



Designation: F2373 – 11

# 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.

1.6 This consumer safety performance specification includes the following sections:

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appropriate safety and health 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](#)
  - [16 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](#)
  - [16 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](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

### 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-*

**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).

<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.

3.1.12 *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.

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>A</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>A</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.