Liability

Playgrounds

Report Number: LB-30-62
Release Date: December 18, 1996
Section Title: Premises/Operations

Abstract

The number of injuries associated with playgrounds has been estimated to be 170,200 yearly based on the most recent Consumer Product Safety Commission (CPSC) data. The extent of the exposure is broad and includes playgrounds located in or near schools, parks, camps, restaurants, and shopping centers. Playground hazards include faulty or damaged equipment and poorly maintained or damaged auxiliary structures, walks, and staircases, and crime. Loss control programs should emphasize proper supervision of playgrounds, maintenance of existing facilities, and protection against crime.

Introduction

Bodily injury due to falls in playgrounds is the principal general liability loss incurred in playgrounds. Hazards that contribute to all types of losses include poorly designed and maintained equipment, poorly maintained walks and staircases, lack of supervision, lack of security, and the lack of resilient surfaces under equipment. The premises coverage in most general liability policies is applicable to these types of losses.

A considerable amount of information is provided in this report concerning design criteria for playground equipment. For a general liability insurance survey, these criteria should be used to determine if the equipment has been altered, abused, or improperly maintained by the user. For information on the product liability aspects of playground equipment and more comprehensive design criteria, see Product Safety Report PS-80-14, *Playground Equipment*. [1]

Background Data

The Consumer Product Safety Commission (CPSC) estimated that, during 1988, the last year for which data is available, 170,200 injuries to children were associated with playground equipment and auxiliary structures. Of these, 119,600 involved equipment in public playgrounds and 41,600 involved equipment used in home playgrounds. Other injuries were incurred with homemade products, such as rope and tree swings.

A study performed by the CPSC, based on 10,730 injuries treated in hospitals, provided data on the percentage of injuries associated with public playground equipment. [11]

Climbers	31.9%
Slides	29.1%
Swings	26.0%
Seesaws	6.0%
Merry-Go-Rounds	3.6%
Other	3.4%

Extent of the Risk

Playgrounds are commonly located next to schools and public and community centers, in children's camps and daycare centers, and in or next to fast-food restaurants and shopping centers. Public and private swimming pools may also have adjacent playgrounds.

The equipment found in playgrounds may include swings, slides, seesaws, monkey bars, and jungle gyms. Frequently, sandboxes, basketball courts, and possibly a small pool are included. Children may bring other items to the playground, such as bats and balls or arts and crafts equipment.

Crime in playgrounds is another risk. Goods stolen from children or their parents and assaults are also insurance concerns.

Hazardous exposures specific to shelters, lavatories, and snack bars, such as electrical and plumbing equipment, vending machines, and cooking equipment are not addressed in this report.

Playground Exposures

Exposures in playgrounds may be categorized as follows:

- Equipment
- Walks, staircases, and ramps
- Crime

Equipment

Falls From Equipment

The majority of injuries associated with public playground equipment involved falls to the surface below the equipment. Victims most frequently reported that they lost their grip, their feet slipped, they collided with or were pushed by another child, they jumped or intentionally dismounted from equipment, the equipment broke, or they lost their balance. [8]

The harder the surface to which the victim falls, the greater the severity of the injury.

Analysis of the surface under and around playground equipment is an essential loss control consideration, since about 75% of the injuries in both public and private playgrounds have resulted from falls to the surface below the equipment.

Falls to Equipment

Slides and climbers were the items of equipment most frequently associated with this hazard. [11]

Impact With Moving Equipment

Swings and seesaws were the items most frequently involved. Victims usually were injured when they walked in front of or behind a swing being used by another child. Those injured by seesaws usually were hit by one of the seats moving upward when the other end was pushed down. [11]

Impact With Stationary Equipment

Injuries occurred when victims ran into or bumped against a stationary item of equipment; climbers and slides were most frequently involved. [11]

Other Hazards

Other injuries occurred when children had fingers caught in swing chairs, made contact with protruding hardware, sharp edges, or twisted limbs when going down slides. Head entrapment is another hazard. This may occur when children place their heads through an opening in one direction then, after turning their heads to a different orientation, are unable to withdraw from the opening. Another hazard involves anchoring devices. Anchoring devices for playground equipment, such as concrete footings and horizontal bars at the bottom of equipment, can be tripping hazards. [11]

Walks, Staircases, and Ramps

Walks, staircases, and ramps are major sources of tripping injuries. Cracks, potholes, and missing sections of concrete, as well as broken or missing handrails, may cause falls.

Crime

Vandalism

Vandals who enter playgrounds may cause damage to key components of the equipment. The damage includes breaking or detaching swing chairs and seats, bending structural elements, and damaging protective handrails. Damaged equipment used by children could result in physical injuries.

Robbery

Children may be assaulted for money and other valuables. Food vendors also may be a target for thieves.

Assault

Physical assault of children may result in injuries.

Loss Control

The Consumer Product Safety Commission (CPSC), in conjunction with the Consumer Federation of America, the American Society for Testing and Materials, and other safety-conscious organizations, have developed a loss control program for playgrounds. The recommendations are applicable to public playgrounds, but most are also useful for home play areas. The dominant concepts developed in the CPSC program emphasized the importance of supervision of playgrounds, protective surfaces, proper design of equipment, and comprehensive maintenance of the playground and the equipment. For insurance purposes, one additional consideration must be added: security. [2]

General

Basic loss control should include the installation of a perimeter barrier completely surrounding the playground to provide security when the playground is closed and also to prevent children from straying from the playground. The solution is usually a well-maintained fence.

The playground should be organized into different areas to prevent injuries caused by conflicting activities. Children playing ball games should not be near areas where others are using swings. Also, children engaged in running games should be remote from quiet areas where others are engaged in predominately passive activities. For example, sandboxes should not be located near ball fields. Moving equipment, such as swings and merry-go-rounds, should be located in a corner or edge of the play area.

Play equipment should be dispersed to avoid crowding in one area. The layout of equipment should be without visual barriers so that supervision of activities is not impaired. Playgrounds should have separate areas for younger children, since they require more attentive supervision. Slide exits should be located in an uncongested area.

Supervision

Supervision of playgrounds is the most vital element in a comprehensive loss control program. The supervisor must be prepared to cope with routine situations, as well as with unusual problems. Control of events that occur in playgrounds is the prime requisite of this position. The supervisor must be on duty from the time the area is opened until the last child leaves. The first duty of the supervisor is to determine the condition of all equipment and play areas *prior* to opening the facility. If any equipment is damaged, repairs should be made or the equipment removed from service prior to the opening of the playground. The condition of grounds, walks, and staircases also must be checked. Inclement weather conditions may cause slippery conditions to develop or result in damaged walks.

Once the playground is opened, the supervisor must be able to supervise the general use of the area. It may be necessary to demonstrate how the equipment should be safely used. An aptitude for working with children is essential. Settling quarrels between youngsters also may be necessary. The supervisor must be alert to hoodlums who may enter the area. Fights between children should be prevented. The use of bicycles and motorized vehicles should be excluded from play areas. When the playground is to be closed, all children must be required to leave, rest rooms checked for stragglers, equipment checked for damage, and the area securely locked, where possible.

Playground supervisors must be trained to meet their responsibilities. The individual performing the work must have training in safety practices. A knowledge of first-aid is essential. Supervisors must know how to get help in case of emergencies. Rapid communication with an ambulance service and the police department is essential. Supervisors must be capable of reacting to unexpected hazards. For example, bee stings must be dealt with promptly, since some children are severely allergic to them and could go into shock.

Playgrounds in public areas generally are unsupervised or only partially supervised. Under these circumstances, supervision by parents should be encouraged. Unsupervised activity will tend to increase the frequency and magnitude of losses, since minor injuries that are not properly and rapidly treated may develop into serious injuries. Also, preventive measures that could be administered by a supervisor will not be available. Unsupervised playgrounds should be inspected by representatives of the owner at least every day that they are open to the public.

Walks, Ramps, and Staircases

Walks, ramps, and staircases used in and around playgrounds should reflect the pattern of usage. They are not only used for pedestrians, but also for tricycles, carriages, strollers, and other wheeled vehicles. The principal hazards associated with walks, ramps, and staircases are trips and falls due to irregular surfaces. Therefore, dirt and gravel walks and ramps are not recommended, since they tend to develop depressions when used by wheeled vehicles. Hard surfaces made of macadam, asphalt, concrete, paving bricks or blocks, or other hard materials should be used for these surfaces. Surfaces should be smooth and pitched so that water will flow away from the paved areas. Slippery or loose paving materials should be avoided. Walks should be located at a safe distance from equipment so that children using them will not collide with pedestrians.

Maintenance of surfaces is essential to repair potholes, cracks, and other irregularities that could cause tripping. Ramps are preferred to staircases whenever their use is practical. The slope of ramps should not exceed one foot (.31 m) of vertical rise to 8 feet (2.4 m) of horizontal length. Ramps should be equipped with handrails and reflect the needs of persons in wheelchairs, as well as parents pushing carriages. Provision should be made to drain water that may collect at the base of ramps. Where curbs and walks intersect, the surfaces should be smooth without irregularities.

Staircases should be built with a slope of 30°-35° from the horizontal. Handrails should be 30-34 in (76.2-86.4 cm) from the top surface of the stair tread to the rail. Wooden handrails should be at least 2 in (5.1 cm) in diameter and metal rails at least 1-1/2 in (3.8 cm). [10]

Surfaces Around Equipment

The severity of an injury caused by a fall from playground equipment can be reduced with the use of shock-absorbent surfaces. Hard surfacing materials, such as asphalt or concrete, are not suitable for use under and around playground equipment unless they are required as a base for other shock-absorbent materials, such as rubber mats. Earth surfaces, such as soils and hard-packed dirt are not recommended, because their shock-absorbing properties can vary considerably, depending on climatic conditions, such as moisture and temperature. Similarly, grass and turf are not recommended because their effectiveness in absorbing shock during a fall can be reduced considerably due to wear and environmental conditions.

Acceptable playground surfacing materials are available in two basic types - unitary or loose-fill. Unitary materials are generally rubber or rubber-like materials in the form of mats that are held in place by a binder that is poured in place and cured to form a shock-absorbing surface. Some unitary materials require installation over a hard surface. Loose-fill materials also can be used for shock mitigation when installed to a sufficient depth. These materials include sand, gravel, wood chips, and shredded wood products. Loose-fill materials should not be installed over hard surfaces, such as asphalt or concrete. Criteria for the evaluation of the effectiveness of surfacing material are included in ASTM F 1292, *Standard Specification for Impact Attenuation of Surface System Under and Around Playground Equipment.* [7]

The CPSC has conducted tests to determine the relative shock-absorbing properties of some loose-fill materials commonly used as surfaces under and around playground equipment. The tests were conducted in accordance with the procedure contained in the voluntary standard for playground surfacing systems, ASTM F 1292. Table 1 lists the critical height [Footnote[1]] (expressed in feet) for each of seven materials when tested in an uncompressed state at depths of 6, 9, and 12 inches. The table also reports the Critical Height when a 9-inch depth of each material was tested in a compressed state. The ASTM criterion is a 200 G deceleration of the object dropped. [7]

The table should be read as follows: If, for example, uncompressed wood mulch is used at a minimum depth of 6 inches, the critical height is 7 feet. If 9 inches of uncompressed wood mulch is used, the critical height is 10 feet. It should be noted that, for some materials, the Critical Height decreases when the material is compressed.

Table 1. Critical Heights (in feet) of Tested Materials

Material	Uncompressed Depth: 6 inches	Uncompressed Depth: 9 inches	Compressed Depth: 12 inches	Compressed Depth: 9 inches
Wood Mulch	7	10	11	11
Double ShreddedBark Mulch	6	10	11	7
Uniform Wood Chips	6	7	>12	6
Fine Sand	5	5	9	5
Coarse Sand	5	5	6	4
Fine Gravel	6	7	10	6
Medium Gravel	5	5	6	5

The critical heights shown in the above table may be used as a guide in selecting the type and depth of loose-fill materials that will provide the necessary safety for equipment of various heights. There are other loose-fill materials, such as bark nuggets or shredded tires, that have shock-absorbing properties equivalent to those in the above table. These recommendation were developed using the method described in ASTM F 1292. [7]

The depth of any loose-fill material may be reduced during use, resulting in different shock-absorbing properties. For this reason, a margin of safety should be considered in selecting the type and depth of material for a specific use.

Equipment Installation

Proper assembly, installation, and maintenance of playground equipment to the manufacturer's specifications are crucial for its safe use. [5,6]

Stability

All playground equipment must be securely anchored in concrete that extends substantially below grade. The depth of the footings will vary with the frost line of the location. The anchoring system must be able to withstand the maximum anticipated forces during use that might cause it to overturn, tip, slide, or move. Documentation should be maintained that all play equipment has been thoroughly checked for stability prior to its first use. In addition, the equipment should be rechecked periodically for evidence of deterioration of the anchoring system.

Hardware Condition

The structural elements of playground equipment materials are subject to corrosion or deterioration. Ferrous metals should be painted, galvanized, or otherwise treated to prevent rust. All paints must meet the current CPSC regulation for lead content (0.06% maximum). Wooden structural elements should be rot- and insect-resistant or otherwise treated to avoid deterioration. The wood should be visibly free of residues that may contain high levels of arsenic, creosote, pentachlorophenol, and tin oxide which are *not* recommended as preservatives for playground equipment.

Hardware used on playground equipment should be equipped with lockwashers, self-locking nuts, or other fastener-locking means. In addition, all fasteners should be corrosion-resistant. Hardware and adjacent sheet metal parts should be free of sharp points, corners, or edges. Wooden parts should be free of splinters. All corners should be smooth or rounded.

Edges and Projections

Edges and projections on playground equipment should not be capable of entangling children's clothing, since this could cause serious bodily injury. This condition is particularly dangerous at the top of slides and climbers. See Reference 10 for the Protrusion Test Procedure. [Paragraph 7.2]

Pinch, Crush, and Shearing Points

Equipment must not contain any accessible pinch, crush, or shearing points that could injure children. These defects may develop as a result of extended use of the equipment. [10]

Head Entrapment

A component or a group of components should not form openings that could trap a child's head. A child's head may become entrapped as the child attempts to enter an opening either feet first or head first. Head entrapment by head-first entry generally occurs when a child places his head through an opening in one orientation, then after turning his head to a different orientation, is unable to withdraw it from the opening. Head entrapment by feet-first entry involves a child who is generally sitting or lying down and slides his feet into an opening that is large enough to permit passage of his body but is not large enough to permit passage of his head which consequently becomes entrapped. In general, an opening may present an entrapment hazard if the distance between any interior opposing surfaces is greater than 3.5 in (8.9 cm) and less than 9 in (22.98 cm). When any dimension of an opening is within this potentially hazardousrange, the opening must be considered as dangerous. This recommendation applies to all completely bounded openings (see Figure 1). Even openings that are low enough to permit children to touch the ground with their feet can present a risk of strangulation for an entrapped child, since younger children may not have the necessary cognitive ability and motor skills to extricate their heads, especially if scared or in a panic.

Figure 1. Examples of Completely Bound Openings [10]

Playgrounds

Angles

The vertex angle formed by adjacent components on playground equipment should not be less than 55°, unless the lower leg is horizontal or projects downward. An exception can be made if a rigid shield is attached to the vertex between adjacent components and the shield is of sufficient size to prevent a 9-in diameter (3.9 cm) circular template from simultaneously touching components on either side of the vertexes.

Figure 2. Shield for Testing the Vertex Angle Formed by Adjacent Components on Playground Equipment [10]

Anchors and Footings

Anchoring devices for playground equipment, such as concrete footings or horizontal bars at the bottom of flexible climbers, should be installed below the playing surface to eliminate the hazard of tripping. This also will prevent children who may fall from sustaining additional injuries due to striking exposed footings and anchors. In addition, environmental obstacles in the play area, such as rocks, roots, and other protrusions that may cause children to trip should be removed. Retaining walls are commonly used to contain loose surfacing materials. In order to minimize the tripping hazard, retaining walls should be highly visible and any change of elevation should be made obvious. The use of bright colors can contribute to better visibility of these hazards.

Cables, Wires, and Ropes

Cables, wires, ropes, or similar flexible components suspended between play units or from the ground to a play unit within 45° of horizontal should not be located in areas of high traffic because they may cause injuries. It is recommended that these suspended components be brightly colored or contrast with surrounding equipment to add to their visibility. This recommendation does not apply to suspended members that are located 7 ft (2.1 m) or more above the playground surface.

Figure 3. Playground Equipment With Various Modes of Access [6]

Access and Platforms

Access to playground equipment can take many forms, such as conventional ramps, stairways, or ladders with steps or rungs. Access also may be by means of climbing components, such as climbing nets, arch climbers, and tire climbers (see Figure 3). Rung ladders and climbing components should not be used as the sole means of access to equipment to be used by preschoolers. Platforms over 6 ft (1.83 m) high should provide an intermediate standing surface where a decision can be made to halt the ascent and find an alternate means of descent. Steps or rungs that provide access to platforms (or other playground equipment) should be evenly spaced, including the spacing between the top step or rung and the surface of the platform (or equipment). Table 2 contains recommended dimensions for various forms of access for rung ladders, stepladders, stairways, and ramps. (These recommendations are not intended to address ramps designed for accessby wheelchairs.) Openings between adjacent steps or rungs and between the top step or rung should preclude the possibility of entrapment. Rungs are generally round in cross-section and should have a diameter or cross-sectional dimension of 1-1.67 in (2.5-4.2 cm).

Table 2. Recommended Dimensions for Access Slope, Tread, or Rung Width, Tread Depth, Rung Diameter, and Vertical Rise for Rung Ladders, Stepladders, Stairways, and Ramps [10]

Type of Access	Component	Age of Intended User 2-5 Years	Age of Intended user 5-12 Years
Rung Ladders	Slope	75°-90°	75°-90°
Rung Ladders	Rung Width	>12"	>16"
Rung Ladders	Vertical Rise (tread-to tread)	<12" ([Footnote[2]])	<12 ([Footnote[3]])
Rung Ladders	Rung Diameter	1"-1.67"	1"-1.67"
Stepladders	Slope	50°-75°	50°-75°
Stepladders	Tread Width - Single File	12"-21"	>16"
Stepladders	Tread Width - Two Abreast	[Footnote[4]]	>40"

Stepladders	Tread Depth - Open Riser	>7"	>3"
Stepladders	Tread Depth - Closed Riser	>7"	>6"
Stepladders	Vertical Rise (tread-to tread)	<9" [Footnote[5]]	<12" [Footnote[6]]
Stairways	Slope	<35°	<35°
Stairways	Tread Width - Single File	>12"	>16"
Stairways	Tread Width - Two Abreast	>30"	>40"
Stairways	Tread Depth - Open Riser	>7"	>8"
Stairways	Tread Depth - Closed Riser	>7"	>8"
Stairways	Vertical Rise (tread-to tread)	<9" [Footnote[7]]	<12" [Footnote[8]]
Ramps (not intended for access by the disabled)	Slope (vertical: horizontal)	<1:8°	<1:8°
Ramps (not intended for access by the disabled)	Width - Single File	>12"	>16"
Ramps (not intended for access by the disabled)	Width - Two Abreast	gt;30"	>40"

Handrails on stairways and stepladders should extend over the full length of the access and should be provided on both sides of all stairways and stepladders. Handrail height should be 22-38 in (55.9-86.5 cm) and the cross-sectional diameter should be 1-1.67 in (2.5-4.2 cm).

Other design details on guardrails and protective barriers are contained in Reference 10.

Design Concerns of Playground Equipment

Slides

All slides should be provided with a platform of sufficient length to facilitate the transition from standing to sitting at the top of the inclined sliding surface. In the case of a free-standing slide, the platform should have a minimum length of 22 in (55.9 cm) (see Figure 4).

Figure 4. Typical Free-Standing Straight Slide [10]

The platform should be level and its width should be at least equal to the width of the slide. Guardrails or protective barriers should surround a slide platform and should conform to the guidelines specified in the general discussion of platforms. Slides should not have any spaces or gaps between the platform and the start of the sliding surface. With the exception of tube slides, handholds should be provided at the entrance to all slides to facilitate the transition from standing to sitting and decrease the risk of falls. These handholds should extend high enough to provide hand support for a child in a standing position, and low enough to provide hand support for a child in a sitting position. For tube slides, the entrance to the chute should be a means to channel a user to a sitting position. This may be a guardrail, a hood, or other device. Whatever means is provided, it should be of a design that does not encourageclimbing.

The average incline of the sliding surface should not exceed 30°, and any change in the slope of the slide chute should not allow a child to lose contact with the sliding surface. All slides should have an exit region to help children maintain their balance and to facilitate a smooth transition from sitting to standing when exiting. The exit region should be essentially horizontal and parallel to the ground and have a minimum length of 11 in (27.9 cm). For slides that are 4 ft (1.2 m) or less in height, the height of the exit region should be no more than 11 in (27.9 cm) from the protective surface. Slide exit edges should be rounded or curved to prevent lacerations or any other injuries.

Swings

Swings may be divided into two distinct types: single-axis of motion and multiple-axis of motion. A single-axis swing is intended to swing back and forth in a single plane and generally consists of a seat supported by at least two suspending members, each of which is connected to a separate pivot on an overhead structure (see Figure 5). A multiple-axis swing consists of a seat (generally a tire) suspended from a single pivot that permits it to swing in any direction. Hardware used to secure the suspending elements to the swing seat and to the supporting structure should not be removable without the use of tools. S-hooks are often part of a swing's suspension system, either attaching the suspending elements to the overhead support bar or to the swing seat. Open S-hooks are hazardous because they can catch a child's clothing and result in strangulation. S-hooks should be pinched closed as tightly as possible. Swings should besuspended from support structures that discourage climbing. A-frame support structures should not have horizontal cross-bars.

Single-Axis Swing

To prevent young children from inadvertently running into the path of single-axis moving swings, swing structures should be located away from other equipment or activities. Additional protection can be provided by a low barrier, such as a fence or hedge. Such barriers should not be an obstacle within the use zone of a swing structure nor hamper supervision by blocking visibility. To minimize the likelihood of children being struck by a moving swing, it is recommended that no more than two single-axis swings be hung in each bay of the supporting structure. Attaching single-axis swings to structures composed of several other types of equipment is not recommended. Swing seats should be designed to accommodate no more than one user at any time. To help reduce the severity of impact injuries, wood or metal swing seats are not recommended. Edges of plastic seats should have smoothly finished or rounded edges. To minimize collisionsbetween swings or between a swing and its the supporting structure, the clearances shown in Figure 5 are recommended. In addition, to reduce side-to-side collision, swing hangers should be spaced wider than the width of the swing seat.

Figure 5. Minimum Clearances for a Single-Axis Swing [6]

Multiple-Axis Swings

Multiple-axis swings, such as tire swings, are typically suspended in a horizontal orientation using three suspension chains or cables connected to a single swivel mechanism that permits both rotation and a swinging motion in any axis. A multiple-axis tire swing should not be suspended from a structure having other swings in the same bay. To minimize the hazard of impact, heavy truck tires should not be used. Further, if steel-belted radials are used, they should be closely examined to ensure that there are no exposed steel belts that could be a potential protrusion or laceration hazard. Plastic materials can be used as an alternative to simulate actual automobile tires. Drainage holes should be provided in the underside of the tire. The likelihood of hanger mechanism failure is increased for multiple-axis swings due to the added stress of rotational movement and multiple occupancy. Special attention to inspection and maintenanceis warranted. The hanger mechanisms for multiple-axis tire swings should not have any accessible sharp points. The minimum clearance between the seating surface of a tire swing and the uprights of the supporting structure should be 30 in (75.0 cm) when the tire is in a position closest to the support structure.

Multiple-Axis Swing Clearance [10]

Typical Climbing Equipment [6]

Climbing Equipment

Climbing equipment or climbers refer to a wide variety of equipment, including arch climbers, sliding poles, chain or net climbers, upper body devices (overhead horizontal ladders, overhead rings), dome climbers, parallel bars, balance beams, cable walks, suspension bridges, and spiral climbers, as well as composite structures with linked platforms. Climbing equipment is generally designed to present a greater degree of physical challenge than other playground equipment. Older children tend to use climbing equipment more frequently and more proficiently than younger ones. Because very young children have not yet developed some of the physical skills necessary for certain climbing activities (including balance, coordination, and upper body strength), they may have difficulty using more challenging climbing components, such as rung ladders, non-rigid climbers, arch climbers, and upper body devices. Climbers should not have climbingbars or other structural components in the interior of the structure onto which a child may fall from a height of greater than 18 in (45.0 cm). Climbing equipment should allow children to descend as easily as they ascend. One way of implementing this recommendation is to provide an easier, alternate means of descent, from another access, platform, or piece of equipment. For example, a stairway can be added to provide a less challenging mode of descent than a vertical rung ladder or flexible climbing device. The space between adjacent rungs of overhead ladders should be greater than 9 in (22.9 cm) to satisfy the entrapment requirements. The center-to-center spacing of horizontal ladder rungs should not exceed 15 in (38.1 cm). This does not apply to the spacing of overhead rings because during use, the gripped ring swings through an arc and reduces the distance to the gripping surface of the next ring. The first handhold on either end of upper body equipment should not be placed directly above the platform orclimbing rung used to mount or dismount. This minimizes the risk of children striking rigid structures if they fall from the first handhold during mount or dismount.

Figure 6. Minimum and Maximum Radii of Non-Circular Merry-Go-Round Platforms [10]

Merry-Go-Rounds

Merry-go-rounds are the most common type of rotating equipment found in public playgrounds. Children usually sit or stand on the platform while other children or adults push the merry-go-round to make it rotate. In addition, children often get on and off the merry-go-round while it is in motion. Merry-go-rounds may present a physical hazard to preschool-age children who have little or no control over such equipment once they are in motion. Merry-go-rounds are *not* recommended for use in playgrounds unless the following are observed:

- The rotating platform should be continuous and approximately circular. The difference between the minimum and maximum radii of a non-circular platform should not exceed 2.0 in (5.1 cm) (see Figure 6). No components of the apparatus, including handgrips, should extend beyond the perimeter of the platform.

- Children should be provided with a secure means of holding on. There should not be any accessible shearing or crushing mechanisms in the undercarriage of the equipment. The rotating platform of a merry-go-round should not have any sharp edges. The surface of the platform should be continuous with no openings between the axis and the periphery that would permit a rod, having a diameter of 5/16 in (0.80 cm), to penetrate completely through the surface. A means should be provided to limit the peripheral speed of rotation to a maximum of 13 ft/sec (3.9 m/sec). Merry-go-round platforms should not be provided with an oscillatory (up and down) motion.

Typical Fulcrum Type Seesaw [10]

Seesaws

The typical seesaw (also known as a "teeter totter") consists of a board or pole supported at the center by a fulcrum and having a seat at each end. Seesaw use is complex because it requires two children to cooperate and combine their actions. Younger children do not generally have the skills required to effectively use fulcrum seesaws. Therefore, they are not recommended on public playgrounds for preschool-age children unless they are equipped with a spring centering device to prevent abrupt contact with the ground, should one child elect to dismount. There is a trend to replace fulcrum seesaws in public playgrounds with spring-loaded seesaws, which have the advantage of not requiring two children to coordinate their actions in order to play safely. The fulcrum in seesaws should not present a pinch or crush hazard. Partial car tires or another shock-absorbing material should be embedded in the ground underneath the seats offulcrum seesaws, or secured to the underside of the seats. This will help prevent limbs from being crushed between the seat and the ground and will cushion the impact. Handholds should be provided at each seating position for gripping with both hands and should not turn when grasped. Handholds should not protrude beyond the sides of the seat. Footrests should not be provided on fulcrum seesaws, unless they are equipped with a spring centering mechanism to minimize the of impact with the ground.

Additional Considerations

In addition to the recommendations for playground equipment developed by the CPSC and associated groups, the ASTM Committee F-15 on consumer products has developed performance specifications for public playground equipment. (ASTM F 1487-93). [6] This document should be considered as a supplement to the work originally performed by the CPSC group. Many sections of the two documents are essentially the same; however, the ASTM specification includes material not covered by the original specification. There is some effort to combine both documents in the near future. Therefore, at the present time, for loss control purposes, both specifications should be considered.

ASTM F 1487

The following is a summary of some of the more important provisions of, *Standard Consumer Safety Performance Specification for Playground Equipment for Public Use Standards Safety Performance Specification for Playground Equipment for Public Use:* [6]

- Materials - Playground equipment should be made of materials that resist the environmental and physical conditions associated with these products. Metals should be protected against corrosion, wood should be rot-resistant, and plastics should be protected against ultraviolet light.

- Performance requirements - Requirements include prevention of user head and neck entrapment, elimination of sharp points, edges, and protrusions, and the avoidance of devices that may cause entanglement. Some of these requirements are identical to the CPSC recommendations.

- Access/Egress - The ASTM document provides additional material to the details found in Table 2 of this report. These include the design of handrails, chains, and other fastening devices.

- Equipment - The ASTM specification includes information on the design of playground equipment in greater detail than the CPSC document.

- Layout - The ASTM specification includes information on an obstacle-free zone that must be established around each piece of playground equipment.

- Accessibility - If the use zone of a playground is not entirely surfaced with an accessible material, at least one accessible route within the use zone must be provided from the perimeter of the playground to all structures.

- Installation - The manufacturer of playground equipment must provide instructions and procedures for the installation of all products. The owner/operator of the playground must carefully adhere to these requirements.

- Structural integrity - The ASTM specification contains details on the required loading and test methods to be used for evaluating the structural integrity of swing assemblies and other components used in playground equipment.

- Maintenance - The manufacturer is required to provide "clear and concise" inspection, maintenance, and repair instructions for each product. The owner/operator of the equipment is required to maintain the protective surfacing around the equipment and also to remove debris and other material around the area that could cause injury, infection, or disease to children. Records must be kept on the installation, inspection, and maintenance of all equipment.

- Labeling - The ASTM document lists the types of labels and warnings that must be posted on and around playground equipment that are needed to protect children against injury. Warnings are to be written in accordance with the ANSI Z 535.4-1991 standard. [4]

CPSC Ban on Lead Paint

The CPSC's *Ban on Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint*, 16 CFR 1303, is applicable to playground equipment. When equipment is repainted, it must conform to the requirements of the standard which limit the lead content in paint to 0.06 percent. [9]

American With Disabilities Act

The *American With Disabilities Act* (ADA) contains provisions concerning the accessiblity to public places. More information on the subject may be found in Liability Report LB-70-20, *The Americans With Disabilities Act - ADA*. [3]

Security

Vandalism may be defined as the willful or malicious destruction of public or private property. Assault is an attack on a person by another person. Assault may result in claims by the victim against the owners of the playground. Vandalism may result in property loss claims by the playground operator. Equipment damaged by vandals can result in bodily injury claims. [1]

Vandalism is best controlled by the erection of a substantial, well-maintained fence around the playground. The fence should be equipped with a gate that can be securely locked. Lighting of the area, as a deterrent against after-hours use, is also important. Rules of conduct for individuals who use the playground should be posted at entrances and enforced by the supervisor. Local police patrols, especially after closing, should be requested.

Assault of children by other children or intruders must be prevented by supervision. The supervisor should have access to a phone or radio contact with the local police department so that assistance can be quickly obtained.

Survey Checklist

Maintenance of the playground and its equipment is a vital loss control function. The playground should be inspected each day, *prior* to admitting the public, for conditions that could be a source of loss. The checklist in the appendix may be used to evaluate hazards.

Summary

The general liability exposure associated with playgrounds may be controlled by careful supervision of the playground, use of well-designed equipment, and attention to proper surfacing under the equipment. Design information presented in this report is a summary of information available in the references cited. For more complete details, the original documents should be consulted.

Appendix: Loss Control Checklist For Playgrounds

Instructions: Answer each question Yes, No, or Not-Applicable.

General Considerations

- 1. Is the playground generally clean and well maintained?
- 2. Can the playground be safely reached by pedestrians or those on bicycles?
- 3. Are the automobile parking areas physically separated from the playground?
- 4. Is perimeter fencing provided?
- 5. Are the fencing and the gate in good condition?
- 6. Are informational signs concerning the use of the playground and the equipment provided?
- 7. Are the signs presented in both written and graphic formats?
- 8. Is the playground surface provided with proper drainage to prevent water from forming puddles?
- 9. Are the restrooms clean and well maintained?
- 10. Are the playground areas free from utility boxes, drainage ditches, sewer covers, and other items that could cause tripping?
- 11. Are the trees free from cracked or loose limbs?
- 12. Are pesticides/herbicides used on shrubs and trees?
- 13. Are there any indications of damage caused by vandalism?
- 14. Are areas where playground equipment is used separated from areas where running games are played?
- 15. Is the playground equipment suitably separated to prevent collisions?
- 16. Are the walkways located away from the equipment in active use?
- 17. Are the walkways free from loose surface materials, irregularities, and slippery substances that could cause slips and falls?
- 18. Is at least one primary entrance provided for persons in wheelchairs?
- 19. Are sharp inclines and abrupt changes in levels avoided at entrances?
- 20. Are walkways clearly defined?

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Playgrounds

- 21. Are pathways at least 48 in (1.22 m) wide?
- 22. Are the slopes of the walkways less than 5%?
- 23. Are pedestrian ramps limited to slopes less than 8% and equipped with handrails?

Supervision

- 24. Is the playground actively supervised?
- 25. Is the supervisor trained to perform the required duties?
- 26. Are records kept of playground and equipment repairs?

Maintenance

- 27. Is the area under and around playground equipment equipped with shock-absorbent material?
- 28. Is all the equipment visibly stable when in use?
- 29. Are metal equipment and hardware free of major corrosion?
- 30. Are wooden structural components free of rot, major cracks, and splinters?
- 31. Is the equipment free of protrusions and projections that may entangle children's clothing?
- 32. Is the equipment free of pinch, crush, and shearing points that could injure children?
- 33. Is the equipment fabricated to eliminate areas that may entrap children's heads?
- 34. Do adjacent structural elements form a vertex angle greater than 55°?
- 35. Are the bases of equipment free of tripping hazards?
- 36. Are the areas above and around equipment free of suspended hazards?
- 37. Are the ladders, stairways, and ramps built in accordance with the requirements listed in Table 2 of this report?

Slides

- 38. Are the slides equipped with platforms to facilitate access to the sitting position?
- 39. Are the platforms equipped with guardrails or equivalent protective equipment?
- 40. Is the average incline of the slides less than 30°?
- 41. Are the exit regions of the slides level?

Swings

- 42. Are the swing hardware and supporting chains in satisfactory condition?
- 43. Are the swings located away from other playground equipment and protected by barriers?
- 44. Are the edges of seats smooth and free from obstructions?

Playgrounds

- 45. Are the multiple-axis swings mounted on frames that do not contain single-axis swings?

Climbing Equipment

- 46. Is the interior of the climbing equipment free of structural components upon which a child could fall?
- 47. Are the tops of the equipment provided with an auxiliary means for reaching the ground?

Merry-Go-Rounds

- 48. Are the rotating platforms essentially circular?
- 49. Does the equipment contain handholds or equivalent devices?
- 50. Are the rotating platforms free of sharp edges?

Seesaws

- 51. Are the seesaws free of cracks, corrosion, and other obvious structural defects?
- 52. Is the equipment provided with spring centering devices or cushioning material to prevent abrupt contact with the ground?
- 53. Are the fulcrums of seesaws free of pinch or crush hazards?
- 54. Are handholds provided at each seating position?

Security

- 55. Does the management of the playground have a security program?
- 56. Is there access to a phone or radio to allow for communication in the event of an emergency?

References

- 1. American Insurance Services Group, Inc. Engineering and Safety Service. *Playground Equipment*. Product Safety Report PS-80-14. New York, NY: AISG, 1993.
- 2. ---. Engineering and Safety Service. *Vandalism: An Overview of the Problem*. Crime Prevention Report CP-25-10. New York, NY: AISG, 1990.
- 3. ---. Engineering and Safety Service. *The Americans with Disabilities Act - ADA.* Liability Report LB-70-20. New York, NY: AISG, 1992.
- 4. American National Standards Institute. *Safety Color Code*. ANSI Z 535.4-1991. New York, NY: ANSI, 1991.
- 5. American Society of Testing and Materials. *Standard Consumer Safety Performance Specification for Home Playground Equipment*. ASTM F 1148-93. Philadelphia, PA: ASTM, 1993.
- 6. ---. *Standard Consumer Safety Performance Specification for Playground Equipment for Public Use*. ASTM F 1487-93. Philadelphia, PA: ASTM, 1993.

- 7. ---. *Standard Specification for Impact Attention of Surface Systems Under and Around Playground Equipment*. ASTM F 1292-93. Philadelphia, PA: ASTM, 1993.
- 8. Consumer Federation of America. *Report on Public Play Equipment and Areas.* Washington, DC: CFA, 1992.
- 9. Consumer Product Safety Commission. *Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint.* 16 CFR 1303. Washington, DC: CPSC, 1979.
- 10. ---. *Handbook for Public Playground Safety.* Washington, DC: CPSC, 1990.
- 11. ---. *Playground Equipment-Related Injuries and Deaths*. Washington, DC: CPSC, 1990.

Footnotes

- Footnote[1] The critical height is defined as the maximum height from which an instrumented simulated headform, upon impact, yields a peak deceleration of not more than 200 Gs. [5]
- Footnote[2] Entrapment provisions apply.
- Footnote[3] Entrapment provisions apply.
- Footnote[4] Not recommended for preschoolers.
- Footnote[5] Entrapment provisions apply.
- Footnote[6] Entrapment provisions apply.
- Footnote[7] Entrapment provisions apply.
- Footnote[8] Entrapment provisions apply.

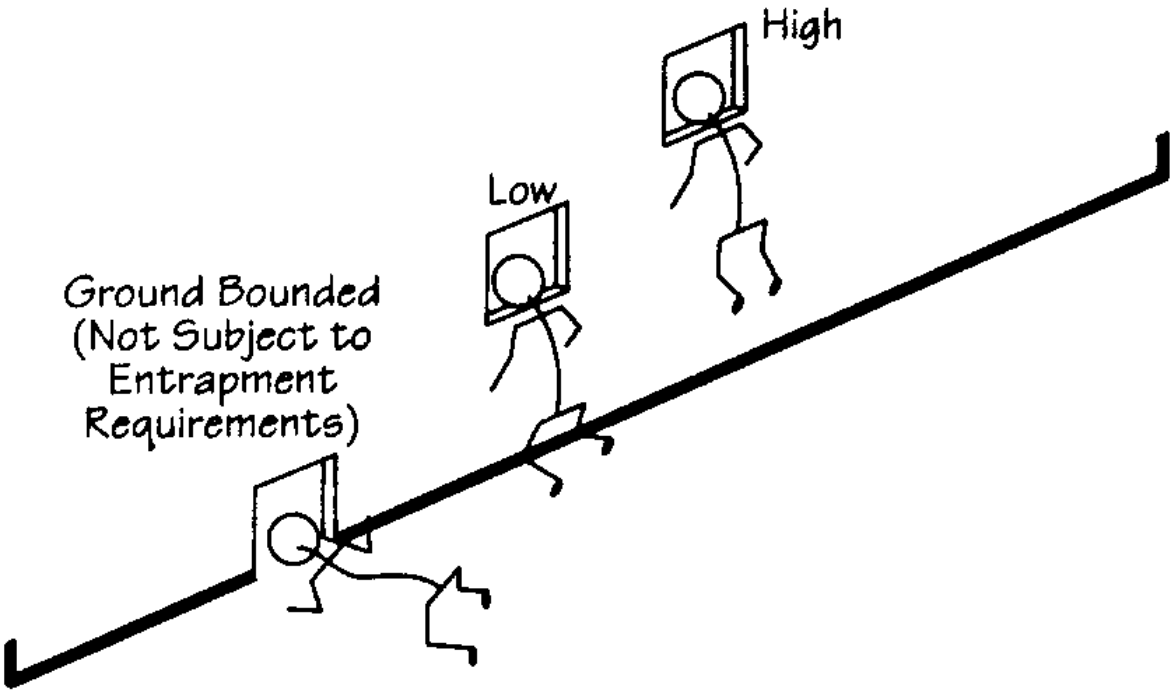

Figure 1. - Examples of Completely Bound Openings

Figure 1. Examples of Completely Bound Openings [10]

Appendix: Figures and Tables

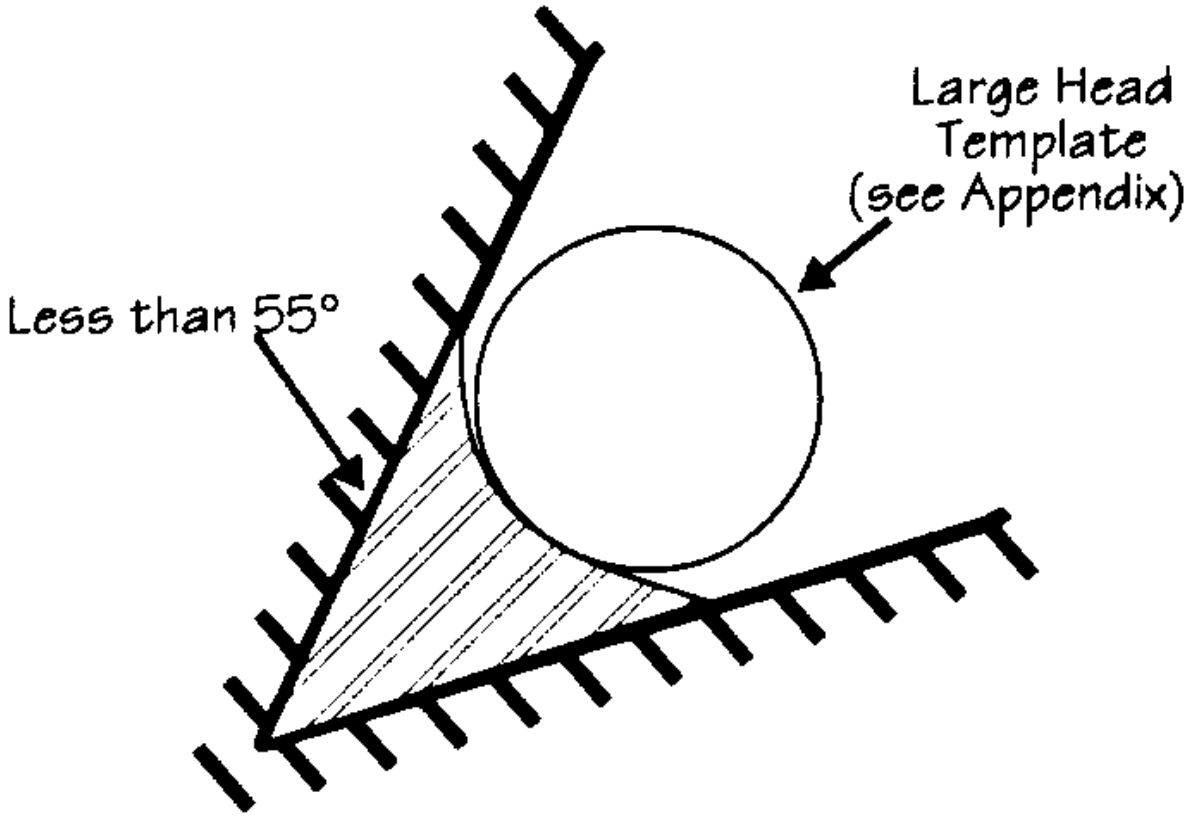

Figure 2. Shield for Testing the Vertex Angle Formed by Adjacent Components on Playground Equipment [10]

Appendix: Figures and Tables

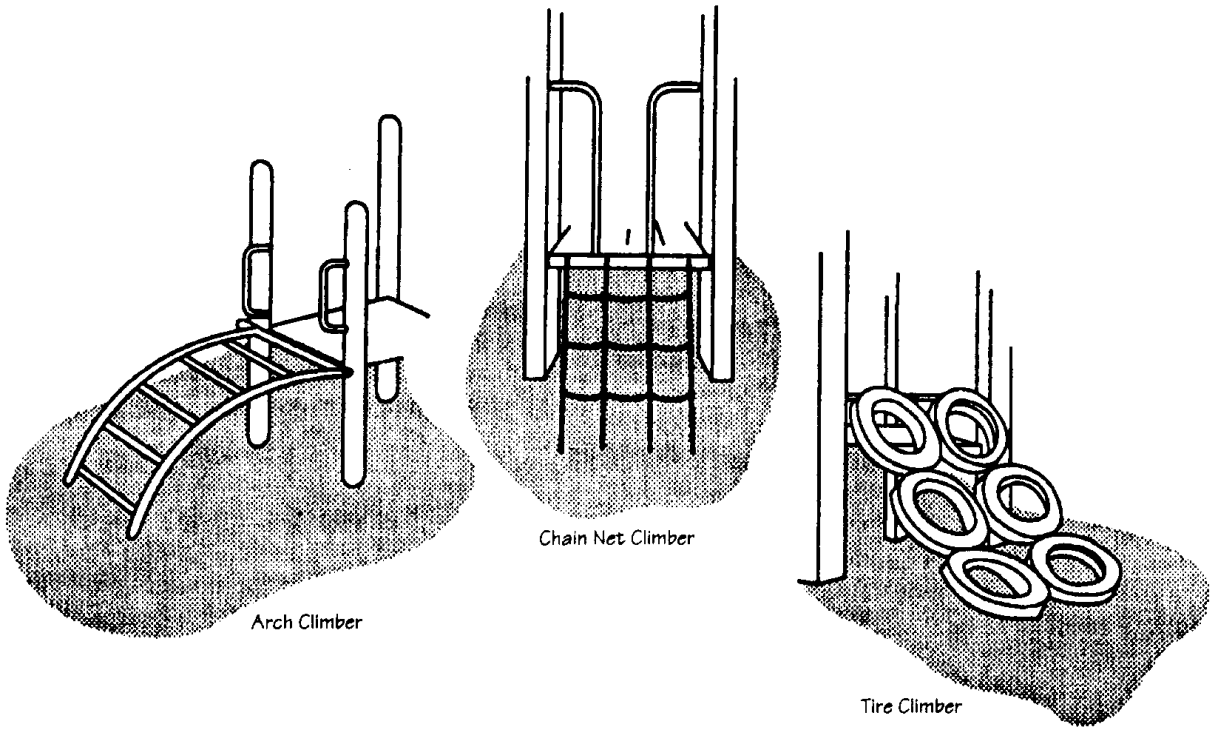

Figure 3. Playground Equipment With Various Modes of Access [6]

Appendix: Figures and Tables

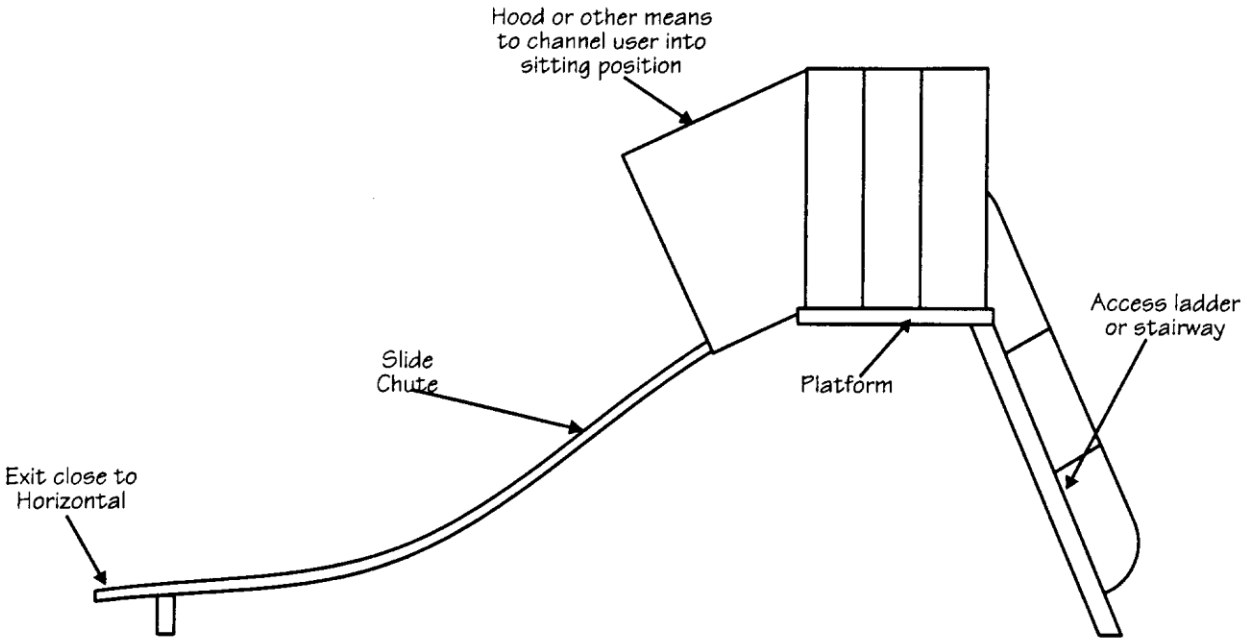

Figure 4. Typical Free-Standing Straight Slide [10]

Appendix: Figures and Tables

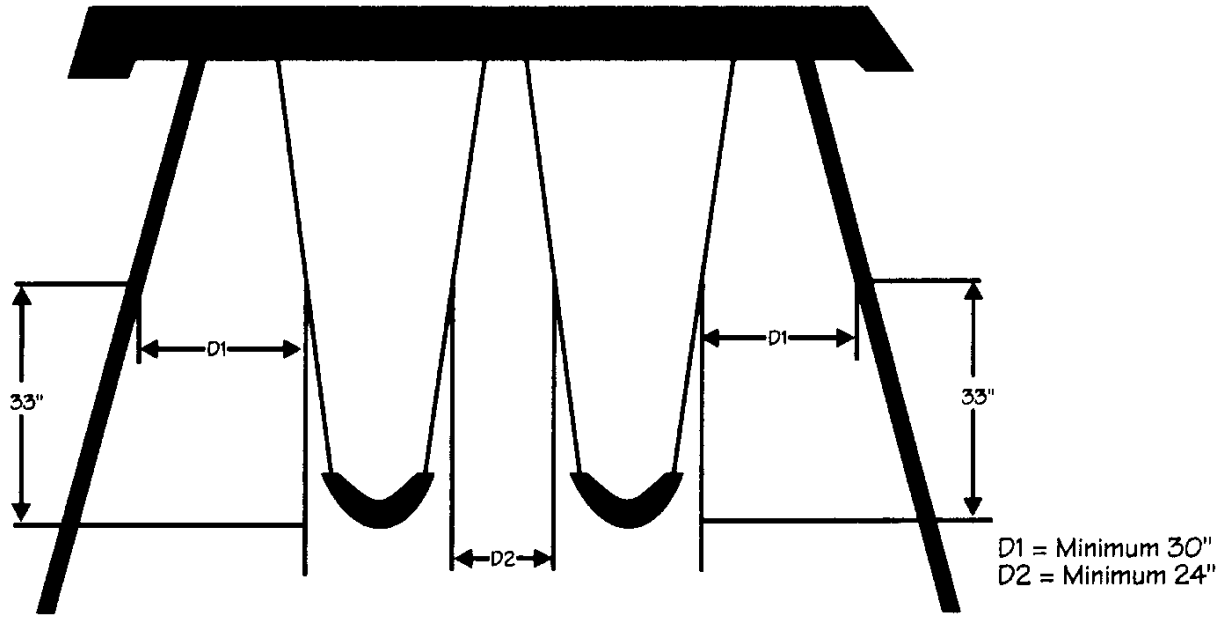

Figure 5. Minimum Clearances for a Single-Axis Swing [6]

Appendix: Figures and Tables

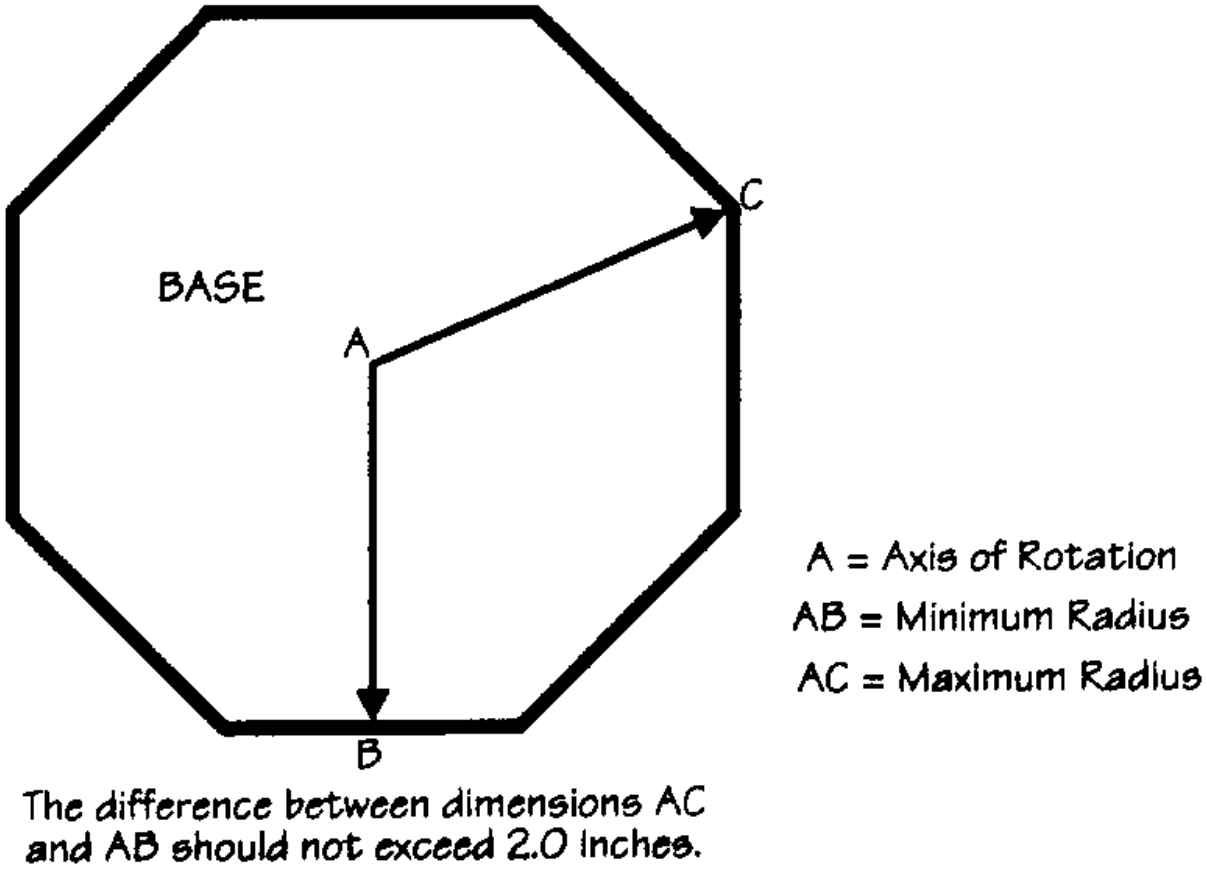

Figure 6. Minimum and Maximum Radii of Non-Circular Merry-Go-Round Platforms [10]