the neck depth of the minimum user ( $0.5 \times 1.6$  in. = 0.8 in.) minus 25 % to allow for tissue compression ( $0.8 - (0.25 \times 0.8) = 0.6$ ).

(3) The 1.0 in. dimension represents the neck length of the maximum users. Specific measurements for the neck length are

not included in the referenced anthropometric report. The 1.0 in. dimension was derived by subtracting head height (7 in.) from the top-of-the-shoulder to top-of-head measurement (8 in.).

(4) The 6.7 in. dimension is the shoulder breadth of a minimum user.

X1.4.2.1 **6.1**—The dimensions referenced above were obtained from: (1) Physical Characteristics of Children as Related to Death and Injury for Consumer Product Design and Use (3), and (2) Size and Shape of the Head and Neck from Birth to Four Years (4).

X1.4.2.2 **6.1**—The 75° angle was chosen because the US CPSC is aware of a fatal entrapment incident that occurred when an 11-month-old child became caught by the neck in a “V” shaped opening in the top edge of an accordion style baby gate. The included angle at the base of the “V” in that incident was reported to be 71°.

X1.4.3 **6.1**—The exemption is consistent with Consumer Safety Performance Specification F1487.

X1.4.4 **6.1**—The 8.2 in. dimension represents the tip-of-chin to back-of-head measurement of a maximum user. Justification for this dimension is based on the premise that an opening wide enough to permit neck entry needs to be sufficiently wide to permit free passage of the head in any orientation. Note that the template in Consumer Safety Performance Specification F1487 has a width based on the head width of a 5-year-old child. This does not ensure against head entrapment for a child under two in any orientation.

X1.4.5 **6.1.2.1**—The applied force of 30 lbf is consistent with the weight of the maximum user (1).

X1.4.6 **6.1.3**—This is consistent with Consumer Safety Performance Specification F1487. Since it is possible that there will be older children playing on the equipment, as a safety precaution, the head probe is based on the dimensions of the 95th percentile 5 year old.

X1.4.7 **6.1.4.2**—Because they have limited problem solving abilities and very little upper body strength, children this age can get trapped in openings that will not be a problem for older children. A 45° angle is self clearing.

X1.4.8 **6.5.1**—This is consistent with Consumer Safety Performance Specification F1148 with the dimensions reflecting a smaller user.

X1.4.9 **6.5.2**—This is consistent with Consumer Safety Specification F963.

X1.4.10 **6.6**—This is consistent with Consumer Safety Specification F963.

X1.4.11 **6.7.1**—This is consistent with Consumer Safety Specification F963.

X1.4.12 **6.8.1**—Neck dimensions were found in Childata (1).

**X1.5 Section 7—Requirements for Access and Egress**

X1.5.1 **7.1.1**—For arch ladders, children under two will fall through the rungs of arch climbing equipment.

X1.5.2 **7.1.1**—For rung ladders, age inappropriate. Children under two lack the necessary balance and gripping/grasping ability to use this component.

X1.5.3 **7.3.4**—Closed risers are to avoid head entrapment and to prevent children from reaching through stairways and stepladders. This would also help to prevent tripping and stepped-on fingers. Fig. X1.1 illustrates why entrapment provisions of Section 6 do not apply to closed riser configurations.

X1.5.4 **7.3.5**—Children under 15 months are cognitively and physically unable to negotiate stepladder angles steeper than 35°.

X1.5.5 **7.3.6**—Children under two lack the necessary skills to safely use flexible components.

X1.5.6 **7.5**—Children 6 months through 23 months are unstable on their feet and need to balance and support themselves with their hands. The smallest user will need a minimum hand support size of 0.6 in. for gripping and 1.2 in. for grasping. This section uses anthropometric data for the 5th percentile 6 month old, see Childata (1).

X1.5.7 **Table 2**—In regard to step ladder slope, the maximum slope of 65° is based on the anthropometric measurements of the maximum user from Childata (1), and the need for a child to place the full length of a foot on the tread (see Fig. X1.2).

X1.5.8 **Table 2**—In regard to the vertical rise on step ladders, the height of the riser is the most difficult part of the ladder for a young child to manage, especially when the child is using the ladder for egress. After reviewing anthropometric data from Childata (1), it was decided to make the maximum height of a riser 7 in.

X1.5.9 **Table 2**—In regard to vertical rise in stairways, it is important for balance that when descending, a child be able to place the full length of the first foot as well as most of the second foot on the tread. Therefore, the minimum depth of the tread should be 8 in. This requirement also takes into consideration children who are crawling up and “bumping down” on

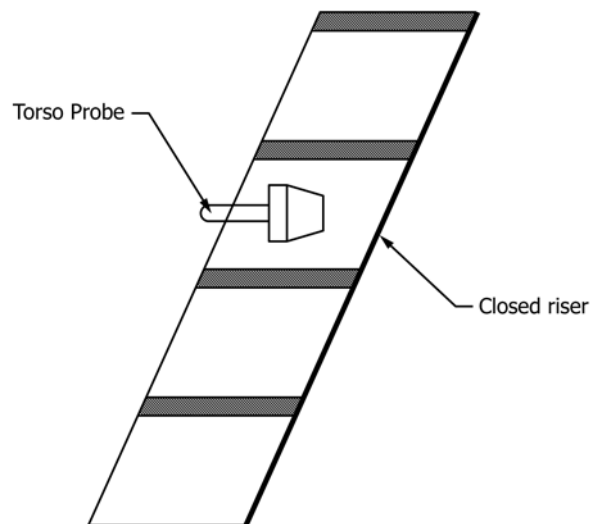


FIG. X1.1 Closed Riser

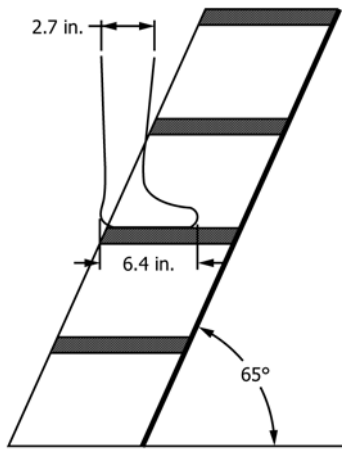


FIG. X1.2 Stepladder Example

to hang from his or her arms for a maximum of 38 s. This would imply that the same child does not have the ability to pull up and over a non-climbable barrier that is above the child’s center of gravity.

X1.6.3 **Table 3**—Impact attenuating surfacing must meet the requirements of Specification F1292 for the next highest 12 in. (300 mm) increment above the platform height. For example, if platform height is 20 in. (510 mm) high, then impact attenuating surfacing must meet a critical fall height requirement of 24 in. (610 mm).

X1.6.4 **Table 3**—In regard to platform height in indoor and outdoor supervised settings, there is no injury data to support more restrictive requirements. In the absence of injury data, the fall height of 18 in. or less is consistent with situations found in supervised settings and in the home. See Falls from Coffee Tables (5).

X1.6.5 **Table 3**—In regard to unlimited access facilities, for example, a public park or playground, the requirements for a public park or playground are more restrictive since regular, consistent maintenance of the surface cannot be assured. This requirement for placement of play equipment on an impact attenuating surface is consistent with Consumer Safety Performance Specification F1487 and US CPSC Document No. 5119 (6), US CPSC Handbook for Public Playground Safety.

their buttock, as well as providing adequate space for children to place their feet on the tread.

X1.5.10 **Table 2**—In regard to ramp slope, the overall percentage of slope is also important to keep children from having to negotiate a ramp that is too steep for their abilities. Therefore, the maximum slope should not exceed 1:8 vertical to horizontal.

**X1.6 Section 8—Requirements for Platforms, Landings, and Other Designated Play Surfaces**

X1.6.1 **8.1.1**—A 32 in. high platform topped by a protective barrier is the approximate upper height limit that will allow a typical caregiver to maintain visual and physical contact with a child (see Fig. X1.3).

X1.6.2 **8.3.4**—24 in. is 1 in. higher than the center of gravity for the maximum user. By setting a minimum barrier height of 24 in., the requirements exceed crib or play yard heights that are already established for children up to 24 months. It is generally accepted in these other specification standards (see example in Consumer Safety Specification F406) that a height of 21 in. is sufficient to keep children inside as long as they are less than 35 in. tall and unable to climb out. Similarly, strength studies in Childata (1) indicate that a 36 month old is only able

**X1.7 Section 9—Equipment Specifications**

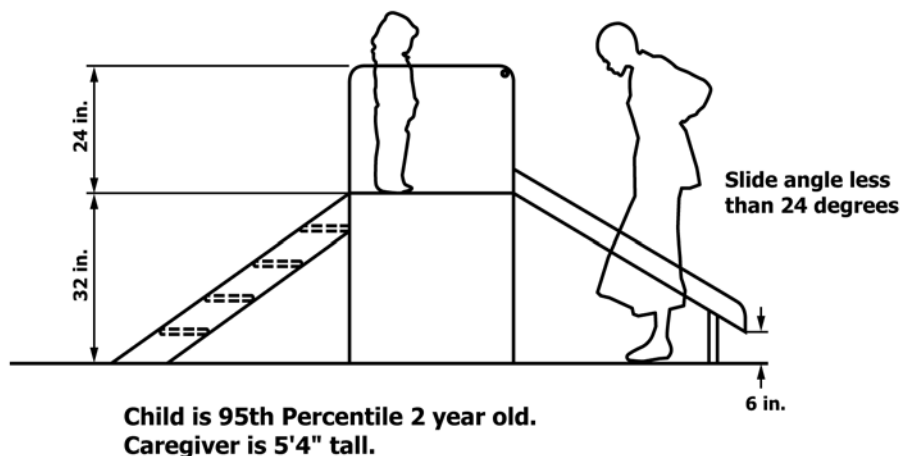
X1.7.1 **9.1**—Children 6 months through 23 months of age are not physically able to use the equipment listed.

X1.7.2 **9.2.2**—The height of the maximum user is 36 in. Children this age are top heavy and they can be expected to fall.

X1.7.3 **9.2.4.1**—The 1:3 ratio was based on unaided sliding on a low friction surface, such as polyethylene sheet, beginning at 20°.

X1.7.4 **9.2.4.2**—Twice the shoulder width of the maximum user.

X1.7.5 **9.3.2.2**—The length from the shoulder to the knee of the maximum user is 19 in. Children of this age use slides



Child is 95th Percentile 2 year old. Caregiver is 5'4" tall.

FIG. X1.3 Platform with Protective Barrier

differently than older children. They often crawl up onto the slide platform and pivot their bodies so that they can go down on their stomachs. This platform length allows for free movement of the body to enable the child to get in the safest position before entering the slide chute.

X1.7.6 **9.3.4.3**—The hip width of the maximum user is 7.63 in. Since the length from the back of the buttocks to the sole of the foot of the maximum user is 17.80 in. (1), 12 in. would not permit children to jam in the slide chute (see Fig. X1.4) as the 16 in. chute does (7).

X1.7.7 **9.3.5.1**—The height from the sole of the foot to the bottom of the thigh of the 12-month-old user is 6 in. (1).

X1.7.8 **9.3.5.2**—At a maximum height of only 32 in., a 20 to 24° incline does not generate enough velocity to warrant a run out, per Newton’s second law. The length from the back of the buttock to the back of the knee of the 5th percentile 12 month old is 7 in., and that length for the maximum user, the 95th percentile 23 month old is 10 in. (1).

X1.7.9 **9.3.5.4**—The transition area of slides is well established in the field and defined in Consumer Safety Performance Specification F1487. This was adapted to suit the anthropometrics of the user described in this specification. The buttock height at maximum depth of the maximum user is 0.58 of the

buttock height of the 95th percentile 12 year old (1). Therefore, 0.58 of 30 in. (minimal transition for Consumer Safety Performance Specification F1487) results in a transition radius equal to 17.4 in.

X1.7.10 **9.4.1.5**—The sole to crotch length of the 5th percentile 24 month old is 12 in. The sole to buttock length of 95th percentile 24 month old is 16 in. (1).

X1.7.11 **9.4.2.1**—The measurement from the navel to the top of the head of the maximum user times two is 36 in. (1).

X1.7.12 **9.5.1.1 and 9.5.3.4**—Children under two have limited understanding of cause and effect, therefore they are unable to predict when a swing might hit them.

X1.7.13 **9.5.2**—A low swing seat allows children to access the seats independently of adult assistance. The maximum pivot point of 47 in. with a clearance from the bottom of the swing seat to the ground of a minimum of 6 in. and a maximum of 8 in. will allow children to swing by themselves without getting too far from the ground. The low pivot point and seat height will prevent the impact hazard posed by a higher swing and therefore a barrier around these swings is not required.

X1.7.14 **9.5.2.2(3)**—Children this age should not be allowed to have independent access to a seat that they have a hard time getting out of.

X1.7.15 **9.5.3.1**—A height limitation of 95 in. for the pivot point will limit potential fall height.

X1.7.16 **9.5.3.2(4)**—Children who are not able to swing themselves in a typical to-fro swing seat must be assisted by an adult. The fully enclosed seat will prevent them from falling out of the swing seat when the swing seat is in motion.

X1.7.17 **9.5.3.2(6)**—18 in. is the mean sitting height of the user at risk, the 6 to 8 month old (1).

X1.7.18 **9.5.3.2(7)**—These swing seats will be used with adult assistance. Adults often push from the front as well as the back of fully enclosed seats.

X1.7.19 **9.5.3.3(4)**—The height of 24 in. will prevent the user from accessing the swing seat independently.

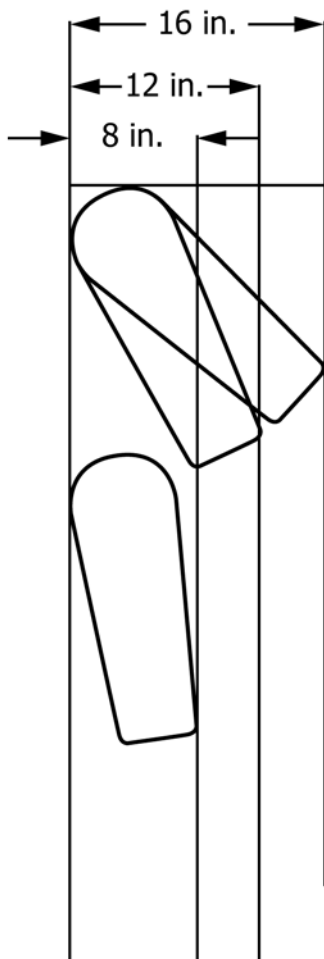


FIG. X1.4 Slide Chute

**X1.8 Section 10—Structural Integrity and Stability**

X1.8.1 **10.1**—Play equipment standards and toy standards include performance requirements for stability. Public Use Play Equipment for Children 6 months through 23 months should include them as well.

X1.8.2 **10.1**—Structural integrity (overload) and stability are often grouped together but are, in fact, two very different performance based tests. Tests for structural integrity (overload) use heavier weights than those used to test for stability because you are trying to determine if the structure will deform or fail. Most tests for structural integrity apply a weight that is three times the 95th percentile weight of the maximum user covered by the standard or the possible oldest user. Stability tests do not use the same weights. Stability tests are designed to determine if the equipment will provide a stable base for the user’s play within the context of the standard. In an effort to

induce instability, the equipment is placed on an inclined surface and the specified weight is usually applied at the top of the equipment.

X1.8.3 **10.2.1**—360 lb is three times the weight of the 95th percentile 12 year old from Chidata (1). Although the age range ends at 23 months old, it is likely that there will be older children playing on this component group. The test method is consistent with Consumer Safety Performance Specification **F1148**.

X1.8.4 **10.2.2**—480 lb is four times the weight of the 95th percentile 12 year old from Chidata (1). Although the age range ends at 23 months old, it is likely there will be older children playing on this component group. The load of four times the weight is used to permit safe access by adults. The test method is consistent with Consumer Safety Performance Specification **F1148**.

X1.8.5 **10.4**—Due to the scale of this equipment, it is appropriate to apply a dynamic force on handrails/barriers using the weight of the maximum user. Test method and load factor are consistent with EN 71–1.

X1.8.6 **10.4.4**—A push out test was added to ensure that both the structural integrity of any individual panel and the attachment method are acceptable.

X1.8.7 **10.5.1**—The slide length measurement is consistent with **9.3.4.1**. The placing of test loads is consistent with **10.2.2**.

X1.8.8 **10.6**—180 lb is six times the weight of the 95th percentile 23 month old. This component group is too small for the older players. A load six times the weight of the maximum user provides an extra margin of safety to test for possible crush injuries on springs.

X1.8.9 **10.7.2.1**—180 lb is six times the weight of the maximum user. The weight load of 180 lb provides an extra margin of safety to test for dynamic forces generated by swings. Due to the size of the swings for this age group, the maximum user was determined to be the 95th percentile 23 month old. Weight load factor is consistent with Consumer Safety Performance Specification **F1148**.

X1.8.10 **10.7.2.4(5)**—The 16 in. center of gravity height is based on field testing of swings that were recalled because of tip-over and swings that have performed without tipping over.

X1.8.11 **10.7.3.1**—360 lb is three times the weight of the 95th percentile 12 year old from Chidata (1). Although the age range ends at 23 months old, it is likely that there will be older children playing on this component group. The test method is consistent with Consumer Safety Performance Specification **F1148**.

X1.8.12 **10.7.3.4(5)**—The 16 in. center of gravity height is based on field testing of swings that were recalled because of tip-over and swings that have performed without tipping over.

### **X1.9 Section 11—Play Equipment Use Zones, Non-Encroachment Zones, and Placement**

X1.9.1 **11**—The use zone requirements for public settings with unlimited access vary from those for supervised settings.

The use zone requirements for supervised indoor and supervised outdoor settings are the same.

X1.9.2 **11**—For simplification and ease of understanding, this section stipulates the general requirements for all use zones followed by the use zone requirements for various types of equipment that have different use zone requirements (for example, climbing equipment, slides, spring rockers, and swings). Within the equipment subsections, the use zone specifications are provided separately for indoor/outdoor supervised settings and for public settings with unlimited access.

X1.9.3 **11.1.6**—The maximum standing reach range for a 95th percentile 24 month old is 43 in.

X1.9.4 **11.2.3**—Protective barriers are required to: be free of designated play surfaces; prevent the passage of the user through the barrier; and be non-climbable. The barriers prevent the users from falling to the adjacent surface; therefore, a use zone with impact attenuating material is unnecessary.

X1.9.5 **11.3.1**—A non-encroachment zone is necessary to ensure that the caregiver has access to the children without climbing onto the structure, and to ensure that children are not permitted to place or stack items against the structure that can be used to climb up to and over the structure.

X1.9.6 **11.4.1.1 and 11.4.1.4**—The height of the 95th percentile 23 month old (1) is 36 in. There are no data to support more restrictive standards.

X1.9.7 **11.4.2.2**—A public setting with unlimited access where it is possible that older children are also present argues for a larger use zone to protect users of adjacent equipment.

X1.9.8 **11.7.1.2 and 11.7.2.2**—Users cannot intentionally exit out of the fully enclosed swing seats so the use zone is less than the use zone required for belt seats in Consumer Safety Performance Specification **F1487**.

X1.9.9 **11.10**—Heat buildup on outdoor play surfacing and equipment can create temperatures hot enough to burn. Caregivers should exercise common sense and appropriate caution to avoid exposing children to potentially injurious situations. If surfaces are too hot for a caregiver’s own hand, then they are probably too hot for children to play on.

### **X1.10 Section 12—Labels and Signs**

X1.10.1 **12**—Requirements in this section are consistent with Consumer Safety Performance Specification **F1487**.

X1.10.2 **12.1.2**—Information on the wording of the labels or signs will help ensure that appropriate information is being presented to the caregiver, the general public, and to those responsible for the site. This information can be imparted most effectively by the use of uniform terminology or symbols, or both, on labels and signs. The ANSI standard is a well recognized consensus standard developed by experts in the field of warnings.

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- (3) “Physical Characteristics of Children as Related to Death and Injury for Consumer Product Design and Use,” UM-HRSI-BI-75-5, University of Michigan, 1975.
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- (5) *Falls From Coffee Tables, 1/1/98-7/7/2003, Children Under Two*, Source: INDP, IPL, DTHS, and NEISS.
- (6) “Never Put Children’s Climbing Gyms on Hard Surfaces, Indoors or Outdoors,” CPSC Publication #5119, US Consumer Product Safety Commission, Washington, DC.
- (7) McDonald, J., and Greene, M., “Special Study: Injuries and Death Involving Children Under Age Two Associated with Playground Equipment,” Directorate for Epidemiology, U.S. Consumer Product Safety Commission.

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