Designation: F2225 – 13

AnAmerican National Standard

Standard Safety Specification for Consumer Trampoline Enclosures[1]

This standard is issued under the fixed designation F2225; 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.

1. Scope

1.1 This safety specification covers the components, assembly, use, labeling, and performance requirements of consumer trampoline enclosures (see Safety Specification F381).

1.2 This specification is applicable to trampoline enclosures to be sold as an accessory to or packaged with trampolines of (*1*) a minimum bed size of 3300 in.^{2} (2.1 m^2), (*2*) a minimum height of 20 in. (510 mm), (*3*) intended for the purpose of continuous, vertical jumping activities, and (*4*) intended for consumer use.

1.3 This specification includes the following sections and selected subsections:

1.4 This specification does not purport to address all of the hazards that may be associated with trampolines or trampoline enclosures, or both. The standard's existence alone will not necessarily prevent injuries. Like other physical activities, trampoline use involves the risk of injury, particularly if the equipment is used improperly. Similarly, the use of a trampoline enclosure alone will not necessarily prevent all injuries.

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

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

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D638 Test Method for Tensile Properties of Plastics

D2240 Test Method for Rubber Property—Durometer Hardness

F381 Safety Specification for Components, Assembly, Use, and Labeling of Consumer Trampolines

F1077 Guide for Selection of Committee F16 Fastener Specifications (Withdrawn 2014)[3]

2.2 *ANSI Standard:*[4]

Z535.4 Product Safety Signs and Labels

2.3 *Federal Standards:*[5]

16 CFR 1500 Hazardous Substances Act Regulations

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

2.4 *AATCC Standard:*[6]

AATCC 169 Weather Resistance of Textiles: Xenon Lamp Exposure

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *attachment system, n*—the complete manner in which certain components are connected.

[1] This safety specification is under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee F08.17 on Trampolines and Related Equipment.

Current edition approved June 1, 2013. Published June 2013. Originally approved in 2003. Last previous edition approved in 2012 as F2225 – 12. DOI: 10.1520/F2225-13.

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

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

[5] Available from Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250–7954.

[6] Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, http://www.aatcc.org.

3.1.2 *barrier, n*—an enclosing device constructed of netting, fabric, or other material that is intended to prevent both inadvertent and deliberate attempts to pass through the device.

3.1.3 *barrier height, n*—the distance from the bed surface at rest to the upper edge of the barrier measured at a support.

3.1.4 *barrier system, n*—an enclosing device that is intended to prevent both inadvertent and deliberate attempts to pass through the device forming the enclosure suspended from or attached, or both, to enclosure support (frame).

3.1.5 *enclosure, n*—equipment which reduces the risk of the user falling off the trampoline.

3.1.6 *enclosure support (frame) attachment system, n*—the framework constructed of supportive materials from which the enclosure barrier is suspended or attached, or both, and the manner in which components are connected.

3.1.7 *upright pole caps, n*—covering cap on exposed enclosure support (frame) pole ends to prevent cuts, abrasion or impalement.

4. Components

4.1 A trampoline enclosure system when offered for sale shall include the following components:

4.1.1 Enclosure support system padding and upright pole caps,

4.1.2 Enclosure support (frame) and attachment system,

4.1.3 Enclosure barrier,

4.1.4 Enclosure barrier attachment system,

4.1.5 Information packet/user manual, and

4.1.6 Suitable on-product and on-package warnings.

5. General Requirements

5.1 The barrier height shall have the following minimums:

5.1.1 For round trampolines with bed diameter at less than 10 ft (2.5 m) – 60 in. (1.5 m).

5.1.2 For round trampolines with a bed diameter of 10 ft (2.5 m) (or more) – 72 in. (1.8 m).

5.1.3 For rectangular trampolines—one-half the length of the longest bed dimension, but not less than 60 in. (1.5 m) minimum barrier height.

5.2 The enclosure support (frame) system and barrier materials shall be of sufficient strength and rigidity to hold the enclosure barrier in place and withstand the loads outlined in Performance Requirement Test #1.

5.3 Support attachment system and hardware shall be subject to ready assembly by the original retail consumer and shall meet the requirements set forth in 6.1 (Performance Requirement Test #1).

5.4 All fasteners shall be manufactured in accordance with Section 5.4.2 of Guide F1077. All fasteners, connecting, and covering devices shall be inherently corrosion resistant or be provided with corrosion resistant coating.

5.4.1 When installed in accordance with the manufacturer's instructions, fasteners, lock washers, self-locking nuts, or other locking means shall be provided for all nuts and bolts to protect them from unintentional loosening. Hardware in moving joints shall also be secured against unintentional loosening.

5.4.2 There shall be no accessible sharp points or edges on fasteners. A cut-off bolt end projecting beyond the face of the nut shall be free of burrs, sharp points, and sharp edges. An accessible bolt end shall not extend more than two full threads beyond the face of a nut.

5.5 Connecting devices such as but not limited to S-hooks and C-hooks shall be properly closed. These connectors are considered closed when there is no gap or space greater than 0.04 in. (1 mm) when measured with a feeler gage.

5.5.1 S-hook connectors are subject to the following additional requirements: (*1*) No portion of the closed end of an S-hook upper loop may project beyond the vertical boundary established by the upper loop; (*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, or (*3*) an S-hook lower loop must align with the connector body and not overlap in any way. (See Fig. 1.)

5.6 The enclosure barrier shall be a durable weather resistant fabric suitable for extended outdoor life. Materials used in the barrier and any fabric, cord, or webbing connections supporting the barrier that are normally exposed to sunlight shall be made of ultraviolet (UV) resistant materials.

5.7 Support (frame) members exposed to contact during foreseeable usage shall be padded. The top end of such support (frame) members shall be capped.

5.8 The barrier attachment system shall include (*1*) upper attachment to upright supports (frame), and (*2*) lower attachment to trampoline bed or trampoline frame top rails. The barrier attachment system shall be of sufficient strength and durability to withstand tearing, deformation or failure as a result of the loads outlined in 6.1 (Performance Requirement Test #1).

5.9 *Enclosure Openings*—The enclosure barrier shall include an opening allowing entry and exit of the user from the jumping surface. This opening, when closed according to the manufacturer's instructions, shall be of sufficient strength and durability to withstand, without tearing, deformation or failure, a direct impact of the loads at the point of the opening and 8 in. to the left and to the right of the opening (outlined in 6.1, Performance Requirement Test #1) with no penetration of any portion of the test load beyond the outer edges of the opening or any opening of the barrier itself. If the enclosure barrier opening is overlapped, the opening point is considered the midsection of the overlap.

6. Performance Requirements

6.1 *Barrier Impact and Enclosure Support Pole (Frame) Impact Tests*—Performance Requirement Test #1 requires four impacts of the maximum specified user weight limit applied as a dynamic side load according to the following procedures. Two of the impacts are to be directed at a point on the barrier midway between the support poles (frame) at a height mid-distance between the top and bottom of the enclosure barrier. The other two impacts are to be applied against the enclosure support poles (frame) at a height mid-distance between the top and bottom of the enclosure barrier. The impacts against the

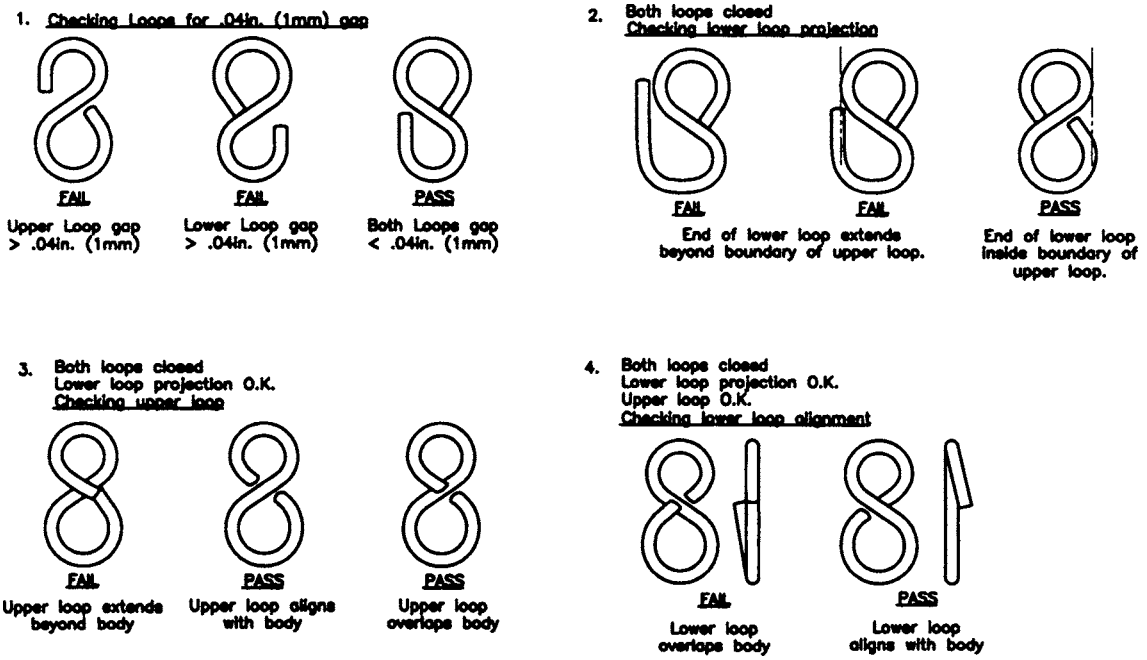

FIG. 1 Requirements for Connecting Devices

enclosure barrier and barrier attachment system shall not produce permanent deformation, tearing or breaking of any component of the enclosure barrier and barrier attachment system. The impacts against the enclosure support (frame) shall not produce permanent deformation, tearing or breaking of any component of the enclosure support (frame) or the support (frame) attachment hardware. If the measured angle of an enclosure pole is greater than 10° from its original measured angle after the test, it shall be interpreted as a permanent deformation.

6.1.1 *Procedure for Performance Requirement Test #1*—The load shall be of mass equal to the maximum specified user weight limit. It should be composed of a bag approximately 16 in. (410 mm) in diameter by 36 in. (910 mm) tall, such as a large duffel bag filled with loosely compacted material such as sand. Alternating small bags of sand and wood chips can be used to fill the bag. The center of gravity of the duffel bag should be at the mid-point (approximately 18 in. (460 mm) from the bottom). The dynamic side load shall be applied in a pendulum motion against the enclosure barrier at the specified points (see 6.1).

6.1.1.1 Secure one side of the trampoline so that the trampoline cannot be moved or cannot slide along the surface on which the trampoline rests.

6.1.1.2 Suspend the bag (load) on a chain so that the distance to the top of the chain (pivot point) to the center of mass of the bag corresponds to one of the lengths specified in Table 1.

6.1.1.3 Position the bag (load) so that it hangs against the side of the enclosure barrier at a point midway between the enclosure support poles (frame) at a height mid-distance between the top and bottom of the enclosure barrier. The pivot point of the pendulum created by the load and chain should be positioned directly above the top of the enclosure barrier. The contact point of the bag (load) to the enclosure barrier should be on the opposite side of the enclosure from the point that secures the trampoline from movement.

TABLE 1 Length to Center of Mass and Angle

Pendulum Length to Center of the Mass of Bag (feet)	Pendulum Length to Center of the Mass of Bag (metres)	Pendulum Angle Relative to Vertical (degrees)
10	3.0	30.0
9	2.7	31.7
8	2.4	33.6
7	2.1	36.0

(1) Measure and record the angle of the enclosure pole nearest the intended barrier impact point, at the midpoint between the top of the enclosure pole and the uppermost point of connection to the trampoline frame with an angle finder designed for use on tubular/round surfaces. (If there are 2 enclosure poles at the same distance from the intended barrier impact point, select one as the test subject). Two measurements at this midpoint should be recorded. One measurement to be taken on the surface of the enclosure pole furthest from the center of the trampoline jump mat, and another measurement to be taken 90° around the circumference of the enclosure pole from the first measurement.

6.1.1.4 Pull the bag (load) back until the load support chain is at an angle that corresponds with the selected chain length distance in Table 1.

6.1.1.5 Release the bag (load) into the enclosure barrier.

(1) Re-measure the angles described in 6.1.1.3 (*1*) and record.

6.1.1.6 Repeat the test in 6.1.1.1–6.1.1.5 (*1*).

6.1.1.7 Repeat the set up in 6.1.1.1 and 6.1.1.2 in preparation for impact tests against the enclosure support poles (frame) at a height mid-distance between the top and bottom of the support pole. Position the bag (load) so that it hangs against the enclosure support pole (frame) on the inside of the enclosure.

The pivot point of the pendulum created by the load and chain should be positioned directly above the top of the enclosure support pole (frame). The contact point of the bag (load) should be on the opposite side of the enclosure from the secured point established in 6.1.1.1.

(1) Measure and record the angle of the enclosure pole to be impacted at the midpoint between the top of the enclosure pole and the uppermost point of connection to the trampoline frame with an angle finder designed for use on tubular/round surfaces. Two measurements at this midpoint should be recorded. One measurement to be taken on the surface of the enclosure pole furthest from the center of the trampoline jump mat, and another measurement to be taken 90° around the circumference of the enclosure pole from the first measurement.

6.1.1.8 Pull the bag (load) back until the load support chain is at an angle that corresponds with the selected chain length distance in Table 1.

6.1.1.9 Release the bag (load) into the enclosure support pole (frame).

(1) Re-measure the angles described in 6.1.1.7 (*1*) and record.

6.1.1.10 Repeat the test in 6.1.1.6–6.1.1.9 (*1*).

NOTE 1—The results should meet or exceed the guidelines set forth in Performance Requirement Test #1.

6.1.1.11 Repeat the set-up in 6.1.1.1 and 6.1.1.2 in preparation for impact tests against the enclosure opening at a height as close as possible to the mid-distance between the top and bottom of the opening. Position the bag (load) so that it hangs against the enclosure opening on the inside of the enclosure. The pivot point of the pendulum created by the load and chain should be positioned directly above the top of the enclosure opening. The contact point of the bag (load) should be on the opposite side of the enclosure from the secured point established in 6.1.1.1.

6.1.1.12 Pull the bag (load) back until the load support chain is at an angle that corresponds with the selected chain length distance in Table 1.

6.1.1.13 Release the bag (load) into the enclosure opening.

6.1.1.14 Repeat the preparation for impact tests as established in 6.1.1.11, except the position of the bag (load) is 8 in. to the right, as measured from the inside of the enclosure, from the enclosure opening as established in 6.1.1.11.

6.1.1.15 Repeat the test methods in 6.1.1.12 and 6.1.1.13.

6.1.1.16 Repeat the preparation for impact tests as established in 6.1.1.11, except the position of the bag (load) is 8 in. to the left, as measured from the inside of the enclosure, from the enclosure opening as established in 6.1.1.11.

6.1.1.17 Repeat the test methods in 6.1.1.12 and 6.1.1.13.

6.2 Performance Requirement Test #2 requires that, following assembly of the trampoline enclosure in accordance with the instructions provided to the consumer, there shall be no sharp edges or points on any portion of the trampoline enclosure capable of inflicting a cut on a child during normal use or reasonably foreseeable abuse. All points and edges on the trampoline enclosure shall be tested for sharpness in accordance with the federal technical requirements in 16 CFR 1500.48 and CFR1500.49 referenced in 2.3.

6.3 Performance Requirement Test #3 requires that there shall be no pinch, crush, or shear points caused by junctures of two components moving relative to one another, or at an opening present in the enclosure support (frame) attachment system or the enclosure barrier attachment system while the enclosure system is in normal use. Pinch, crush, or shear points shall be deemed to be any point that allows a 3⁄16 in. (5 mm) diameter neoprene rod to enter at one or more positions or entraps a ½-in. (13-mm) diameter neoprene rod. 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 in accordance with Test Method D2240.

6.4 *User Containment*—Performance Requirement Test #4 requires that a trampoline enclosure shall be designed and constructed so that when assembled and the enclosure opening is closed (see 5.9), there shall be no accessible opening that presents the risk of accidental head or neck entrapment, or unintentional user exit, by either a head first or feet first entry into the opening. Openings between the ground and the bottom edge of the equipment (such as rails and the base of the frame, etc.) are exempt from this requirement.

6.4.1 *Accessible Openings*—Any completely bounded opening that completely accepts the torso test probe. A completely bounded opening is accessible when a torso test probe (see Fig. 2) may be inserted into the opening to a depth of 4 in. (100 mm) using the following test method.

6.4.2 *Containment Test Procedure for Completely Bounded 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 while keeping its base parallel to the plane of the opening.

6.4.2.1 An opening can pass this test if the opening does not admit the torso probe.

6.4.2.2 An opening fails the test under the following condition: The opening admits the test probe.

6.4.3 *Containment Test Procedure for Nonrigid Openings*—A nonrigid opening located in components such as, but not limited to, flexible netting and barriers, tarps and plastic barriers, is considered accessible if a torso probe will penetrate the opening to a depth of 4 in. (100 mm) when tested in accordance with 6.4.1. 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 while keeping its base parallel to the plane of the opening; apply 50 lbf (222 N) while attempting to push the probe through the opening.

6.4.3.1 A nonrigid opening can pass this test if 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.

6.4.3.2 A nonrigid opening fails the test under the following condition: The opening allows full passage of the torso probe.

6.5 *Ultraviolet (UV) Resistant Materials Test:*

6.5.1 The barrier and any fabric, cord, or webbing connections supporting the barrier that are normally exposed to