

CHAPTER 3

CHILD SAFETY REQUIREMENTS IN THE OUTDOOR PLAY AREA

3-1. Introduction

All play equipment will meet the requirements of CPSC and ASTM F1487. Those involved with the inspection and maintenance of the CDC outdoor play area must be familiar with child safety requirements for the outdoor play area. Guidelines for child safety are as follows:

3-2. Head and neck entrapment

All elements within the play area will be designed, constructed, and assembled to reduce the risk of accidental head or neck entrapment when children enter any opening headfirst or feetfirst. Entrapment occurs when a child's head or neck becomes lodged within a space and cannot be withdrawn. Strangulation or emotional injury can result. Both the opening size and shape are considered in determining entrapment potential. Any opening that is closed on all sides and all angular openings will meet the entrapment criteria specified in *ASTM F 1487*. This *ASTM* standard includes testing criteria that can be used to evaluate opening size and shape for entrapment potential. Recommended inspection procedures are provided.

3-3. Maximum recommended equipment heights by age group

Play equipment should be selected that allows safe and successful use by children of a specific chronological age, mental age, and physical ability. Play equipment height and complexity should not exceed the user's ability as defined by tables 3-1 and 3-2. These tables are based on the average user in each age group. An individual child's skills may vary from these averages and must be assessed by caregivers during program activities.

3-4. Multiple exits

A minimum of two exits should be provided on all play equipment, including composite structures and playhouses. Climbers, such as rung ladders, climbing nets, and arch climbers, should not be used as the sole means of access to equipment intended for children under age five. A playhouse window may qualify as an exit if it is large enough to be climbed through by a child.

3-5. Pinch, crush, and shear points

Pinch, crush, or shear points are junctures that could cause contusion, laceration, abrasion, amputation, or fracture during use. A pinch, crush, or shear point is defined by *ASTM F 1487* as any point that entraps a 16 mm (5/8-inch) diameter rod at one or more positions. Accessible crush, pinch, or shearing points will not be provided in outdoor play areas. To reduce the likelihood of unintentional contact with a pinch, crush, or shear point, openings will meet the specifications of *ASTM F 1487*. The hardware that attaches chain to equipment are exempt from pinch, crush, and shear point requirements. The attachment area of heavy duty coil springs to the body and base of rocking equipment is also exempt.

3-6. Protective barriers

Protective barriers are enclosures that help keep children from falling off elevated platforms. A protective barrier is a vertical surface, game panel, series of vertical or diagonal bars spaced less than 90 mm (3-1/2 inches) apart, or other design free of footholds or handholds that may facilitate climbing. For school age children, any play equipment platform over 750 mm (30 inches) in height above the playing surface will be surrounded with a protective barrier a minimum 970 mm (38 inches) high. For toddlers and preschoolers, any play equipment platform over 500 mm (20 inches) in height above the playing surface will be surrounded with a protective barrier. A protective barrier a minimum 750 mm (29 inches) high will be provided for preschoolers. For toddlers, a protective barrier a minimum 500 mm (20 inches) high will be provided. *ASTM F 1487* also allows the use of a guardrail for some platform heights and age groups. However, guardrails provide less protection. Therefore, the use of guardrails will be avoided, except when necessary for play equipment function, e.g., on moving bridges. Protective barrier requirements are illustrated in figure 3-1.

3-7. Protrusions

Protrusions are hardware, pipes, posts, or other structural members that extend in any direction from play equipment, site elements, or site furnishings. Protrusions may catch a child's clothing causing strangulation or loss of balance. Protrusions may also pose a potential impact hazard. Hardware that increases in diameter from the surface to the exposed end and caps or coverings that do not fit flush against the nut or surrounding surface are two examples of protrusions that are likely to catch a child's clothing. All protrusions will meet the requirements of *ASTM F 1487*.

Table 3-1: Recommended composite structure platform heights.

Age Group	Maximum Platform Height	
	Millimeters	Inches
Toddler	900	36
Preschool	1200	48
School age	1400	56

Table 3-2: Maximum recommended play equipment heights.

Play Events	Infant	Toddler	Preschool	School age
Balance beam (maximum height)	N/A	N/A	300 mm (12 inches)	400 mm (16 inches)
Banister slide (maximum height of attached platform)	N/A	N/A	N/A	1400 mm (56 inches)
Chinning/turning bars (maximum height)	N/A	N/A	1500 mm (60 inches)	2100 mm (84 inches)
Clatter bridge (height to bridge surface)	N/A	N/A	760 mm ^b (30 inches)	1200 mm (48 inches)
Climber - freestanding (maximum height)	N/A	N/A	1500 mm ^c (60 inches)	1500 mm (60 inches)
Climber - attached to composite (maximum height)	N/A	N/A	1200 mm ^c (48 inches)	1400 mm (56 inches)
Climber - arch (maximum height, attached to composite structure)	N/A	N/A	1200 mm ^c (48 inches)	1400 mm (56 inches)
Climber - arch - freestanding	N/A	N/A	N/A	1500 mm (60 inches)
Climber - net - installed at 90° (maximum height)	N/A	N/A	2400 mm (96 inches)	2400 mm (96 inches)
Climber - net- installed at 60° (maximum height)	N/A	N/A	N/A	1400 mm (56 inches)
Fire pole (maximum height of attached platform)	N/A	N/A	N/A	1400 mm (56 inches)
Horizontal ladder (maximum height)	N/A	N/A	1500 mm ^c (60 inches)	2100 mm (84 inches)
Parallel bars (maximum height)	N/A	N/A	N/A	900 mm (36 inches)
Playhouse - freestanding (maximum height at roof ridge)	1800 mm (72 inches)	1800 mm (72 inches)	1800 mm (72 inches)	1800 mm (72 inches)
Ring trek (maximum height - rings to safety surface)	N/A	N/A	N/A	2100 mm (84 inches)
Slide (maximum height at entrance)	N/A	900 mm ^a (36 inches)	1200 mm (48 inches)	1400 mm (56 inches)
Spring rocking equipment (maximum seat height)	N/A	N/A	700 mm (28 inches)	N/A
Stationary bridge (maximum height to bridge surface)	No potential fall	900 mm (36 inches)	1200 mm (48 inches)	1400 mm (56 inches)

Table 3-2. Maximum recommended play equipment heights (cont.).

Play Events	Infant	Toddler	Preschool	School age
Swings - to-fro (maximum crossbeam height)	2100 mm (84 inches)	2100 mm (84 inches)	2400 mm ^b (96 inches)	2400 mm (96 inches)
Swings - rotating (maximum crossbeam height)	N/A	N/A	2400 mm ^b (96 inches)	2400 mm (96 inches)
Track ride (maximum height - hand hold to safety surface)	N/A	N/A	N/A	2100 mm (84 inches)
Tunnel (maximum height of attached deck)	Ground level No potential fall	900 mm (36 inches)	1200 mm (48 inches)	1400 mm (56 inches)

Note: ^aRecommended for ages 2 and older.
^bRecommended for ages 3 and older.
^cRecommended for ages 4 and older.

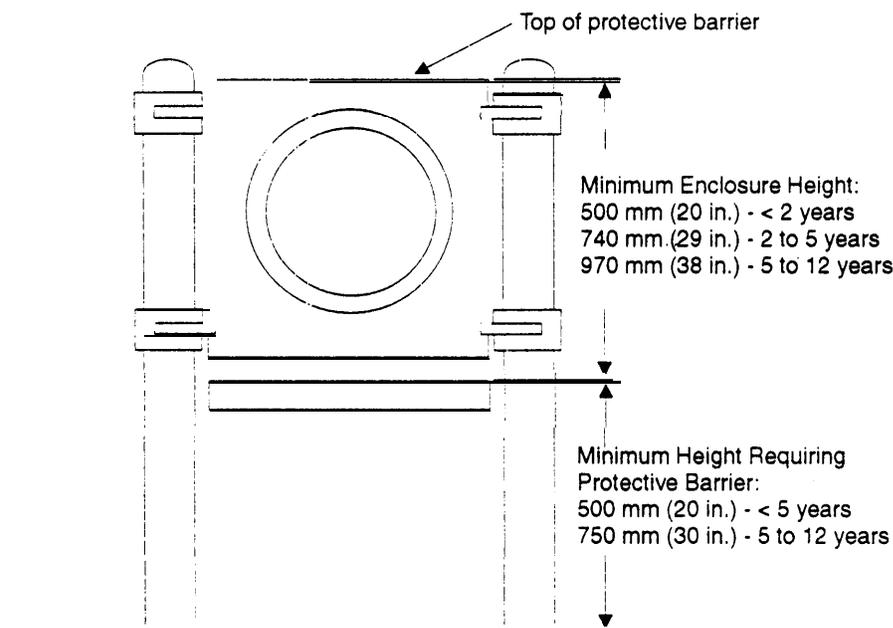


Figure 3-1: Protective barrier requirements.

3-8. Safety surfaces

Adequate safety surfacing throughout play equipment use zones is essential. Falls from play equipment represent over 70% of all playground equipment-related injuries treated in hospital emergency rooms. Without appropriate safety surfacing, these falls may result in permanent head injury or death.

a. *Types of Safety Surfacing.* A number of safety surfacing materials are available. Each type of safety surfacing has unique advantages and disadvantages.

The two major types of safety surfaces are synthetic surfacing and loose-fill surfacing. Synthetic surfacing is purchased as tiles that are formed in the factory, or it is poured in place on-site. Loose-fill surfacing includes organic and inorganic materials, such as sand, gravel, chopped tire, and wood products.

b. *Impact Attenuation Criteria.* Standards for impact attenuation have been developed with the goal of reducing severe head injury or death from falls from manufactured play equipment. Safety surfaces that meet the requirements of *ASTM F 1292* will be provided throughout the play equipment use zone. *ASTM F 1292*

states that the surface must yield both a peak deceleration of no more than 200 g's and a Head Injury Criteria (HIC) value of no more than 1,000 for a headfirst fall from the highest accessible height of the play equipment. G-force measures the peak deceleration of the head during impact. HIC measures the duration of the impact during its most severe phase.

c. *Critical Height of Safety Surfacing Materials.* The performance of safety surfacing is measured from potential fall heights. The critical height of a surfacing material is the maximum height at which a headfirst fall from equipment onto the safety surface meets the *ASTM F 1292* standard. For instance, a particular surfacing material may not meet test criteria for a fall from 2400 mm (96 inches), but will meet criteria for a 1800 mm (72-inch) fall. It can then be said that this surfacing material has a 1800 mm (72-inch) critical height. The critical height of safety surfacing material used in children's play areas will equal or exceed the highest accessible height of the equipment provided. The highest accessible height of various types of play equipment is measured from different points. Table 3-3 describes how the highest accessible height is determined for various manufactured equipment.

d. *Manufactured Safety Surfacing.* Testing data should be obtained from manufacturers of synthetic surfaces, chopped tire surfaces, or wood products manufactured as safety surfacing to verify that the sur-

face meets the requirements of *ASTM F 1292* for a headfirst fall from the highest accessible equipment height to be provided.

e. *Loose-Fill Surfacing.* Loose-fill materials are often not manufactured specifically as safety surfacing. Therefore, test data is not available from suppliers. In 1993, the U.S. Army Corps of Engineers commissioned a testing program to develop recommended material depths for loose-fill surfaces. Materials tested include sand, pea gravel, and bark mulch. To reproduce required impact-attenuating performance, the materials must meet standard specifications; the maximum accessible height of play equipment must not exceed 2400 mm (96 inches); and the surface must receive regular maintenance to maintain material depth. A 25 mm (1-inch) difference in material depth may dramatically increase injury potential. Table 3-4 describes the recommended installed material depth for loose-fill surfacing.

3-9. Use zones

A use zone is the clear area under and around play equipment where a child could land when falling, jumping, or exiting from the equipment. For all play equipment, an unobstructed use zone covered with safety surfacing will be provided, which at minimum conforms to *ASTM F 1292* for the highest accessible equipment

Table 3-3: Highest accessible height of play equipment.

Play Equipment	Highest Accessible Height
Composite equipment	Measure from the top edge of the protective barrier.
Infant crawl area	Measure from maximum height of 600 mm (24 inches).
Playhouse, nonclimbable	Measure from the maximum height of the highest surface which is a minimum 50 mm (2 inches) wide and has a slope of 30 degrees or less.
Spring rockers	Measure from the seat.
Stationary equipment, climbable	Measure from the maximum height of the structure.
Swings	Measure from the height of the swing crossbeam.

Table 3-4: Recommended installed depths for loose-fill safety surfacing.

Material	Recommended Installed Depth
Sand	450 mm (18 inches)
Gravel	300 mm (12 inches)
Wood products	300 mm (12 inches)
Chopped tire	150 mm (6 inches)

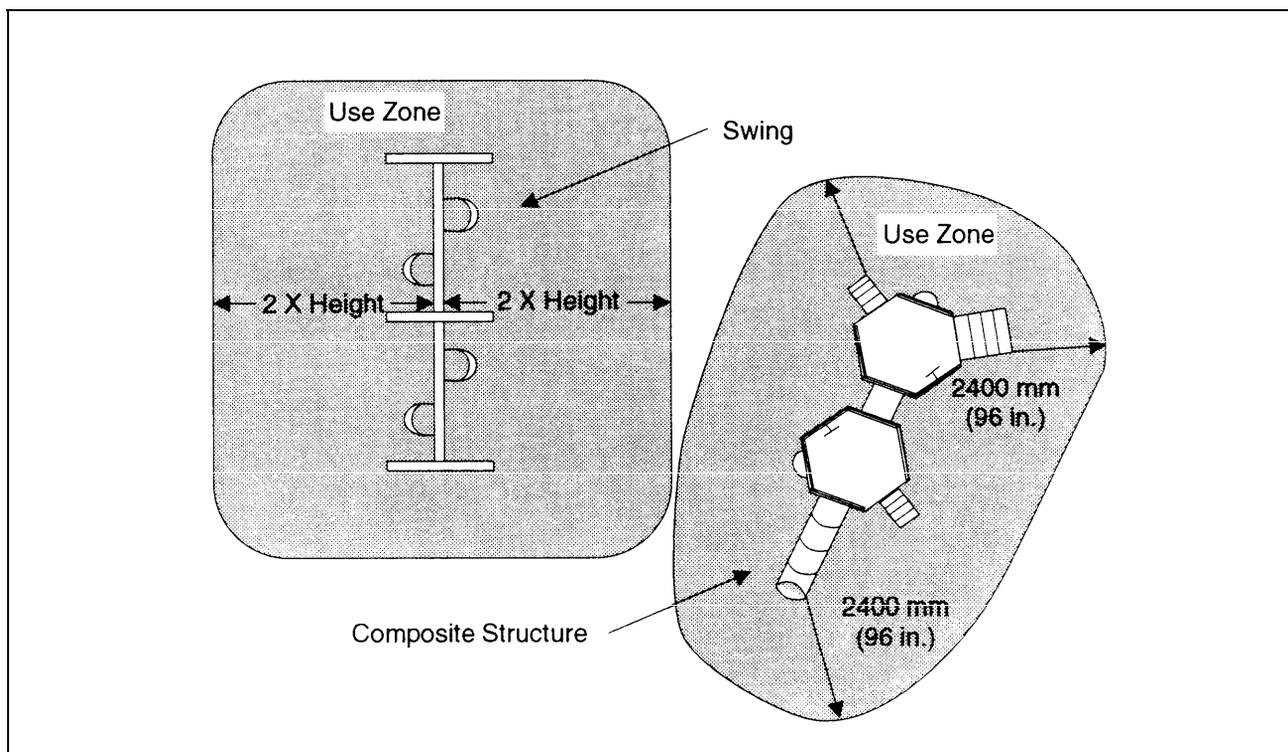


Figure 3-2: Adjacent play equipment without overlapping use zones.

fall height. This criteria reduces the likelihood of life-threatening head injuries that often result from falls from play equipment. Use zones should not overlap except where indicated. Figure 3-2 provides an example of adjacent play equipment without overlapping use zones. The use zone dimensions depend on the equipment type and users' age group. Use zone requirements for each type of play equipment are provided.

a. Stationary Equipment. Figure 3-3 illustrates a typical stationary equipment use zone. For toddlers, provide a minimum 1800 mm (72-inch) use zone from all sides of the equipment. For preschoolers and school age children, provide a minimum 2400 mm (96-inch) use zone from all sides of the equipment.

b. To-Fro Swing Use Zone. Swings require an ample fall zone to protect children who may fall or jump from a moving swing (fig 3-4). For swings, the use zone is equal to two times the height of the crossbeam. This use zone will be provided both in front of and behind the equipment. A 1800 mm (72-inch) use zone must also be provided on both sides of the swing. When two swings are located adjacent to each other, the swings may share the use zone at the side.

c. Slide Use Zone. For slides, use zone dimensions in front of the slide exit region and to both sides of the slide bed must be considered (fig 3-5). Depending

on the height of the slide, an 1800 to 2400 mm (72 to 96-inch) use zone in front of the slide exit region is required. An 1800 mm (72-inch) use zone is also required on both sides of the slide bed.

d. Playhouses and Ba/ante Beams. Some play equipment with a maximum accessible height under 750 mm (30 inches) may have overlapping use zones (fig 3-6). Two nonclimbable playhouses may have overlapping use zones. Two balance beams under 500 mm (20 inches) high may have overlapping use zones.

e. Hard Surfaces. Do not allow hard surfaces such as concrete or asphalt to intrude upon equipment use zones. Containment barriers for loose-fill surfacing and hard-surfaced pathways must be located outside of equipment use zones. If a pathway lies within an equipment use zone, it must be covered with safety surfacing. Dirt and grass are not acceptable fall zone surfacing materials.

f. High Use Play Areas. Sufficient space should be provided between all adjacent structures and individual play equipment for play and circulation. In settings where periodic overcrowding is likely, a supplemental circulation area beyond the use zone is recommended.

3-10. Sharp points and edges

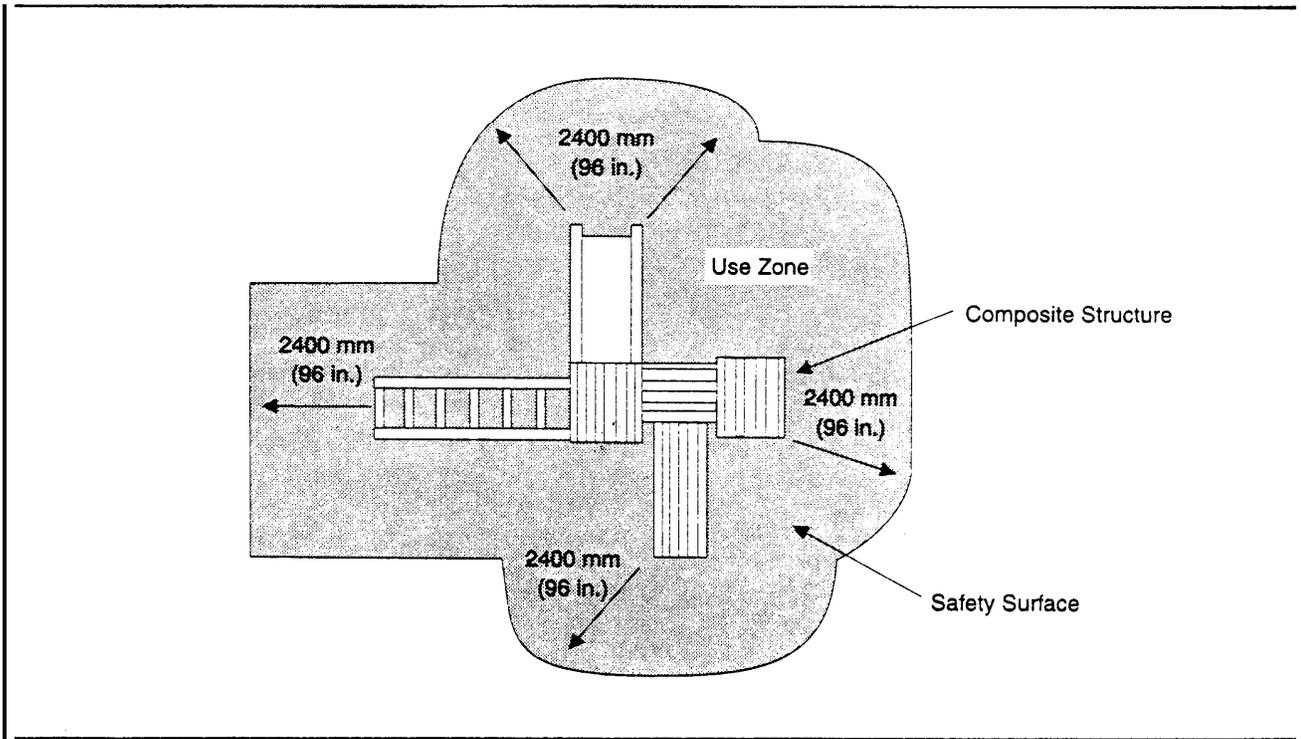


Figure 3-3: Typical stationary equipment use zone.

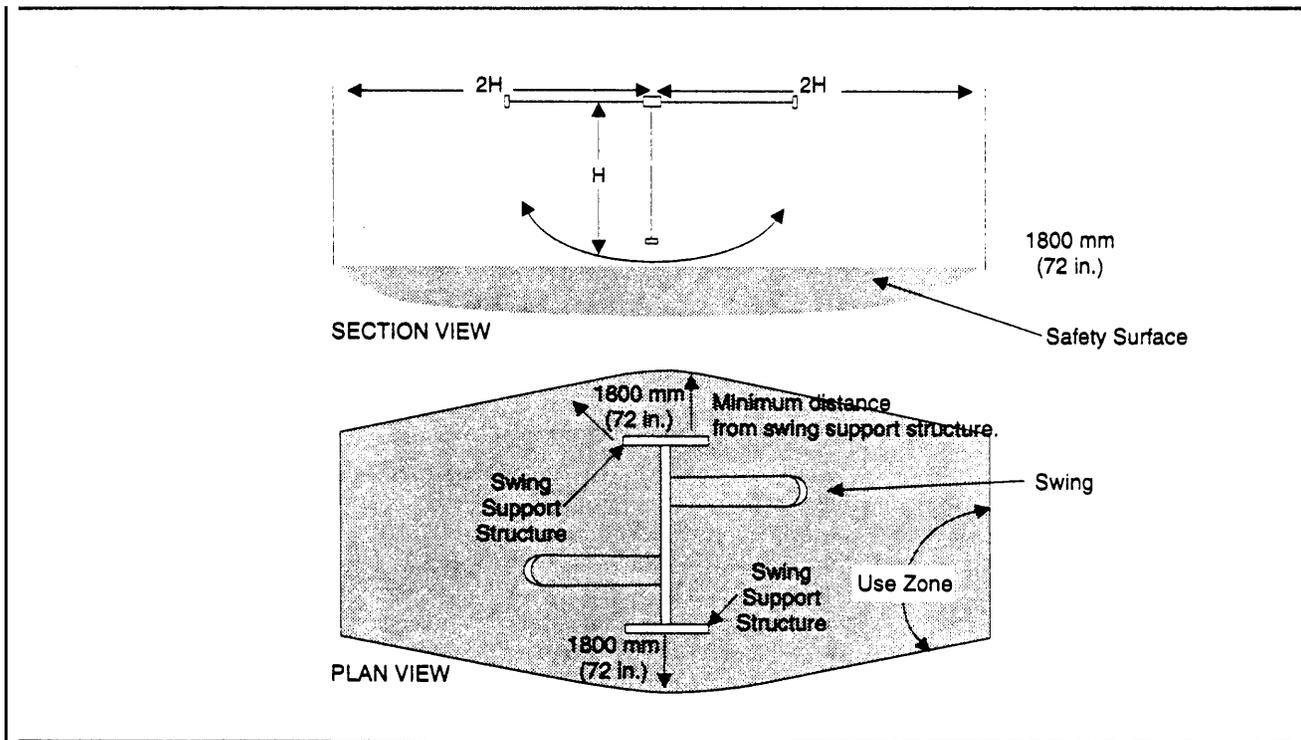


Figure 3-4: Typical swung use zone.

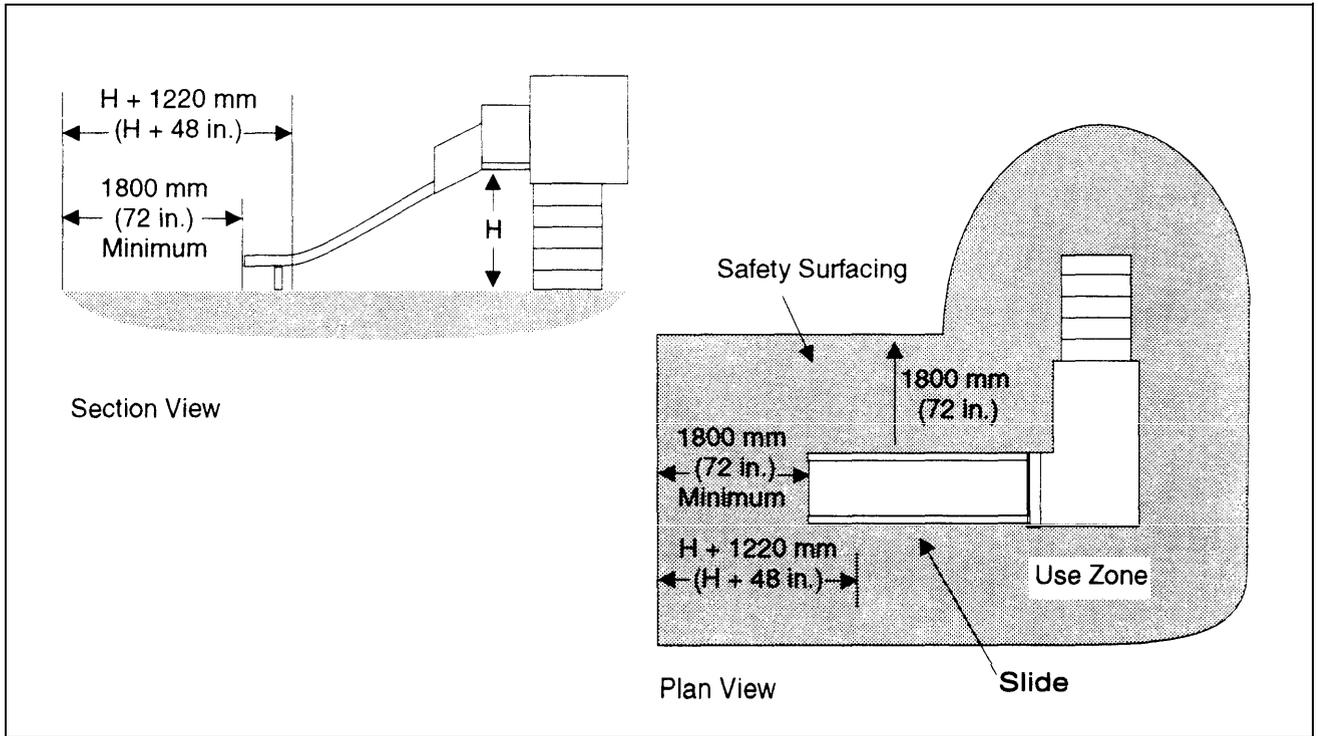


Figure 3-5: Typical slide use zone.

A sharp point or edge is one that can puncture or cut a user's skin. Accessible sharp points or edges will not be provided in the outdoor play area. Manufacturers will provide verification that all points and edges meet ASTM F 1487 standards.

3-11. Wood preservatives

Wood play equipment should be naturally rot- and insect-resistant or should be treated to avoid deterioration. The CPSC has made recommendations on acceptable wood preservatives for children's play areas as well as preservatives which must be avoided. These guidelines will be followed by the CDC.

a. *Inorganic Arsenicals*, The most common wood treatment used for playground equipment are the inorganic arsenical. These should be applied by the manufacturer or wood preserver in accordance with the specifications of the American Wood Preservers Association CI 7 standard. This standard states that the treated wood should be visibly free of residues which may contain high levels of arsenic. Chromated copper arsenate, which causes a greenish coloration, is acceptable if the dislodgeable arsenic on the surface of the wood is minimized. Treated wood which complies with these standards may be suitable for use in children's play areas. However, arsenical treated wood must not be used in the construction of drinking fountains or other

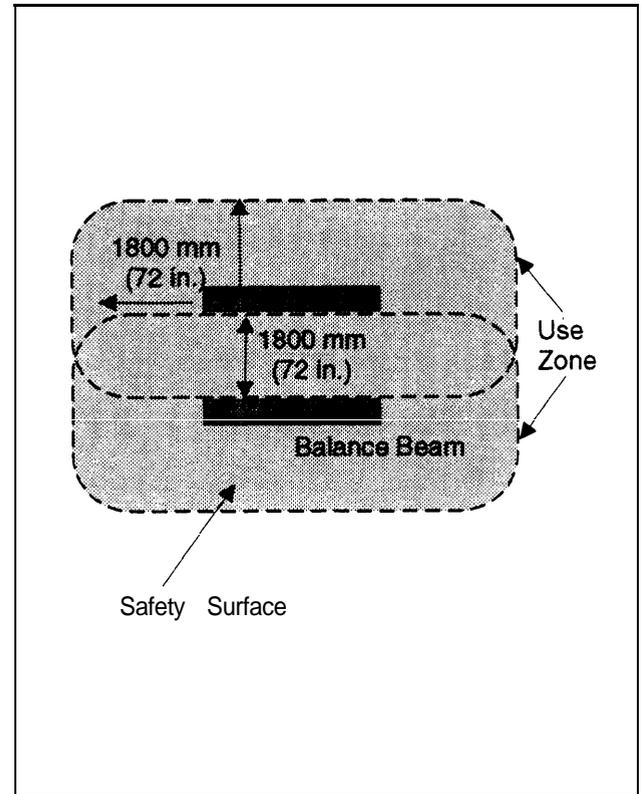


Figure 3-6: Typical overlapping use zones.

locations where it would contact public drinking water directly or indirectly.

b. Other Acceptable Wood Preservatives. According to CPSC, wood treated with other preservatives that have low toxicity may be suitable for use in children's play areas. These include copper or zinc naphthenates, and berates.

c. Unacceptable Wood Preservatives. CPSC has identified several wood preservatives as too toxic or irritating to be used as preservatives in children's play areas. These preservatives will not be used in CDC play areas. These include creosote, pentachlorophenol and tributyl tin oxide. Finishes that contain pesticides must also be avoided.

d. Guarantee of Wood Treatment Safety. When writing contract specifications, require a written guarantee that preservatives or other treatments applied to wood do not present a hazard to the consumer.

e. Maintenance Precautions for Treated Wood. Special health precautions may be needed for persons

performing woodworking tasks, such as sanding, sawing, and sawdust disposal, on wood treated with preservatives. Before performing these tasks, staff must consult the wood manufacturer regarding necessary health precautions and disposal information.

3-12. Weed and Pest Management Plan

The weed and pest management plan for the CDC outdoor play area includes policies and practices designed to control pests. The effect of this plan on child health and safety is frequently overlooked. Because children are considered at greater risk than adults when exposed to toxic chemicals, weed and pest management must emphasize child safety. Current policies and practices must be evaluated by the play area inspection team. DPW shall be consulted to ensure that a weed and pest management plan which emphasizes child safety is developed for the CDC.