

and the mechanical, electrical, and chemical environment in and around swimming pools. For purposes of this part 1207, "local normal" temperature extremes and wind variations are defined as the average annual record limits for the past 10 years at any slide installation point in the U.S.A. where such statistical information exists (see reference (a) in §1207.11)

(c) *Materials selection.* The selection of all materials for swimming pool slides should be such that all surfaces and edges that may come in contact with the user are assembled, arranged, and/or finished (deburred, polished, etc.) so that they will not constitute a cutting, pinching, puncturing, or abrasion hazard under casual contact and intended use by children or adults.

(d) *Toxicity.* The selection of materials used in swimming pool slides should be such that the assembled and installed products should not be toxic to man or harmful to the environment under intended use and reasonably foreseeable abuse or disposal. All paints and finishes used on swimming pool slides shall comply with 16 CFR 1303.2(b)(2) and 1303.4(a).

(e) *Chemical compatibility.* The selection of materials for swimming pool slides should be such that the assembled and installed product, and the parts, are chemically compatible with the materials and environment contacted under intended use and reasonably foreseeable abuse.

[41 FR 2751, Jan. 19, 1976, as amended at 43 FR 58813, Dec. 18, 1978]

§ 1207.5 Design.

(a) *Strength.* The strength of the assembled and installed swimming pool

slide shall be such that no structural failures of any component part shall cause failures of any other component part of the slide as described in the performance tests in paragraphs (d)(4) and (f)(9) of this section.

(b) *Edges.* Edges of swimming pool slide runways, ladders, handrails, and deck anchor flanges shall be designed, finished (deburred, polished, etc.), or protected in such a manner as to prevent cutting human tissue on casual contact and intended use. If edge guards are used, they shall be permanently affixed to the structure in a tamper-proof fashion.

(c) *Ladders, steps, stairs, or ramps—(1) General.* Swimming pool slide ladders, steps, stairs, or ramps shall have treads, not rungs, if the angle of the incline is 15° or greater from a plumbline.

(2) *Angle.* Swimming pool slide ladders not using rungs shall be designed and installed in such a manner that the user's center of gravity will be approximately positioned directly over each step during the use of the ladder. When tread design ladders are used, the minimum installed angle shall be not less than 15° from a plumbline dropped from a ladder step as shown in figure A. If stairs or ramps are used to ascent to the top of the slide, they shall be designed in accordance with reference (c) of § 1207.11, pages 457-463.

(NOTE: To convert the English system values given in the figures to metric values, the following conversion factors should be used: 1 inch=2.54 cm., 1 foot=30.48 cm., 1 square inch=6.452 sq. cm., 1 lb. (mass)=0.4536 kg., 1 lb. (force)=4.448 newtons, and 1 ft.-lb.=1.356 newton-meters.)

TYPICAL LADDER SLOPE MEASUREMENT

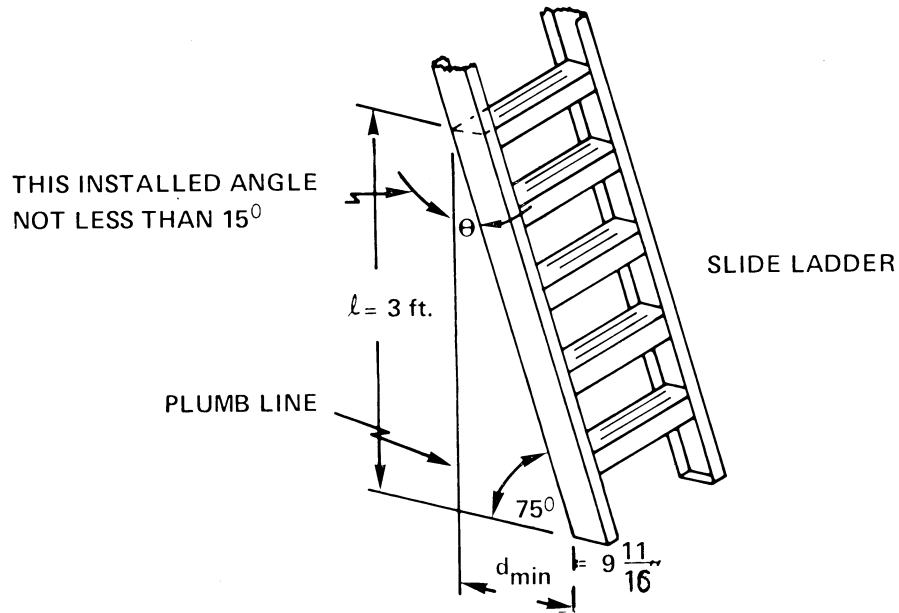


FIGURE A

(3) Steps—(i) Dimensions. Slide ladder treads may have flat or curved tread surfaces and shall be designed so that they have a minimum tread width of 2 inches (5.08 cm) and a minimum length of 12 inches (30.48 cm) (reference (c) of

§1207.11). The riser height of slide ladder treads shall be no more than 12 inches (30.5 cm) nor less than 7 inches (17.8 cm) and shall be constant over the entire height of the ladder (reference (c) of §1207.11).

LADDER TREAD DIMENSIONS

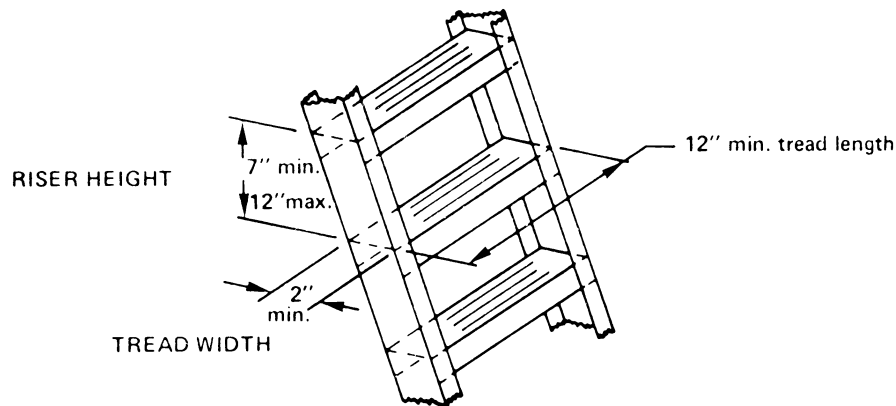


FIGURE B

(ii) *Tread curvature.* If slide ladder tread surfaces are curved, they shall not have a radius of curvature less than seven times the tread width.

(iii) *Slip resistant surfaces—(A) General.* The tread surface of all swimming pool slide ladders shall have a slip-resistant surface that is either an integral part of or permanently attached to the ladder steps. The performance test is designed to insure that all tread slip-resistant surfaces shall have the ability to maintain a barefooted 50-percentile adult male (reference (d) of § 1207.11) at an angle of repose of $33^\circ \pm 1^\circ$ without movement with a safety factor

of 2.0. The angle of repose is the angle formed by the intersection of the ladder rails and the line connecting the user's feet and center of gravity. The tread and the foot shall be wet for this test.

(B) *Performance test.* A wooden block shall be prepared in accordance with figure C. The contact surface area of the block shall be 8 square inches (51.61 square cm) to simulate the ball of the foot (reference (d) of § 1207.11). It shall be covered with $\frac{1}{4} \pm \frac{1}{8}$ inch (.64 \pm .32 cm) of natural or silicone rubber sponge capped with porous soft leather as shown in figure C.

TEST BLOCK FOR SLIP-RESISTANCE MEASUREMENTS OF SLIDE LADDER TREADS

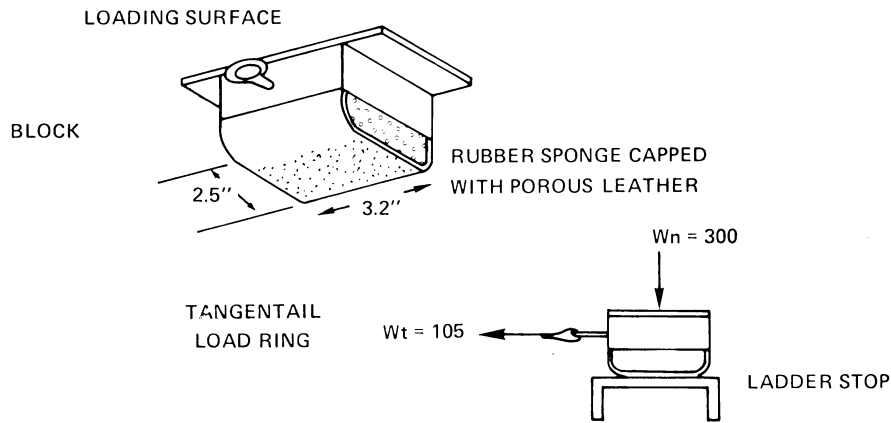


FIGURE C

The tests shall be carried out on a slide assembled and installed according to the manufacturer's instructions. The block shall be soaked in pool water for at least 3 minutes and placed at the midpoint of the wet step with the centroid of load of the block on the longitudinal axis of the step. The block shall be loaded symmetrically on its upper bearing surface with a weight of 300 ± 2 pounds (136.1 ± 0.9 kg). A controlled and measured force shall be applied at the tangential load ring of the block tangent to the horizontal and increased at a rate of no more than 20 pounds (88.96 newtons) per second. If the block does not move at the point that the tangential load is equal to 105 pounds (467.1 newtons), the tread surface passes this performance test. Other force-creating means that produce equal forces on the block (300 ± 2 lbs, 1,334 newtons) may be substituted for weights if they result in substantially identical slip-resistance measurements.

(iv) *Fastener requirements.* Ladder treads shall be attached to the ladder rails in such a manner that continued intended use or reasonably foreseeable abuse shall not cause any fastener to

loosen, crack, or break. All attachment methods that are used to hold the ladder tread to the ladder rails shall be permanent and tamperproof. If fasteners are used for the tread-rail attachment, the number and placement of such fasteners shall not cause a failure of the tread under the ladder loading conditions specified in this paragraph (c)(3).

(v) *Aboveground pool ladders.* Aboveground pool slides equipped with swing-up ladders shall be designed so that the ladders may be fixed in the up position by a tamperproof lock.

(vi) *Ladder platforms.* Swimming pool slides whose height above the surface upon which the slide is mounted is greater than 7.5 feet (2.29 meters) shall have a platform built into the ladder. This platform shall be located at least 6 feet (1.83 meters) above the deck and shall have minimum dimensions of 12 by 12 inches (30.48×30.48 cm.). The floor of the platform shall have a slip-resistant surface whose performance exceeds the requirements of the tests specified in paragraph (c)(3)(iii)(B) of this section. A minimum dimension of two times the riser height shall be maintained from the platform to the top of

the slide runway. Transitional handrails shall be provided when a platform is used.

(vii) *Static load performance test.* Ladder treads or rungs shall be capable of supporting a 300-pound (1,334-newton) static load in the center without failure or permanent deformation.

(d) *Handrails.* Swimming pool slide ladders shall be equipped with handrails to aid the slider in safely making the transition to the runway. The handrails shall extend no more than 18 inches (45.72 cm) above the top of the slide runway platform (see figure D₁).

(1) *Size.* The outside diameter of handrails shall be between 1.00 and 1.90 inches (2.54 and 4.83 cm) (references (c) and (d) of §1207.11).

(2) *Extent of handrails—(i) Maximum angle ladder.* If ladder handrails for a ladder inclined 15 degrees or less from the vertical extend below the slide transition area, they shall be parallel to the ladder rails at a perpendicular distance from them of 4 to 6 inches (10.16 to 15.24 cm) (see figure D₂). The handrail shall begin 3 to 5 feet (0.91 to 1.52 meters) above the pool deck. Handrails should not provide a means of entrapment.

FIG. D₁

TYPICAL TRANSITION HANDRAIL

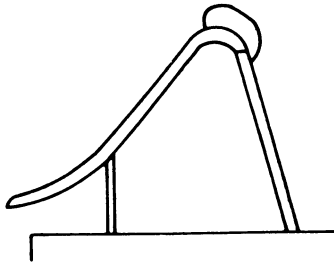
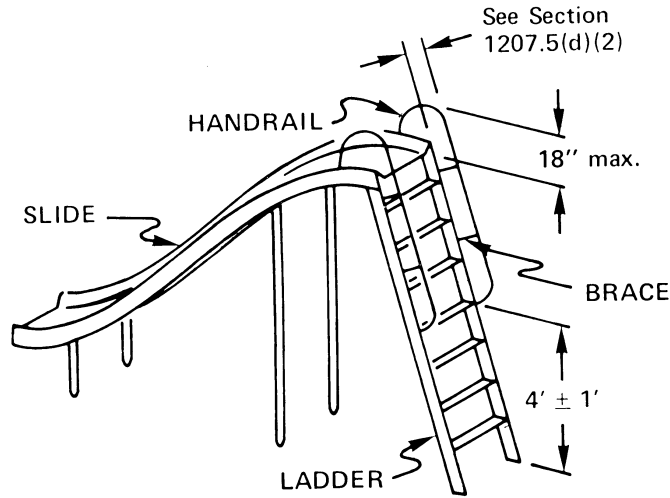


FIG. D₂
 MAXIMUM/MINIMUM DIMENSIONS FOR SLIDE LADDER HANDRAILS



(ii) *Extent of handrails for ladders, steps, stairs, or ramps.* For slides not using the minimum angle ladder (15 degrees or less from the vertical), the perpendicular distance between the ladder handrails and the ladder rails below the slide transition area shall be the distance “l” as shown in table 1.

TABLE 1—VARIATIONS OF l

Ladders: 15° < θ < 40°	$L = (34.09\theta_{\text{rad}} - 3.86) \pm 1"$ $= (86.59\theta_{\text{rad}} - 9.80) \pm 2.54 \text{ cm}$
Stairs: 40° < θ < 70° ...	$l = 34" \pm 1"$ $= 86.36 \pm 2.54 \text{ cm}$
Ramps: θ < 70°	$l = 42" \pm 1"$ $= 106.68 \pm 2.54 \text{ cm}$

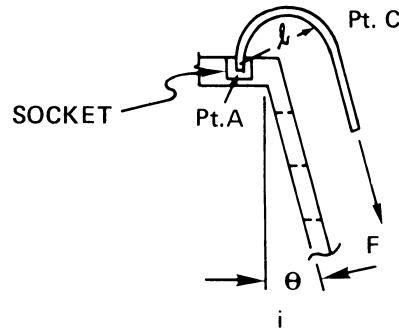
(3) *Bracing of handrails.* If handrail braces are used, they shall withstand intended use and reasonably foreseeable abuse.

(4) *Attachment and strength of handrails.* Handrails and their fasteners

shall withstand allowable shear, bending, and cyclical loading in intended use and reasonably foreseeable abuse. All fasteners for handrail connections shall be vibrationproof, selflocking, and tamperproof. Threaded fasteners shall be capable of withstanding a 1-foot-pound (1,356-newton meter) back-off torque.

(i) *Sockets performance test.* If handrail sockets are used, the handrail end shall be permanently fixed in the socket so that it cannot be pulled out or bent at the socket by a moment of 233 foot-pounds (316 newton-meters) applied clockwise around point A in figure E. The socket shall not permanently deform under the maximum applied loads.

FIG. E
APPLICATION OF HANDRAIL MOMENTS

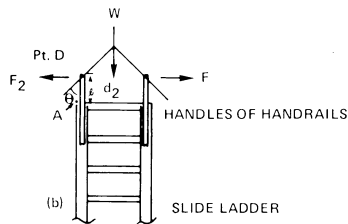


MOMENT = FORCE x DISTANCE = $f \times l = 233 \text{ ft. lbs.}$

WHERE : Pt. C IS TAKEN AT THE MAXIMUM MOMENT ARM " l FROM Pt. A.

(ii) *Side forces.* If the handrail is in a socket or attached to the side of the slide runway rail, the attachment methods must be capable of withstanding all shear and bending forces induced by a 172-foot-pound (233-newton-meter) moment counterclockwise around point A in figure F.

FIG. F
APPLICATION OF HANDRAILS MO.



MOMENT = $F_2 \times d_2 = \text{FORCE} \times \text{DISTANCE} = 172 \text{ ft. lbs.}$

(iii) *Performance tests—(A) Strength for climbing and falls.* (1) Attach a pull loop to point C of the upper handrail (figure E). Point C is the point where a perpendicular to the axis of the handrail

passes through point A, the socket, or other attachment point. Attach a stranded steel cable or wire rope to point C. All cables and ropes shall have at least a 1,000-pound (4,448-newton) tensile capacity. Attach a 162-pound (73.5-kg) weight to this cable at least 4 feet (1.22 meters) below point C. Observe any permanent deformation or bending on the hand-rail at point A. If none exists, the handrail passes this performance test.

(2) Lift the weight one foot (30.48 cm) from its maximum static position and drop it. Observe any permanent deformation of the handrail or its attachments at point A. If each handrail will still support the 162-pound (73.5-kg) weight for a period of 15 minutes and has not been bent more than 45° from its original direction, it passes this performance test.

(B) *Transition handrail strength.* Rotate the assembled slide into the horizontal position on its side on a loading dock or other platform. Move the slide into such a position that the entire

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handrail assembly overhangs the platform and level the slide. Fasten the slide firmly in this position and attach a 115-pound (52.2-kg) weight to point D, as shown in figure F, and check for any visible permanent deformation of the handrail at point A. If none exists, the handrails pass this performance test.

(e) *Lubrication.* Swimming pool slides shall either be equipped with a method of lubrication (for example, water) or have a similar coefficient of friction so that the slider has a smooth, continuous slide. If water is used, the nozzles, piping, or hoses that deliver water to the runway shall be recessed or designed in such a fashion as not to interfere with a slider's progress down the slide or create tripping hazards on the slide.

(f) *Runways—(1) Curvature.* Slide runway curvature between the front and rear support legs of the slide shall be consistent with maintaining the slider safely on the slide during intended use and reasonably foreseeable abuse.

(2) *Dynamic equilibrium.* (i) Swimming pool slide runways, whether straight or curved, shall be designed as “balanced curves.” On a balanced curve, the test fixture discussed in paragraph (f)(2)(ii) of this section shall stay on a trajectory that keeps it within a distance of ± 41 percent of the runway width to the runway centerline at all points along the runway without contacting the runway rails.

(ii) *Performance test—(A) Direct measurement.* Build a wooden pallet no larger than 5 by 5 inches (12.7×12.7 cm), as shown in figure G. Securely attach a lead rod or bar on the pallet. Size the bar so that the weight-to-area ratio of

the assembly is 1.30 ± 0.05 lbs./sq. in. ($8,960 \pm 340$ newtons/sq. meter) and the pallet does not tip over when in motion. Attach a felt pen or other suitable marking device to the pallet assembly as shown in figure G to mark the slide during descent.

(B) *Test.* Lubricate the slide in accordance with the manufacturer's instructions. Center the pallet at the top of the slide runway and release. Observe the pallet's descent and note if it touches the slide's side rails. If it touches, check alignment and installation again. With water off and the slide dry, center the pallet at the top of the runway and release. Measure the distance from the felt pen marked line to the centerline of the runway. If within ± 41 percent of the width measured from the centerline along the entire path and if the pallet does not contact the runway rails, the slide is dynamically balanced and passes this performance test.

(3) *Runway side rails.* Swimming pool slide runways shall have permanent runway side rails of at least 2 inches (5.08 cm) and height to prevent lateral discharge of the slider off the slide under intended use and reasonably foreseeable abuse.

(4) *Runway side-rail heights.* Runway side-rail heights shall be designed as a function of the maximum slide-slope angle (as shown in figure H). Table 2 that follows shows side-rail height versus maximum slide-slope angle. If the maximum slide-slope angle is not shown in table 2, the next higher side-rail height must be used. Maximum slide-slope angles shall not exceed 75° . (See figure H.)

FIG. G
ASSEMBLY FOR MEASUREMENT OF RUNWAY EQUILIBRIUM

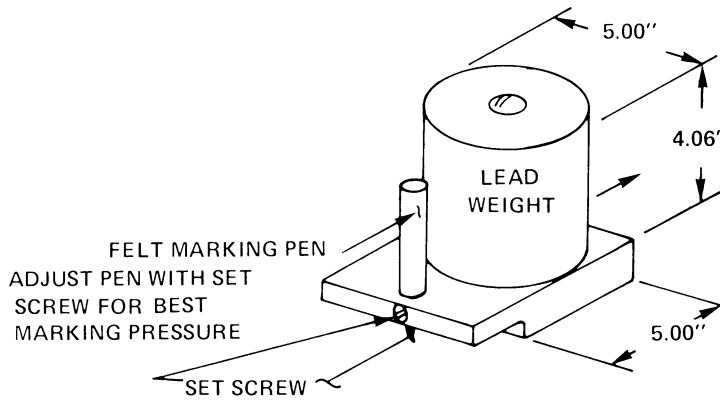
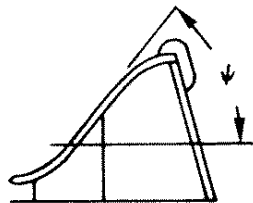


TABLE 2

ψ =Maximum slide-slope angle	Runway side-rail height inches (centimeters)
<60°	2 (5.08)
60-70°	3 (7.62)
70-75°	3½ (8.89)

FIG. H
MAXIMUM SLIDE SLOPE ANGLE "↘"



(5) *Slide geometry.* Swimming pool slide runways shall have a smooth transition section and have geometry such that the path of the center of gravity of the slider is not more than $\pm 10^\circ$ from the horizontal at the center of gravity's exit off the slide and such that the slider's angle of attack (α), shown in figure I and defined below, shall be at least $+15^\circ$ when the slider's feet leave the slide. (See figure I.)

(i) *Performance tests.* Measurement of the 50th-percentile adult male (71 ± 2 inches and 162 ± 5 pounds, 180.34 ± 5.08 cm

and 73.5 ± 2.3 kg)¹ slider's angle of attack shall be made using any of the following methods or their equivalent:

(A) Motion picture cameras (36 frames per second or more).

(B) Still cameras with strobe lights and reflectors on the head and hip of the slider.

(C) Still cameras with rotating shutters and lights on the head and hip of the slider.

(D) Video tape recorder.

(ii) Measurements shall be made from the still water level as the horizontal. The path angle shall be determined by measuring the angle between a tangent to the path of the center of gravity (line X) and the horizontal taken through the center of gravity (line Y). At least five consecutive runs with the same subject shall be made in order that an average may be computed.² Angle of attack shall be taken as the angle between the slider's longitudinal axis (Z) and the tangent to the path of his center of gravity (X). The slider's longitudinal axis shall be located by the vertical line that passes through his center of gravity when he stands erect. The slider shall wear usual swimming attire. The angle-of-attack measurement shall be made after the

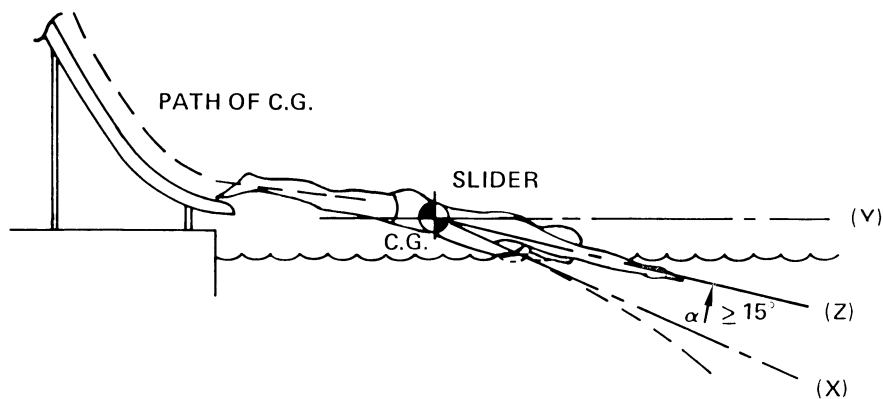
¹ See reference (f) of § 1207.11 for full discussion.

² Maximum measurement variation of ± 15 percent.

slider's feet have cleared the slide, the distance between the end of the slide and his feet being less than 8 inches (20.3 cm). The slider's descent must be headfirst, prone, belly-down, and with arms extended in front. Except when starting, the slider shall not augment the slide trip by forcibly reacting with the slide through the use of his hands,

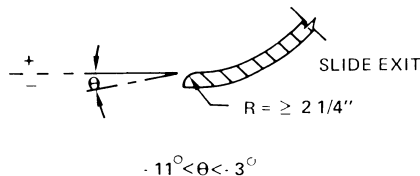
arms, feet and/or legs. The slider's starting reactions with the slide shall be only as strong as necessary to start him moving. If the average angle of attack measured and computed in the above manner is equal to or greater than +15°, the slide passes this performance test.

FIG. I
MEASUREMENT OF ANGLE OF ATTACK



(6) *Runway exit lips.* All runway exit lips of swimming pool slides shall be smoothly faired into the runway surface with a radius of curvature at the exit lip of the slide of at least 2¼ inches (5.72 cm) (see figure J).

FIG. J
RUNWAY EXIT ANGLE θ



(7) *Runway exit vertical angle.* The angle of the runway at exit of the slide (θ) shall be -3 to -11 degrees from the horizontal as shown in figure J.

(8)(i) *Runway exit ramp lateral curvature and exit lip horizontal angle.* No net lateral forces on the slider shall

exist in that portion of the runway exit ramp beyond the forward support points of the slide. All slides shall be designed and constructed so that the exit lip of the slide is level at all points along the width of the runway at the runway exit lip line drawn at the point where the lip curvature shown in figure J is tangent to the runway. The slide shall be designed so that any side forces on the user induced by prior lateral curvature will be reduced to zero upon exit from the slide runway.

(ii) *Performance tests.* Those tests described in paragraph (f)(2)(ii) of this section are also applicable to paragraph (f)(8) of this section, and the path of the test fixture must be parallel to the centerline of the slide at the exit lip (within 5°) and not touching the side rails of the runway.

(9) *Strength of slide runways and supports—(i) Static loads.* A properly assembled and installed slide runway shall be

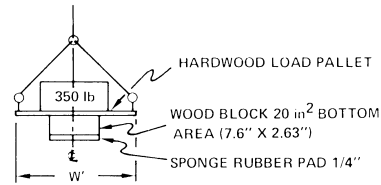
capable of supporting a static load of at least 350 pounds (1,557 newtons) applied normal to the runway over an area of no more than 20 square inches (129.03 square cm) at any point along its length or width.

(ii) *Dynamic loading.* Properly assembled and installed slide runways shall be capable of supporting, without structural failure except as defined in paragraph (f)(9)(iii)(B)(3) of this section, a dynamic load of at least 450 foot-pounds (610.2 newton-meters) dropped on an area of 20 square inches (129.03 square cm) at the midpoints of the upper runway platform and the lower runway exit ramp.

(iii) *Performance tests—(A) Static loads.* Assemble and install a slide according to the manufacturer's instructions. Prepare a 20-square-inch (129.03 square cm) load-bearing pallet according to figure K. Place the loaded pallet on the upper slide platform, positioned between the runway rails, until the scale on the hoist line reads between 0 and 10 pounds (0 and 44.48 newtons). Keep the pallet in this position for 10 minutes. Remove the loaded pallet and

observe the runway for any significant structural failure such as permanent deformations or cracks. If there are none, the slide passes the test. Repeat the same test on the lower runway exit ramp.

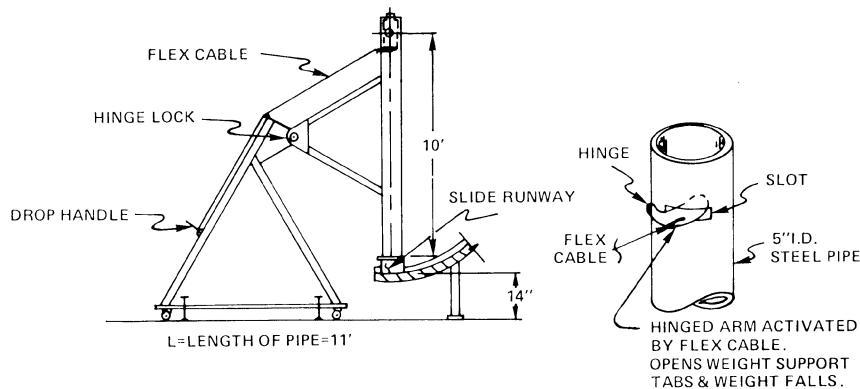
FIG. K
STATIC LOAD TEST FOR
SLIDE BED



w' = WIDTH OF SLIDE RUNWAY MINUS 1/4''

(B) *Dynamic loads. (1)* Assemble and install a slide according to the manufacturer's instructions. Use the hardwood load pallet shown in figure K and set it up under dynamic load guides fabricated as shown in figure L, or an equivalent impact-testing machine.

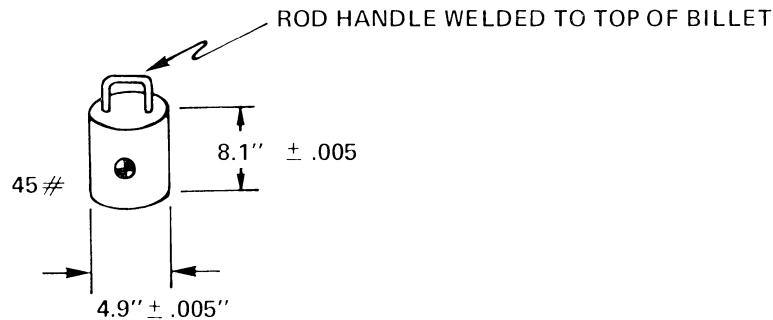
FIG. L
DYNAMIC LOAD TEST



(2) Fabricate a 45-pound (20.4-kg) billet of 4.900±0.005-inch (12.45±0.01 cm) steel rod as shown in figure M, or equivalent, and load into the pipe

above the trigger slot. The length of the pipe from the trigger slot to the impact pallet shall be 10.0±0.1 feet (3.05 meters±3.05 cm).

FIG. M
TYPICAL BILLET FOR IMPACT TESTING



(3) Drop the billet onto the pallet and observe the slide for any permanent deformations or cracks. If the slide runway can still support a static load of 350 pounds (1,557 newtons) on the pallet without further crack propagation, it passes this test.

(4) Perform the test on the entrance and exit platforms of the slide runway.

[41 FR 2751, Jan. 19, 1976; 41 FR 9307, Mar. 4, 1976; 41 FR 10062, Mar. 9, 1976, as amended at 41 FR 12638, Mar. 26, 1976; 41 FR 13911, Apr. 1, 1976]

§§ 1207.6–1207.8 [Reserved]

§ 1207.9 Product certification.

(a) Certification shall be in accordance with section 14(a)(1) of the Consumer Product Safety Act (15 U.S.C. 2063(a)(1)).

(b) A certificate shall accompany the swimming pool slide (in the form of a permanent label on the shipping container(s) or in the form of a separate certificate) to all distributors and retailers to whom the material is delivered certifying that the slide conforms to this part 1207. The certificate or permanent label issued under this section shall be based upon either a test of each product or a reasonable testing program, shall state the name of the manufacturer or private labeler issuing the certificate, and shall include the date and place of manufacture.

(c) Any certificate shall be based upon the test procedures and requirements specified in this part 1207.

§ 1207.10 Handling, storage, and marking.

(a) *Marking.* The manufacturer's or private labeler's identification shall appear on the slide and shipping container. Such identification shall include the identity and address of the manufacturer or private labeler. If a private labeler's name is used, the marking shall include a code mark that will permit an identification of the manufacturer.

(b) *Shipping, handling, and storage.* The slide shall be designed, constructed, or packaged so that reasonably foreseeable shipping, handling, and storage will not cause defects in the slide that will prevent the slide from complying with the requirements of this part 1207.

§ 1207.11 References.

(a) "Statistical Abstract of the United States 1973," U.S. Dept. of Commerce, pp. 181–185, 192.

(b) "Human Engineering Guide for Equipment Designers," Woodson and Conover, pp. 2–166 through 2–169 published by the University of California Press, 2223 Fulton St., Berkeley, California 94720.

(c) "Human Engineering Guide to Equipment Design," Van Cott and KinKade, published by U.S. Dept. of