



Designation: F1487 – 21

Standard Consumer Safety Performance Specification for Playground Equipment for Public Use¹

This standard is issued under the fixed designation F1487; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This consumer safety performance specification establishes nationally recognized safety standards for public playground equipment to address injuries identified by the U.S. Consumer Product Safety Commission (CPSC).

During 1999 the CPSC estimated that about 156 000 victims were treated in U.S. hospital emergency rooms for injuries associated with public playground equipment. About three fourths of these injuries resulted from falls, primarily to the surface on which the equipment was located. Other hazard patterns involved impact by swings and other moving equipment and contact with protrusions, crush or shear points, and sharp edges. Fatalities reported to the CPSC resulted from falls; entanglement of clothing or similar items on equipment; entanglement in ropes tied to or caught on equipment; head entrapment; impact by equipment that tipped over or otherwise failed; and impact by moving swings. This consumer safety performance specification does not eliminate the need for supervision of children on public playground equipment. It is intended to minimize the likelihood of life-threatening or debilitating injuries, such as those identified by the CPSC.

There has been significant harmonization of this performance specification and CAN/CSA-Z614.²

1. Scope

1.1 This consumer safety performance specification provides safety and performance standards for various types of public playground equipment and dimensional requirements for their clearance and use zones. Its purpose is to reduce life-threatening and debilitating injuries.

1.2 The range of users encompassed by this consumer safety performance specification is the 5th percentile 2-year-old through the 95th percentile 12-year-old.

1.3 Home playground equipment, toys, amusement rides, sports equipment, fitness equipment intended for users over the

age of 12, public use play equipment for children 6 to 24 months, and soft contained play equipment are not included in this specification.

1.4 Products or materials (site furnishings) that are installed outside the equipment use zone, such as benches, tables, independent shade structures, and borders used to contain protective surfacing, are not considered playground equipment and are not included in this specification.

1.5 This specification does not address accessibility, except as it pertains to safety issues not covered in the DOJ 2010 Standard for Accessible Design.

1.6 This consumer safety performance specification includes the following sections:

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¹ This consumer safety performance specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.29 on Playground Equipment for Public Use.

Current edition approved May 1, 2021. Published May 2021. Originally approved in 1993. Last previous edition approved in 2017 as F1487 – 17. DOI: 10.1520/F1487-21.

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1.6.1 The requirements in this specification are designed to mitigate the hazards typically presented by various types of equipment. New equipment may not specifically fit into the designated types listed in the specification; however, the designer or manufacturer, or both, shall use professional judgment to perform and document a hazard analysis and follow appropriate requirements to mitigate the hazards.

NOTE 1—See **Appendix X1** at the end of this standard to find more information on how one might conduct such an assessment as stated in this section.

1.7 General Measures, Tolerances, and Conversions:

1.7.1 The general tolerances for this specification (unless otherwise specified) are as follows:

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.

1.7.3 The conversion factor from inch-pound to metric units is 1 in. = 25.4 mm, and 1 lb = 0.45359 kg.

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

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.9 *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:³

- D2240** Test Method for Rubber Property—Durometer Hardness
- F355** Test Method for Impact Attenuation of Playing Surface Systems, Other Protective Sport Systems, and Materials Used for Athletics, Recreation and Play
- F698** Specification for Physical Information to be Provided

- for Amusement Rides and Devices (Withdrawn 2009)⁴
- F846** Guide for Testing Performance of Amusement Rides and Devices (Withdrawn 2013)⁴
- F853** Practice for Maintenance Procedures for Amusement Rides and Devices (Withdrawn 2014)⁴
- F893** Guide for Auditing Amusement Rides and Devices (Withdrawn 2013)⁴
- F963** Consumer Safety Specification for Toy Safety
- F1004** Consumer Safety Specification for Expansion Gates and Expandable Enclosures
- F1148** Consumer Safety Performance Specification for Home Playground Equipment
- F1159** Practice for Design of Amusement Rides and Devices that are Outside the Purview of Other F24 Design Standards
- F1292** Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment
- F1918** Safety Performance Specification for Soft Contained Play Equipment
- F1951** Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment
- F2373** Consumer Safety Performance Specification for Public Use Play Equipment for Children 6 Months through 23 Months
- F3313** Test Method for Determining Impact Attenuation of Playground Surfaces Within the Use Zone of Playground Equipment as Tested in the Field
- F3351** Test Method for Playground Surface Impact Testing in Laboratory at Specified Test Height

2.2 ANSI Standards:⁵

- ANSI Z535.1** Safety Color Code
- ANSI Z535.2** Environmental and Facility Safety Signs
- ANSI Z535.4** Products Safety—Signs and Labels

2.3 Federal Standards:⁶

- 16 CFR Part 1303** Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint
- 16 CFR 1500** Hazardous Substances Act Regulations, including Sections:
 - 1500.48** Technical Requirements for Determining a Sharp Point in Toys and Other Articles Intended for Use by Children Under 8 Years of Age
 - 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 Section 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

⁴ The last approved version of this historical standard is referenced on www.astm.org.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁶ Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.access.gpo.gov>.

³ 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.

DOJ 2010 Standard for Accessible Design United States Department of Justice (DOJ) 2010 Standard for Accessible Design: Title II (28 CFR 35) and Title III (28 CFR 36)⁷

2.4 UL Standard:⁸

UL 969 Standard for Safety: Marking and Labeling Systems

2.5 CSA Standard:⁹

CAN/CSA-Z614 Children's Playspaces and Equipment

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *accessible, adj*—relating to a part or portion of the playground equipment that (1) can be contacted by any body part or (2) is approachable or usable, or both, by persons with disabilities.

3.1.2 *accessible playground, n*—playground equipment area, that, when viewed in its entirety, may be approached, and entered and provides a range of play opportunities and experiences to users of varying abilities.

3.1.3 *accessible route, n*—pathway specifically designed to provide access for individuals with disabilities, including those using wheelchairs or mobility devices.

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

3.1.5 *climbing net structure, n*—playground climbing devices made of flexible components arranged in either a 2-dimensional grid or a 3-dimensional matrix.

3.1.5.1 *Discussion*—See Fig. A1.53 for examples of climbing net structures.

3.1.6 *completely bounded opening, n*—any opening in a piece of play equipment that is totally enclosed by boundaries on all sides so that the perimeter of the opening is continuous.

3.1.7 *component, n*—of a play structure, any portion thereof that generates specific activity and cannot stand alone.

3.1.8 *composite play structure, n*—two or more play structures attached or functionally linked, to create one integral unit that provides more than one play activity; an example is a combination climber, slide, and horizontal ladder.

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

3.1.10 *designated play surface, n*—any elevated surface for standing, walking, sitting, or climbing, or a flat surface accessible for play by children that measures more than 2.0 in. (51 mm) wide by 2.0 in. (51 mm) long having less than 30° angle from horizontal.

3.1.10.1 *Discussion*—See 6.7.

3.1.11 *embankment slide, n*—a slide that follows the contour of the ground and at no point is the bottom of the slide chute greater than 12 in. (305 mm) above the surrounding ground surface.

3.1.12 *enclosed swing seat, n*—suspended device upon which a user sits which has nonremovable 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.

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

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

3.1.15 *fall height, n*—vertical distance between a designated play surface and the protective surfacing beneath it.

3.1.16 *flexible component, n*—any part of the playground equipment that changes its shape when in use; examples include the tire net, the cargo net, and the log bridge.

3.1.17 *functionally linked play structure, 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.

3.1.18 *g, n*—acceleration due to gravity at the earth's surface at sea level (32 ft/s² (9.8 m/s²)).

3.1.19 *guardrail, n*—device around an elevated surface that prevents inadvertent falls from the elevated surface.

3.1.20 *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.

3.1.21 *head injury criteria (HIC), n*—a measure of impact severity that considers the duration over which the most critical section of the deceleration pulse persists as well as the peak level of deceleration.

3.1.22 *maximum user, n*—12-year-old child; measurement characteristics are the 95th percentile values for combined sexes.

3.1.23 *minimum user, n*—a 2-year-old child; measurement characteristics are the 5th percentile values for combined sexes.

3.1.24 *partially bounded opening, n*—any opening in a piece of play equipment that is not totally enclosed by boundaries on all sides so that the perimeter of the opening is discontinuous.

3.1.25 *platform, n*—flat surface, intended for more than one user to stand, and upon which the user(s) can move freely.

3.1.26 *play structure, n*—free standing structure with one or more components and their supporting members.

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

3.1.28 *professional judgment, n*—ability of a qualified person in the field of playgrounds/playground equipment design, use, or operations, to render an opinion, decision, or both, concerning a matter within that field of expertise.

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

⁷ Available free at: <http://www.ada.gov/regs2010/ADAAregs2010.htm>.

⁸ Available from Underwriters Laboratories (UL), UL Headquarters, 333 Pfingsten Road, Northbrook, IL, 60062, <http://www.ul.com>.

⁹ Available from Canadian Standards Association (CSA), 178 Rexdale Blvd., Toronto, ON M9W 1R3, Canada, <http://www.csagroup.org>.

3.1.30 *protective barrier, n*—enclosing device around an elevated surface that prevents both inadvertent and deliberate attempts to pass through the device.

3.1.31 *protective surfacing, n*—material(s) to be used within the use zone of any playground equipment.

3.1.31.1 *Discussion*—Protective surfacing shall meet the minimum impact attenuation requirements of Laboratory Test Specification **F1292**.

3.1.31.2 *Discussion*—Protective surfacing tested in the field shall meet the minimum impact attenuation requirements of Field Test Specification **F3313**.

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

3.1.33 *public use playground equipment, n*—play structure for use in play areas of schools, parks, child-care facilities, institutions, multiple-family dwellings, private resorts and recreation developments, restaurants, and other areas of public use.

3.1.33.1 *Discussion*—Requirements for amusement park equipment, sports use, home playground equipment, toys, soft contained play equipment, and play equipment for children 6 through 23 months are covered in Specifications **F698**, **F1148**, **F963**, **F1918**, **F2373**, Guides **F846** and **F893**, and Practices **F853** and **F1159**. Independent loose items intended to be manipulated by the intended users are not covered in this standard.

3.1.34 *qualified person, n*—one with current knowledge, training, skill, education, and experience who has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work through the application of professional judgement.

3.1.35 *rocking/springing equipment, n*—any play structure that rocks about a fixed base.

3.1.36 *rotating equipment, n*—any play structure intended to support the weight of the user(s) that revolves about an axis at any angle and is intended to revolve repeatedly.

3.1.36.1 *Discussion*—Examples of such equipment include a merry-go-round, whirl, logroll, or spinner. This does not include sand diggers, steering wheels, or other components that are intended for manipulation.

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

3.1.38 *sharp edge, n*—edge that can cut a user's skin.

3.1.38.1 *Discussion*—An edge is judged as potentially sharp pursuant to the provisions of 16 CFR Section 1500.49.

3.1.39 *sharp point, n*—point that can puncture or lacerate a user's skin during use.

3.1.39.1 *Discussion*—A point is judged as potentially sharp pursuant to the provisions of 16 CFR Section 1500.48.

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

3.1.40.1 *Discussion*—The signal word for safety labels is WARNING.

3.1.41 *small part, n*—object that may become detached and presents a choking, aspiration, or ingestion hazard to the user.

3.1.41.1 *Discussion*—A small part is determined to be a hazard pursuant to the provision of 16 CFR Part 1501.

3.1.42 *stability, n*—ability of the playground equipment to withstand anticipated forces which act to tip or slide the playground equipment when properly assembled and installed.

3.1.43 *stair, n*—device having a slope of 50° or less from a horizontal plane and consisting of a series of steps that can be used for ascending and descending.

3.1.44 *stationary equipment, n*—any play structure which has a fixed base and does not move.

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

3.1.45.1 *Discussion*—Also referred to as a *tread*.

3.1.46 *stepping forms, n*—one or more individual, elevated, freestanding devices used to provide balance experiences which may also be used as an access or egress component (see **Fig. A1.44**).

3.1.47 *swing, n*—an element or seat suspended from an elevated support structure so as to allow users to move freely in one or more planes and possesses a pivot point greater than 24 in. (610 mm) when measured vertically from the top of the suspended element to the pivot point.

3.1.47.1 *Discussion*—Swings include the following types: single axis (to-fro), multiple axis (rotating), or swings with multiple motions consisting of a combination of single axis and multiple axis (combination swings).

3.1.48 *swing bay, n*—space beneath the overhead beam bounded by one or more supports on which swing assembly or assemblies are attached.

3.1.49 *transfer point, n*—platform along an accessible route of travel or an accessible platform provided to allow a child in a wheelchair to transfer from the chair onto the equipment.

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

3.1.51 *trolley ride, n*—play component designed with a mechanism that travels along a designated path such as a cable or track, and whereby the user is suspended from the mechanism.

3.1.51.1 *Discussion*—Trolley rides may be level or have a height difference (see **Fig. A1.65**).

3.1.51.1 *upper body type trolley ride, n*—trolley ride designed to support the user by hands only.

3.1.51.2 *seated type trolley ride, n*—trolley ride designed with a suspended element for sitting or standing.

3.1.52 *upper body equipment, n*—overhead component designed to support a child by the hands only (for example, horizontal ladders, chinning bars, and ring ladders).

3.1.53 *use zone, n*—area beneath and immediately adjacent to a play structure or equipment that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

3.1.53.1 *Discussion*—Other than the equipment itself, the

use zone shall be free of obstacles that children could run into or fall on top of and thus be injured. The surface area within the use zone shall meet the minimum impact attenuation requirements of Specification **F1292** from the maximum fall height.

3.1.54 *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*—Playground equipment shall be manufactured and constructed only of materials that have a demonstrated durability in the playground or similar outdoor setting. Any new materials shall be documented or tested accordingly for durability by the playground equipment manufacturer.

4.1.1 Metals subject to structural degradation such as rust or corrosion shall be painted, galvanized, or otherwise treated. Woods shall be naturally rot- and insect-resistant or treated to avoid such deterioration. Plastics and other materials that experience ultraviolet (UV) degradation shall be protected against ultraviolet light.

4.1.2 Regardless of the material or the treatment process, the manufacturer shall ensure that the users of the playground equipment cannot ingest, inhale, or absorb any potentially hazardous amounts of substances through body surfaces as a result of contact with the equipment. All materials content shall comply with the Consumer Product Safety Improvement Act of 2008 (CPSIA) (this includes but is not limited to coating and substrate).

4.1.3 Wood intended for playground equipment that is not naturally rot- and insect-resistant shall be treated to resist rot and insect attack from standard procedures. Any wood not naturally rot- and insect-resistant, which has any fabrication up to 6 in. (150 mm) above, or any portion at or below the level of the protective surface of the playground, shall be treated after wood fabrication. Deviations shall have independent documentation of durability. Chromated copper arsenate (CCA), creosote, pentachlorophenol, tributyl tin oxide, and surface coatings that contain pesticides shall not be used for playground equipment.

4.2 All fasteners used to construct public playground equipment shall meet the requirements of Section 4.

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 Moving suspended elements shall be connected to the fixed support with bearings or bearing surfaces that serve to reduce friction or wear.

4.2.3.1 Steel cable that is permanently affixed to a hanger assembly performs as a bearing surface. Cable ends should be inaccessible or capped to prevent injury from frayed wires.

Cables and steel-cored ropes should be protected to prevent fraying, loosening, unraveling, or excessive shifting of joints.

4.2.4 Hooks and connecting devices shall be subject to the requirements of **6.4.5**.

4.3 *Tires*:

4.3.1 Tires shall not trap water.

4.3.2 Tires shall not have exposed steel belts.

5. General Requirements

5.1 Playground 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 Play equipment designed for a specific age group (2 through 5, 5 through 12, 2 through 12) shall have all play activities on that equipment meet the requirements for that age group.

5.3 Play structures shall be anchored to the ground or not be intended to be relocated.

5.4 *Small Parts*—When installed in accordance with the manufacturer's instructions, equipment for children under 3 years of age shall meet the requirements of 16 CFR Part 1501.

6. Performance Requirements

6.1 *Head and Neck Entrapment*—Public playground equipment shall be designed and constructed or assembled so that any accessible opening shall meet the following performance requirements to reduce the risk of accidental head or neck entrapment by either a head-first or feet-first entry into the opening. Openings between the protective surfacing and the bottom edge of the equipment (that is, rails, platforms, steps, and so forth) are exempt from this requirement as indicated by **Fig. A1.1**.

6.1.1 *Accessible Openings*—A completely bounded rigid opening is accessible when a torso test probe (see **Fig. A1.2**) can be inserted into the opening to a depth of 4.0 in. (102 mm) or more.

6.1.1.1 *Test Procedure for Completely Bounded Rigid Openings*—Place the 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; rotate the probe to its most adverse orientation (that is, major axis of the base of the probe parallel to the major axis of opening). If the torso probe can be inserted into the opening to a depth of 4.0 in. (102 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 torso probe when it is rotated to any orientation about its own axis, or (2) the opening admits the torso probe and also admits the head probe. An opening fails the test if the opening admits the torso probe but does not admit the head probe.

6.1.2 *Non-rigid Completely Bounded Openings*—A non-rigid opening such as may be found in but not limited to flexible nets, tarps, and plastic enclosures is considered accessible if a torso probe will penetrate the opening to a depth of

4.0 in. (102 mm) or more when tested in accordance with the test procedure outlined in 6.1.2.1 (see Figs. A1.2 and A1.3 for probe dimensions).

6.1.2.1 Test Procedure for Completely Bounded Non-rigid Openings—Place the torso probe in the opening, tapered-end first, with the plane of its base parallel to the plane of the opening; rotate the 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); apply a force of 50 lbf (222 N) to the probe to attempt to pass it through the opening. If the base of the probe passes through the opening, place the large head probe in the opening, tapered end first, with the plane of its base parallel to the plane of the opening. Apply a force of 50 lbf (222 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 torso probe to be inserted so deep that the opening admits the base of the probe when it is rotated to any orientation about its own axis, or (2) the opening allows full passage of the torso probe and also allows the large head probe to pass completely through. A non-rigid opening fails the test if the opening allows full passage of the torso probe but does not admit the large head probe.

6.1.3 Boundaries of Large Openings—If the opening admits the 9.0-in. (229-mm) head probe, each portion of its boundary shall be evaluated for partially bounded opening requirements of 6.1.4.

6.1.4 Partially Bounded Openings:

6.1.4.1 A partially bounded opening is considered accessible when any of the following conditions exist, and must meet the performance requirements as recommended in 6.1.4.2 and 6.1.4.3.

6.1.4.2 If the unbounded part of a partially bounded opening is between 1.875 ± 0.005 in. (47.6 mm) and 9.0 in. (229 mm) in width when measured perpendicular to each surface, the opening can be considered accessible and must meet the conditions of 6.1.4.3.

6.1.4.3 Test Method—The “A” portion of the test template (Fig. A1.4) is to be inserted along the centerline of the opening (determine the most adverse condition) (see Fig. A1.5) so that the centerline of the template follows the centerline of the opening and the plane of the template is parallel to the plane of the opening until the motion is arrested by contact between the test template and the boundaries of the opening. By visual inspection, determine if there is simultaneous contact between the sides of the template. If simultaneous contact is made the opening is accessible and must be tested using the “B” portion of the test template (see Fig. A1.6).

6.1.4.4 If the angle test template “A” indicates failure, check for an exempted thick surface condition by positioning the plane of the “B” portion of the test template between and perpendicular to the plane of the boundaries of the opening (see Fig. A1.7 and Fig. A1.9). If the test template fits completely within the boundaries of the opening, the opening is considered hazardous and fails the test unless it allows full passage of the 9.0-in. (229 mm) head probe (see Fig. A1.8). If the template does not fit down within the boundaries of the opening (defined as the opening outlined by the contact points of the test template “A”) the opening is not considered accessible.

6.1.4.5 The test template is divided into two sections. Section “A” is used first to determine accessibility and is based on the Specification F1004 standard rationale. Section “B” is used to determine if the thickness of the material or the location of the opening prevents access to the opening. The thickness of 0.75 in. (19.1 mm) for the template itself is based on half of the neck depth of a 5th percentile two year old minus compression. This dimension is consistent with Specification F1004.

6.1.4.6 Other dimensions are based on the following:

(1) 6.1 in. (155 mm) width represents 95th percentile 5 year old head width,

(2) 1.875 ± 0.005 in. (47.6 mm) is the neck breadth of the 5th percentile 2 year old (2.5 in. (64 mm) minus tissue compression),

(3) 8.5 in. (216 mm) shoulder width of 5th percentile 2 year old, and

(4) 3.0 in. (76 mm) neck length of a five year old.

6.1.4.7 Exemption to 6.1.4:

(1) Those partially bounded openings which are inverted. A partially bounded opening is considered inverted if the lowest interior boundary immediately adjacent to the opening is horizontal or slopes downward.

(2) Partially bounded openings that form “V” angles less than 55° where the apex of the angle is formed by an inclined or vertical climbing surface and a rope, chain or cable are exempt if the rope, chain or cable are in contact with the inclined surface at or below the protective surface at the point of the formed “V” angle.

(3) Partially bounded openings where simultaneous contact of the “A” portion of the template is less than 24 in. (610 mm) above the protective surfacing.

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

6.2.1 All points and edges on public play equipment shall be tested for sharpness in accordance with the requirements in 16 CFR 1500.48 and 1500.49 referenced in 2.3.

6.2.2 The exposed open ends of tubing shall be provided with caps or plugs that cannot be removed without the use of tools. Chimes, tubes, and other musical equipment is exempt from this requirement; however, the tube edges shall meet 6.2.1.

6.2.3 Suspended members, such as rings on upper body equipment and swing seats, shall have a minimum radius of 0.25 in. (6.4 mm) on corners and edges. This requirement does not apply to swing belt seats, straps, ropes, chains, connectors, and other flexible components.

6.2.4 A cut-off bolt end projecting beyond the face of the nut shall be free of burrs, sharp points, and sharp edges.

6.3 Protrusions—There shall be no protrusions on public play equipment. Three projection test gauges (shown in Fig. A1.10) and a projection gauge (shown in Fig. A1.11) are required to determine whether projections are protrusions. Their use is described in this section.

6.3.1 Accessible Projections—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 projection test gauges to

be placed over it. Any of the conditions described in the remainder of this section constitute a protrusion hazard.

6.3.2 Determining Whether a Projection is a Protrusion—Successively place each of three gauges (see Fig. A1.10) over each accessible projection in all orientations (see Fig. A1.12 and Fig. A1.13). Determine whether the projection extends beyond the face of any gauge. The projection fails the test and is a protrusion if it extends beyond the face of any of the three gauges.

6.3.2.1 Exemption to Protrusion Criteria—A manipulative device attached to a rope, cable, or chain is exempt from meeting the projection criteria using the large 3-in. (76.2 mm) interior diameter projection gauge. The use of the smaller gauges still applies.

6.3.3 Swing Seat Protrusions—Test for this condition with the suspended member in all positions of its intended travel. Keeping the projection test gauge (see Fig. A1.11) oriented vertically, and its axis parallel to the plane of travel, place it over any projection accessible throughout the path of travel. Any projection on the suspended member which extends beyond the face of the test gauge is a protrusion.

6.4 Entanglement—There shall be no entanglement hazards on public play equipment. Three test gauges, a feeler gauge, and the means to accurately measure a 0.12 in. (3.0 mm) extension are required to determine whether entanglement hazards exist. Any of the conditions described in this section constitutes an entanglement hazard.

6.4.1 Slides—The following requirements apply to slides in the areas shown in Fig. A1.14. Examples are shown in Fig. A1.15, Fig. A1.16, Fig. A1.17, and Fig. A1.23.

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

(1) One of the three projection gauges (see Fig. A1.10) 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 the projection gauge (see Fig. A1.11) may be used to measure the 0.12 in. (3.0 mm) extension.

6.4.1.2 Slides shall be constructed in such a manner as to provide a continuous sliding surface (roller slides exempted) and shall minimize the likelihood of entanglements.

6.4.2 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 Figs. A1.15–A1.17) is an entanglement hazard.

6.4.3 Exposed Bolt End Projections—Any accessible bolt end projecting beyond the face of the nut more than two full threads is an entanglement hazard (see Fig. A1.15(6)). A bolt end is inaccessible and not an entanglement hazard when the bolt end is recessed and the 3.5 in. (89 mm) OD projection gauge (see Fig. A1.10) cannot be made to contact the bolt end when the outside curve of the gauge is placed flat against the recessed area (see Fig. A1.18).

6.4.4 Projections Which Increase in Size—Any projection which fits within any of the three projection test gauges (see

Fig. A1.10) and where the increase in size extends greater than 0.12 in. (3.0 mm) from the initial surface with a depth greater than 0.12 in. (3.0 mm) is an entanglement hazard (see Fig. A1.15).

6.4.5 Connecting Devices—Connecting devices such as, but not limited to, S-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 gauge (see Fig. A1.19(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 may project beyond the vertical boundary established by the upper loop (see Fig. A1.19(2)).

(2) An S-hook upper loop may align with, may partially overlap, or may completely overlap the connector body. If the upper loop completely overlaps the connector body, it must not extend past the connector body (see Fig. A1.19(3)).

(3) An S-hook lower loop must align with the connector body and not overlap it in any way (see Fig. A1.19(4)).

6.4.5.2 Exemptions to 6.4.5:

(1) Connecting devices that have an in-fill such as plastic or cable that completely fills the interior space of both loops preventing entry of items of clothing into the interior of the connecting device.

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, or at an opening present at the junction of a stationary support and a rigid supporting member for a swinging element (that is, pendulum see saw, glide rides, and so forth) while the swinging elements are within their normal swinging angles. A crush or shear point is any point that entraps at one or more positions a 0.62 in. (15.7 mm) diameter rod.

6.5.1 To reduce the likelihood of unintentional contact with a crush or shear point, an opening shall comply with either 6.5.1.1 or 6.5.1.2.

6.5.1.1 An opening with a minor dimension of less than 1.0 in. (25 mm) is acceptable if a finger probe (as illustrated in Fig. A1.20), when inserted point first into an opening, cannot be made to touch any crush or shear point. The probe shall be applied in all possible articulated positions with an application force not to exceed 1 lb (4 N).

6.5.1.2 An opening in an enclosure with a minor dimension of 1.0 in. (25 mm) or more, shall require that the crush or shear point be located at a distance as specified in Table 1 from the plane of the opening. An enclosure in this case covers a crush or shear point.

6.5.1.3 Exemptions to 6.5:

(1) Chain and its method of attachment,

(2) The attachment area of heavy duty coil springs to the body and base of rocking equipment,

(3) The area between a swinging element and a horizontal top rail, and

TABLE 1 Minimum Acceptable Distance from an Opening to a Crush or Shear Point

Minimum Dimension of Opening, ^A in. (mm), ± 0.05 ^B	Minimum Distance from Opening to Part, in. (mm)
1 (25)	6.5 (165)
1.25 (32)	7.5 (190)
1.5 (38)	12.5 (318)
1.875 (48)	15.5 (394)
2.125 (54)	17.5 (445)
More than 2.125 (54) and less than 6 (152)	30 (762)

^A See 6.5.1.2.

^B Between 1-in. and 2.5-in. (25-mm and 64-mm) interpolation is used to determine values specified in the table.

(4) The area between small, lightweight moving parts necessary as an integral part of the play activity (for example, abacus beads, bell clappers, telephone receivers, etc.) provided that this area is not considered a crush or shear point as defined in 3.1.9.

6.6 Suspended Hazards—There shall be no single non-rigid component (cable, wire, rope, or other similar component) suspended between play units or from the ground to the play unit within 45° of horizontal, unless it is above 84 in. (2130 mm) above the protective surface.

6.6.1 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 5.0 in. (127 mm).

6.6.2 Exemptions for Suspended Components:

6.6.2.1 Multiple (two or more) suspended components (cables, wire, rope, or similar components) located at two or more elevations, may be suspended below 84 in. (2130 mm) when they comply with all other aspects of the single suspended component section and cannot be looped or stretched to contact another suspended component(s).

6.6.2.2 Chain or cable used to support a suspended element intended for standing or sitting that has an attachment point that moves along a designated path of travel is exempt from this requirement. Rope shall not be used as a method of suspending swings and suspended elements.

(1) Suspended elements intended for standing or sitting must meet the requirements of 8.6.7.

6.6.2.3 Rope, cable, or chain with a length of 7.0 in. (178 mm) or less may be attached at one end only. Multiple lengths of such cords that can contact each other would be treated as one length of cord.

6.6.2.4 Climbing net structures shall be exempt from 6.6 but still must meet the requirements of 6.6.1.

6.6.2.5 For ground level components, ropes, chain or cable used to attach manipulative components (for example, mallet for chime panel) to play panels or similar activities shall not be longer than 24 in. (609 mm). The attachment point of the cable to the panel shall not be higher than 27 in. (686 mm) above the underlying surface.

6.6.2.6 A single suspended component can be below 84 in. (2130 mm) if it is a minimum of 1 in. (25 mm) at its widest cross section dimension and is either brightly colored or contrasts with its surrounding environment.

6.7 Elevated Surfaces:

6.7.1 An elevated surface shall also be considered as a designated play surface if it meets both of the following conditions:

6.7.1.1 A flat surface test device 2.0 in (51 mm) long \times 2.0 in (51 mm) wide and constructed of rigid material (see Fig. A1.64) shall be placed on the surface. If the entire contact face of the test device (including all four corners) connects simultaneously with the elevated surface, the underlying surface shall be considered as flat and accessible.

6.7.1.2 The accessible flat surface shall be less than 30° from horizontal.

6.8 Exemptions—Portions of equipment located more than 84 in. (2130 mm) above any underlying designated play surface are exempt from the requirements of Section 6.

7. Requirements for Access/Egress

7.1 Accessible Routes to a Play Structure:

7.1.1 Accessible routes within a use zone shall conform to the performance requirements of Laboratory Test Specifications F1292 and F1951. Field testing of the accessible route within the use zone shall comply with the requirements of Specification F3313.

7.1.2 Ramps, platforms, or other stationary bridges, when used to connect an elevated access from the perimeter of the playground to the play equipment, shall be exempt from the use zone fall requirements where the connection is made at the perimeter (see Fig. A1.46).

7.2 Rung Ladders, Stepladders, Stairways, and Ramps:

7.2.1 Steps and rungs shall be evenly spaced within a tolerance of ± 0.25 in. (± 6.4 mm) and horizontal within a tolerance of $\pm 2^\circ$.

7.2.2 Steps and rungs shall not trap water (that is, no standing water) and should not encourage the accumulation of debris.

7.2.3 See Table 2 for access slope; tread, rung, or ramp width; tread depth; ladder rung diameter; and vertical rise.

7.2.4 Ramps that are a component of a play structure and intended to provide wheelchair access shall have a horizontal run between landings not to exceed 144 in. (3660 mm) (see Fig. A1.46).

7.2.5 Landings with play components shall include space for a wheelchair user to park and play with an adjacent circulation path not less than 36 in. (910 mm) wide (see Fig. A1.46).

7.2.6 Handrails:

7.2.6.1 Continuous handrails shall be provided on both sides of stairways (see 7.3.1.3 for spiral stairways), ramps, and stepladders that have more than one tread.

(1) **Exemptions**—Stairways do not require handrails where protective barriers are used. Barriers on stairways must provide alternate hand support.

7.2.6.2 Stairways or stepladders consisting of only one tread shall have handrails or alternate means of hand support on both sides.

7.2.6.3 Handrails or other means of hand support shall be available for use at the beginning of the first step.

7.2.6.4 Handrails shall be between 0.95 in. and 1.55 in. (24 mm and 39 mm) in diameter or maximum cross section.

TABLE 2 Rung Ladders, Stepladders, Stairways, and Ramps (Access Slope; Tread, Rung, and Ramp Width; Tread Depth; Rung Diameter; and Vertical Rise, by Age of Intended User)

Type of Access	Age of Intended User, years		
	2 through 5	5 through 12	2 through 12
Rung Ladders:^A			
Slope	75 to 90°	75 to 90°	75 to 90°
Total ladder width ^B	≥12 in. (300 mm)	≥16 in. (410 mm)	≥16 in. (410 mm)
Vertical rise (top of rung to top of rung)	≤12 in. ^C (300 mm)	≤12 in. ^C (300 mm)	≤12 in. ^C (300 mm)
Rung diameter	0.95 to 1.55 in. (24 to 39 mm)	0.95 to 1.55 in. (24 to 39 mm)	0.95 to 1.55 in. (24 to 39 mm)
Stepladders:			
Slope	50 to 75°	50 to 75°	50 to 75°
Tread width:			
Single file access	12 to 21 in. (300 to 530 mm)	≥16 in. (410 mm)	16 to 21 in. (410 to 530 mm)
Two-abreast access	^A	≥36 in. (910 mm)	^A
Tread depth:			
Open riser	≥7.0 in. (178 mm)	≥3.0 in. (76 mm)	≥7.0 in. (178 mm)
Closed riser	≥7.0 in. (178 mm)	≥6.0 in. (152 mm)	≥7.0 in. (178 mm)
Vertical rise (top of step to top of step)	≤9.0 in. ^C (229 mm)	≤12.0 in. ^C (305 mm)	≤9.0 in. ^C (229 mm)
Stairways:			
Slope	<50°	<50°	<50°
Tread width:			
Single file access	≥12 in. (300 mm)	≥16 in. (410 mm)	≥16 in. (410 mm)
Two-abreast access	≥30 in. (760 mm)	≥36 in. (910 mm)	≥36 in. (910 mm)
Tread depth:			
Open riser	≥7.0 in. (178 mm)	≥8.0 in. (203 mm)	≥8.0 in. (203 mm)
Closed riser	≥7.0 in. (178 mm)	≥8.0 in. (203 mm)	≥8.0 in. (203 mm)
Vertical rise (top of step to top of step)	≤9.0 in. ^C (229 mm)	≤12.0 in. ^C (305 mm)	≤9.0 in. ^C (229 mm)
Ramps (does not address wheelchair use):			
Slope (vertical/horizontal)	≤1:8	≤1:8	≤1:8
Width:			
Single file access	≥12.0 in. (300 mm)	≥16.0 in. (410 mm)	≥16.0 in. (410 mm)
Two-abreast access	≥30.0 in. (760 mm)	≥36.0 in. (910 mm)	≥36.0 in. (910 mm)

^A Shall not be a sole means of access on a play structure designated for children less than 5 years of age.

^B Excluding side supports.

^C Entrapment provisions apply.

7.2.6.5 Handrail height (the vertical distance between the top front edge of a step or, if used on a ramp, the top of the ramp surface, and the top surface of the handrail above it) shall be between 22 in. and 38 in. (560 mm and 970 mm).

7.3 Other Means of Access:

7.3.1 Spiral Stairways:

7.3.1.1 Spiral stairways shall meet the general requirements for spacing, orientation, drainage, tread width, and vertical rise specified for stairway access in 7.2.1 – 7.2.3.

7.3.1.2 The depth of the outer edge of the tread on spiral stairways shall be 7.0 in. (178 mm) or greater on equipment for children 2 through 5 years, and 8.0 in. (203 mm) or greater on equipment for children 5 through 12 years. These depth requirements apply to spiral stairways with both open and closed risers.

7.3.1.3 Spiral stairways shall meet the requirements specified for handrails in 7.2.6. However, when the design of the stairway does not permit handrails on both sides of the stairway, a continuous handrail shall be provided along the outside perimeter of the steps.

7.3.2 Climbers:

7.3.2.1 Arch climbers and flexible climbers shall not be used as the sole means of access to other components of equipment intended for use by 2 to 5 year olds.

7.3.2.2 Flexible climbing components shall be securely connected at both ends. When one end is connected to the ground and the flexible component is not vertically shielding the anchoring device, the anchoring device shall be beneath the base of the minimum required depth of the protective surfacing material. Where unitary surfacing material is used, a maintenance access opening is permissible, provided that the anchoring device is not accessible when tested with the 3.50 in. (88.9 mm) O.D. projection gauge (Fig. A1.10) as in Fig. A1.18. Tensioning devices are not considered to be part of the anchoring device.

7.3.2.3 Connections between ropes, cables, chains, or tires used as access to other components of equipment shall be securely fixed.

7.3.2.4 Flexible components used as access to other components of equipment for use by 2 through 5-year-olds shall readily allow users to bring both feet to the same level before ascending to the next level.

7.3.2.5 Climbers used as access shall provide a means of hand support for use while climbing.

7.4 Transition from Access to Platform:

7.4.1 On stairways and stepladders, there shall be a continuation of handrails from the access to the platform.

7.4.2 On accesses that do not have side handrails, such as rung ladders, arch climbers, or flexible climbers, there shall be alternate hand gripping support to facilitate the transition to the platform.

7.4.3 For rung ladders, flexible climbers, and arch climbers, the stepping surface used for final access shall not be above the designated play surface it serves.

7.5 Platforms, Landings, Walkways, Ramps, and Similar Transitional Play Surfaces:

7.5.1 Platform surfaces shall be horizontal within a tolerance of $\pm 2^\circ$.

7.5.2 Platforms, landings, walkways, ramps, and similar transitional play surfaces shall not trap water and should not encourage accumulation of debris.

7.5.3 Platforms, landings, walkways, ramps, and similar transitional play surfaces that are elevated above the protective surfacing and that are accessible to wheelchairs shall provide a clear width of not less than 36 in. (910 mm). Clear width may be reduced to 32 in. (810 mm) for not more than 24 in. (610 mm) along the path of travel (see Fig. A1.48).

7.5.4 Turning spaces and parking spaces provided at a transfer point on wheelchair-accessible platforms shall not overlap (see Fig. A1.47).

7.5.5 Guardrails shall be provided on platforms, landings, walkways, ramps, and similar transitional play surfaces, in accordance with 6.1, 7.5.5, and 7.5.6. Guardrails shall contain no designated play surfaces. Guardrails are not intended to surround the designated play surfaces on play equipment (for example, balance beams and climbers) unless required in Section 8.

7.5.5.1 Guardrails or protective barriers are required on elevated surfaces that are greater than 20 in. (508 mm) above the protective surfacing when intended for use by 2- through 5-year-olds, on elevated surfaces greater than 30 in. (760 mm) above the protective surfacing when intended for use by 5- through 12-year-olds, and on all elevated wheelchair-accessible platforms except as specified in 7.5.5.2 and 7.5.6.3 (see Fig. A1.49).

7.5.5.2 Guardrails shall completely surround the elevated surface except for entrance and exit openings necessary for each event.

(1) The maximum clear opening without a top horizontal guardrail shall be 15 in. (380 mm).

(2) Means of ascent and descent that are accessible by openings with horizontal dimensions greater than 15 in. (380 mm) shall have a minimum of one top rail of a guardrail.

(3) Stairs, ramps, and upper body components, or components that provide a transfer point (system) or entry point as defined in the DOJ 2010 Standard for Accessible Design are exempt from this requirement.

(4) Professional judgment shall be used in the design and placement of all openings on wheelchair-accessible, elevated surfaces, and a means provided to prevent wheelchairs from falling off.

7.5.5.3 The top surface of guardrails shall have a height 29 in. (740 mm) or greater when the elevated surface is for use by 2 through 5-year-olds, and 38 in. (970 mm) or greater when for use by 5 through 12-year-olds.

7.5.5.4 The lower edge of guardrails on elevated surfaces intended for 2 through 5-year-olds shall be no greater than 23 in. (580 mm) above the underlying equipment surface. For elevated surfaces intended for 5 through 12-year-olds, the lower edge of the guardrails shall be no greater than 28 in. (710 mm) above the underlying equipment surface.

7.5.5.5 Wheelchair-accessible ramps less than or equal to 30 in. (760 mm) above the protective surface of the use zone, when designed for use by 2- through 5-year-olds, or less than or equal to 48 in. (1220 mm), when designed for use by 5- to 12-year-olds, shall have a handrail 26 in. to 28 in. (660 mm to 710 mm) high on each side of the ramp and conform to 7.2.6.3 and 7.2.6.4. Ramp height shall be measured at the highest point (see Fig. A1.46).

7.5.5.6 Wheelchair-accessible ramps must have a curb projecting above the ramp a minimum of 2.0 in. (51 mm) at both edges when any of the following conditions are present (see Fig. A1.46):

- (1) Guardrails or barriers not extending to within 1.0 in. (25 mm) of the ramp surface,
- (2) Ramps with two rails and no barrier, or
- (3) Ramps where the barrier is beyond the edge of the ramp surface.

7.5.6 Protective barriers shall contain no designated play surfaces and shall minimize the likelihood of climbing. Barriers are not intended to surround the designated play surfaces on play equipment (for example, balance beams and climbers) unless required in Section 8.

7.5.6.1 Protective barriers are required on elevated surfaces greater than 30 in. (760 mm) above the protective surfacing when intended for use by 2 through 5-year-olds, and greater than 48 in. (1220 mm) above the protective surfacing when intended for use by 5 through 12-year-olds. Ramp height shall be measured at the highest point.

(1) On stairways, all steps greater than 48 in. (1220 mm) above the protective surfacing shall require protective barriers.

(2) The height of the protective barrier on a step shall be the vertical distance between the top front edge of a step and the top surface of the protective barrier.

7.5.6.2 Wheelchair-accessible ramps that require barriers shall have a handrail 26 in. to 28 in. (660 mm to 710 mm) high on each side of the ramp.

7.5.6.3 Protective barriers shall completely surround the elevated surface except for entrance and exit openings necessary for each event.

(1) The maximum clear opening without a top horizontal guardrail shall be 15 in. (380 mm).

(2) Means of ascent and descent that are accessible by openings with horizontal dimensions greater than 15 in. (380 mm) shall have a minimum of one top rail of a guardrail.

(3) Stairs, ramps, and upper body equipment are exempted from this requirement.

(4) Professional judgment shall be used in the design and placement of all openings on wheelchair-accessible, elevated surfaces and a means provided to prevent wheelchairs from falling off.

7.5.6.4 The top surface of protective barriers shall have a height 29 in. (740 mm) or greater when the elevated surface is