

UNIFIED FACILITIES CRITERIA (UFC)

CHILDREN'S OUTDOOR PLAY AREAS



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CHAPTER 7

CHILD SAFETY REQUIREMENTS FOR OUTDOOR PLAY AREAS

7-1. Introduction.

The designer should be thoroughly familiar with safety requirements for children's outdoor play areas. The U.S. Consumer Product Safety Commission (CPSC) estimates that each year in the U.S. approximately 170,000 children are treated in hospital emergency rooms and 17 deaths occur from injuries sustained on public play areas. In addition to child safety, potential liability, sustained morale, and public relations are further reasons why military installations should provide safe play areas. This chapter describes general safety guidelines that will help prevent serious injuries.

7-2. Guidelines for Child Safety.

Children's outdoor play areas will meet the requirements of the CPSC *Handbook for Public Playground Safety* and the American Society for Testing and Materials (ASTM) *Standard Consumer Safety Performance Specification for Playground Equipment for Public Use* (ASTM F 1487). This chapter defines safety terms and provides additional guidance for instances where no guideline has been provided or new research has become available. For a complete review of safety requirements, CPSC and ASTM F 1487 should be consulted along with this manual. If a conflict exists between this manual, CPSC, or ASTM F 1487, the more stringent requirement will be applied.

7-3. Material Selection.

Building materials will be selected that have demonstrated durability in play areas or outdoor settings. For purchased items, holes in materials should be factory-drilled. Extra holes that will not be filled in by hardware and could harbor insects should not be present.

a. Plastic. High density polyethylene is a material commonly used for manufactured play equipment. It is especially appropriate for slides, because plastic surfaces are less likely than metal to cause burns in hot climates. Plastic coatings, such as polyvinyl chloride (PVC), may also be used on metals that would otherwise become too hot in direct sunlight. Plastic materials should be ultraviolet (UV) stabilized to minimize fading, resistant to cracking, and shatterproof. Fiberglass should be avoided because it has low impact tolerance.

b. Metal. Metal requires less maintenance than wood materials and is more durable. Rust-free

metal materials, such as stainless steel and aluminum, should be selected. Metals subject to rust or corrosion should be painted, galvanized, or otherwise treated. All metal edges should be rolled or have rounded capping. Hollow metal tubes should be capped to eliminate standing water and sharp edges. To avoid the risk of contact burn injury, bare or painted metal surfaces will be avoided in regions where intense sunlight and heat can be expected, unless the surfaces are located out of direct sunlight.

c. Wood. Wood materials require regular maintenance to control splintering, weathering, and deterioration. Wood that is naturally rot- and insect-resistant or treated to avoid rapid deterioration should be selected. Cedar, cypress, and redwood are naturally resistant to decay, checking, and cupping. Regional species should be selected to reduce costs of site-built elements, such as benches and planters. Wood should be premium grade and free of sap wood and loose knots.

d. Wood Preservatives and Paints. Wood preservatives and paints used in children's outdoor play areas will meet ASTM F 1487 standards. Play area users should not be able to ingest, inhale, or absorb hazardous amounts of substances as a result of contact with preservatives and paints. Wood that is not naturally rot- and insect-resistant will be treated below the level of the play area surface and up to 150 mm (6 inches) above the play area surface.

(1) *Inorganic Arsenical.* The most common wood treatment used in play areas are the inorganic arsenical. These will be applied by the manufacturer or wood preserver according to the specifications of the American Wood Preservers Association C 17 standard. This standard states that treated wood will be visibly free of residues that may contain high levels of arsenic. Chromated copper arsenate, which causes a greenish coloration, is acceptable if the amount of arsenic on the surface of the wood that can be dislodged is minimized. Treated wood that complies with these standards may be suitable for use in children's play areas. However, arsenical-treated wood will not be used in the construction of drinking fountains or other locations where it would contact public drinking water directly or indirectly.

(2) *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.

(3) *[Unacceptable Wood Preservatives.* Several wood preservatives are too toxic or irritating to be used in children’s play areas. These include creosote, pentachlorophenol, and tributyl tin oxide. Finishes that contain pesticides will be avoided.

(4) *Paints.* All paints or similar finishes used in play areas will comply with the ASTM F 1487 standard to minimize lead exposure.

e. Fasteners and Connecting Devices. All fasteners and connecting and covering devices will be corrosion-resistant, such as stainless steel, brass, zinc plated metal, zinc-chromate plated metal, or galvanized steel.

(1) *Unintentional Loosening.* All fasteners, connecting and covering devices, and hardware in moving joints will not loosen or be removable without tools when installed according to manufacturer’s instructions. All nuts and bolts will be protected from detachment with lock washers, self-locking nuts, or other locking means.

(2) *Friction or Wear* All moving parts, such as swing chains, will be connected to the fixed support with bearings or bearing surfaces that reduce friction or wear. A steel cable permanently connected to a hanger assembly is acceptable.

(3) *Entanglement.* Entanglement occurs when a child’s clothing or items worn around a child’s neck become caught or entwined on play equipment or site furnishings. Strangulation, loss of a body part, or emotional injury may result. Fastening devices, such as S-hooks, pelican hooks, C-hooks, or clevis devices, will be closed as specified by ASTM F 1487 to prevent possible entanglement.

f. Chain, Cable and Rope. Verification should be obtained from manufacturers that chain and cable meet structural integrity requirements specified by ASTM F 1487. Chain should be a minimum size 4/0 and zinc plated. Cable should be a minimum 25 mm (1 inch) diameter and be composed of strands of steel cable with a synthetic covering of polypropylene or dacron. Rope will not be used in unsupervised children’s outdoor play areas. Cable and chains that are not properly designed can cause strangulation or injuries. To avoid these hazards, all chains and cables will meet ASTM F 1487 requirements.

g. New Construction Materials. New materials are constantly being developed for manufacturing use. Recent examples include the increased use of plastics and recycled materials. If any materials used in construction do not have demonstrated durability in play areas or the outdoors, documentation or test results will be obtained from manufacturers to verify durability.

7-4. 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.

7-5. 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 7-1 and 7-2. 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 parents and guardians.

7-6. 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 a minimum of 400 mm (16 inches) in diameter.

7-7. 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

Table 7-1. Recommended Composite Structure Platform Heights.

Age Group	Maximum Platform Height	
	Millimeters	Inches
12-24 months	900	36
2-5 years	1200	48
5-12 years	1400	56

Table 7-2. Maximum Recommended Play Equipment Heights.

Play Events	6 weeks-12 mos.	12-24 mos.	2-5 years	5-12 years
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)

^aRecommended for ages 2 and older.

^bRecommended for ages 3 and older.

^cRecommended for ages 4 and older.

Table 7-2. Maximum Recommended Play Equipment Heights--Continued

Play Events	6 weeks-12 mos.	12-24 mos.	2-5 years	5-12 years
Swings - to-fro (maximum crossbeam height)	2100 mm (84 inches)	2100 mm (84 inches)	2400 mm ^a (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)

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

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. Chain and the hardware that attaches it 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.

7-8. 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 (3-112 inches) apart, or other design free of footholds or handholds that may facilitate climbing. For

children ages 5 through 12 years, 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 children under 5 years, 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 740 mm (29 inches) high will be provided for children ages 2 to 5 years. For children under 2 years, a protective barrier a minimum high 500 mm (20 inches) 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 7-1.

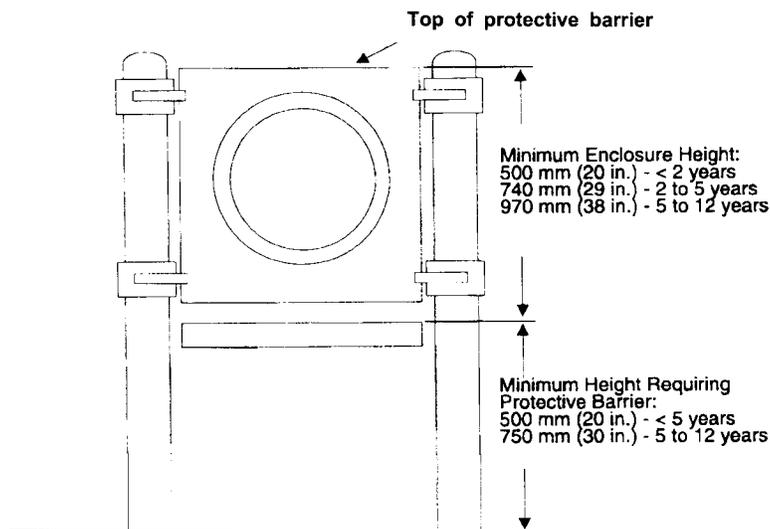


Figure 7-1. Protective Barrier Requirements.

7-9. 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.

7-10. Sharp Points and Edges.

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.

7-11. 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 fall height (chap 11). 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 7-2 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 equipment are provided in chapter 10.

a. Typical Use Zone. Figure 7-3 illustrates a typical manufactured play equipment use zone. For infant to 2 years, provide a minimum 1800 mm (72-inch) use zone from all sides of the equipment. For ages 2 through 12 years, provide a minimum 2400 mm (96-inch) use zone from all sides of the equipment. Some equipment, such as to-fro swings and tire swings, have greater requirements.

b. Typical Overlapping Use Zone. An overlapping use zone may be provided for some equipment, such as two playhouses which are not designed for climbing, two balance beams under 500 mm (20 inches) high, and two spring rockers with a seat height of 750 mm (30 inches) or less. Figure 7-4 illustrates a typical overlapping use zone.

c. High Use Play Areas. Sufficient space should be provided between all adjacent structures and individual play equipment for play and circulation.

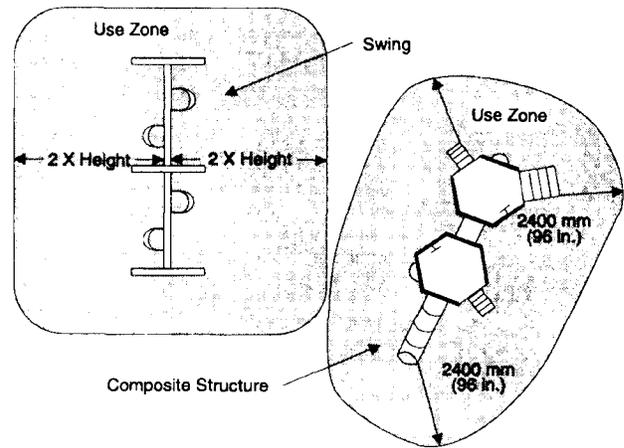


Figure 7-2. Adjacent Play Equipment without Overlapping Use Zones.

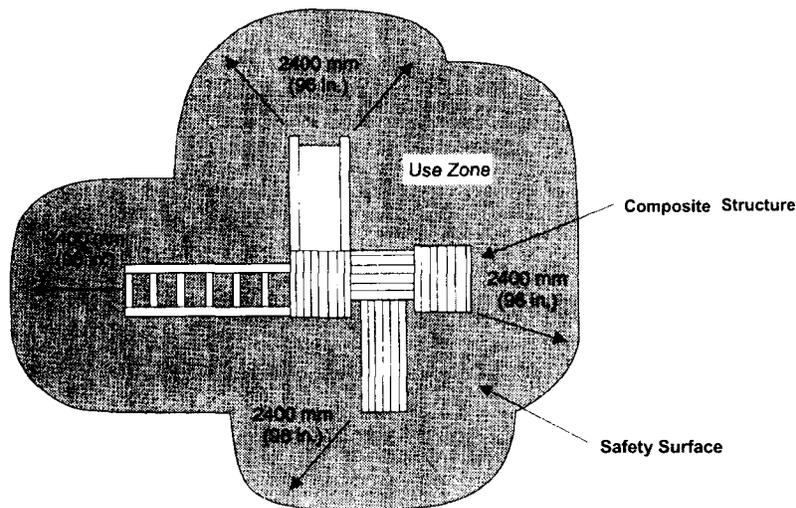


Figure 7-3. Typical Use Zone.

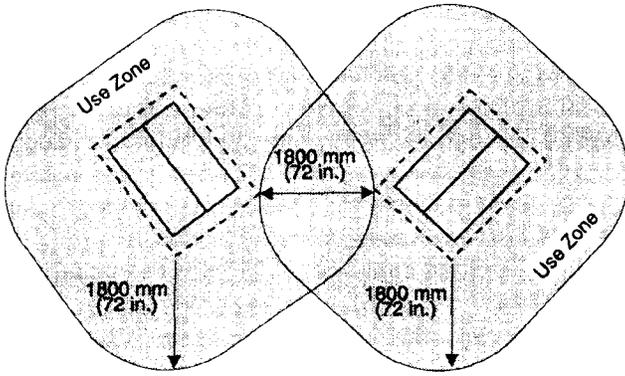


Figure 7-4. Typical Overlapping Use Zone.

In settings where periodic overcrowding is likely, a supplemental circulation area beyond the use zone is recommended.

7-12. Utilities.

Play area utilities will support child safety and not expose children to hazards.

a. Water Only cold, potable water will be provided.

b. Electricity. Provisions for utility metering, transformers, and other electrical equipment will be located in locked vaults or utility rooms away from children's play areas.

c. Storm and Sanitary Sewers. Drainage grates will be locked. Grate shape or fastening device will prevent incorrect placement of grates by maintenance staff.

d. Utility Boxes. Utility boxes will be locked and located outside of the play area. The boxes will never be located within play equipment use zones.

e. Telephones. Telephones for emergency communication are recommended in neighborhood and community parks.

f. Power Circuits. Ground fault circuit interrupters (GFCI) should be provided for all outdoor power circuits.

CHAPTER 8

ACCESSIBILITY

8-1. Introduction.

This chapter describes general criteria for designing play areas that are accessible to children and adults with disabilities. It presents guidelines and standards that apply to the design of children's outdoor play areas. In addition, information to assist designers in creating an accessible design program and guidance for creating accessible play area components is provided.

8-2. Accessibility Criteria.

Federal guidelines describe accessibility standards for adults, but are not always appropriate in children's play areas. Criteria and policies for accessible play areas follow:

a. Accessibility Standards for Adults. Play areas will comply with the Uniform Federal Accessibility Standards (UFAS) (Federal Standard 795). In cases where the Americans With Disabilities Act Accessibility Guidelines (ADAAG, 36 CFR 1191) provides equal or greater accessibility than UFAS, the ADAAG will be met.

b. Accessibility Guidelines for Children. UFAS and ADAAG requirements are based on adult-sized dimensions. When these dimensions are appropriate for children's outdoor play areas, accessibility standards for adults are referenced in this manual. In many cases, however, design criteria based on child-sized dimensions should be used for the proper functioning of the play area. These dimensions are provided where needed.

c. Policy on Play Area Access for Children and Adults with Disabilities. Play is a primary means through which children learn and develop. Both child development and the integration of children with and without disabilities are best supported by a diverse, challenging play area. Every part of the play area may not be accessible to all of its users, but the social experience provided should be accessible to everyone.

(1) *Provide Like or Similar Experiences.* When more than one play activity of the same type is provided in close proximity, one will be accessible. If one activity of its kind is provided, it will be accessible. For example, if two spring rocking animals are provided in the same part of the play area, one should be accessible. If only one spring animal is provided, it should be accessible.

(2) *Provide an Accessible Path of Travel.* An accessible path of travel is a pathway that is firm,

stable, and slip-resistant. It allows for ease of use by persons using a wheelchair, walker, cane, or crutches. An accessible route of travel connecting all accessible activities within the play area will be provided.

(3) *Promote Interaction Among Users.* To encourage social interaction between users with varying abilities, less challenging play activities will be provided in the same area as the most challenging equipment or components.

8-3. Disability Types.

Play area diversity increases play options for all children, including those with disabilities. Descriptions of general types of disabilities that should be considered when designing children's outdoor play areas follow:

a. Physical Disability With Upper Body Strength. Some individuals with physical disabilities have limited mobility, but have upper body strength that may allow transferring onto play equipment, using a horizontal ladder, or playing a manipulative game. Examples include a paraplegic who uses a wheelchair for mobility or an individual who walks with a cane or crutches.

b. Physical Disability Without Upper Body Strength. Some individuals with physical disabilities have limited use of their hands and arms. Use of both the upper and lower body maybe affected, as is the case with a quadriplegic or a person severely affected by cerebral palsy. Other individuals may have use of the legs but have limited arm use, such as a person whose limbs were amputated.

c. Visual Disability. Individuals with limited vision include people with a wide range of visual limitations. Some people with limited vision can read large print, and others cannot distinguish light from darkness. Few individuals totally lack all vision.

d. Auditory Disability. People with auditory disabilities are unable to respond normally to sound in most social situations. Abilities range from mild hearing loss to profound deafness.

e. Developmental Disability. For people described as developmentally disabled, learning ability develops more slowly than average. Reasoning and judgment capabilities may also develop at a slower pace. For most people with developmental disabilities, it is not the ability to learn that is lacking, but the speed and ease with which things are learned that is impeded. The range of capabilities in people with

developmental disabilities is greater than in any other disability group. People with developmental disabilities may also have difficulty with coordination, balance, agility, strength, body awareness, and self-image.

8-4. Play Area Components.

With proper design, most play area components can be accessible to children and adults with disabilities.

a. *Entry Areas.* All main entrances will be fully accessible. The overhead clearance at the entrance will meet accessibility standards for adults. The width of the entrance will be 1200 mm (48 inches) at minimum. The main entrance will be linked by accessible pathways to public transportation stops, when provided, passenger loading zones, accessible parking spaces, and to public streets and sidewalks. A person with a disability will be able to travel independently from this entrance to all accessible spaces within the play area.

b. *Pathways.*

(1) *Accessible Routes of Travel.* An accessible route is a continuous unobstructed route, such as a primary pathway or fully accessible surfacing, which is accessible to persons with disabilities. At minimum, the accessible route will extend from the play area perimeter to each type of activity within the play area.

(2) *Accessible Routes Within the Play Equipment Use Zone.* At least one accessible route will be provided within the use zone. The accessible route will extend from the play area perimeter to each type of play equipment that provides a different activity or function.

(3) *Surfacing of Accessible Routes.* The surface of the accessible route should be firm, stable, and slip-resistant. Examples of appropriate surfacing include: concrete, asphalt, and synthetic safety surfaces. Accessible safety surfacing within the play equipment use zone will meet the requirements of ASTM F 1292, except where a ramp, deck, or stationary bridge connects to a pathway at the edge of a use zone.

(4) *Minimum Width of Accessible Routes.* The minimum width of accessible routes will be 1500 mm (60 inches).

(5) *Maximum Slope of Accessible Routes.* The cross slope and running slope of accessible routes will meet accessibility standards for adults.

(6) *Edge of Accessible Routes.* If the accessible route is adjacent to loose-fill material or if there is a difference in height between two adjacent surfaces, the edge of the route will be treated to prevent a wheelchair from traveling off of the route or from tipping into loose-fill material. If the route is within

the use zone of play equipment, the path and edge treatment will meet the requirements of ASTM F 1292.

(7) *Accessible Routes with Slopes Greater than 1:20.* Any accessible route with a slope greater than 1:20 is a ramp. Ramps will meet accessibility standards for adults.

(8) *Seating and Rest Areas.* Along all primary pathways, a 1500 mm by 1500 mm (60-inch by 60-inch) level space should be provided every 60 to 120 m (200 to 400 feet). Seating should be provided every 0.25 km (1/8 mile).

(9) *Auxiliary Pathways.* Auxiliary or secondary pathways will have a minimum width of 900 mm (36 inches). If the pathway is longer than 6 m (20 feet), a turnaround area will be provided every 6 m (20 feet). For play purposes, an auxiliary path may be textured or bumpy for a maximum length of 1500 mm (60 inches).

(10) *Drainage Grates.* Grate openings will have a maximum width of 12 mm (1/2-inch). The longest dimension of grate openings will be perpendicular to the accessible path of travel.

(11) *Wheeled Toys.* Wheeled toys are an important method of independent mobility for children with disabilities and should be allowed on play area pathways.

(12) *Changes in Texture.* Changes in texture and material should be provided as nonvisual and tactile warnings for hazards and dangerous locations, such as crosswalks, stairs, water areas, etc. Textures used as a warning or cue for people with visual disabilities will be consistent throughout a site.

c. *Sports and Games.* Fully accessible viewing areas will be provided for spectators, parents, and children. Firm sports and games surfaces will be provided for wheelchair use. Accessible drinking fountains will be provided.

d. *Dramatic Play.* Playhouses should have an interior space large enough to allow wheelchair access. An entrance will be provided that at minimum meets accessibility standards for adults. Windows will be provided at a height that allows viewing from a wheelchair. Performance platforms should be located at ground level. If a ramp is present, a turning space will be provided for children in wheelchairs that at minimum meets accessibility standards for adults.

e. *Sand Play.* If provided, both ground-level and raised sand play components will be accessible.

(1) *Back Supports.* For ground-level sand play, a firm, stationary back support will be provided for leaning or resting. Back supports will be provided in close proximity to the most active part of the sand play area to promote social interaction. Back sup-

ports may include any vertical surface with a minimum height of 300 mm (12 inches) and a minimum width of 150 to 375 mm (6 to 15 inches). Boulders, logs, and posts may be used as back supports.

(2) *Transfer Points.* For children 2 to 5 years, a transfer point will be provided at a height of 275 to 350 mm (11 to 14 inches) to allow children to transfer from wheelchairs onto ground-level sand play surfaces (fig 8-1). For children ages 5 to 8 years, a transfer point will be provided at a height of 350 to 400 mm (14 to 17 inches).

(3) *Raised Sand Area.* Raised sand areas at wheelchair height are highly accessible and can be attractive to all children. However, raised areas are not a substitute for ground-level sand play. The shallow depth of sand provided in raised sand components limits play opportunities. Accessible manufactured sand tables are one alternative for providing raised sand play opportunities.

(4) *Faucets.* Faucets will be provided that meet accessibility standards for adults.

f. Gardens.

(1) *Raised Beds.* Raised beds will be provided for children who use wheelchairs or cannot easily stoop. Locate the raised bed within the main garden area at a height of 500 to 750 mm (20 to 30 inches) above the garden surface. A minimum of 10% of the gardening surface should be raised.

(2) *U-shaped Beds.* Raised beds that are U-shaped allow easy reach from a central location. Access should be provided from either side or by forward reach at a height of 500 to 900 mm (20 to 36 inches) above the ground.

(3) *Ground-Level Gardens.* A transfer point will be provided to enable a child to transfer into the garden. For children ages 2 to 5 years, the height of the transfer point will be 275 to 350 mm (11 to 14 inches). For children ages 5 to 12 years, a transfer point at a height of 350 to 400 mm (14 to 17 inches) will be provided.

(4) *Garden Pathways.* A minimum 1100 mm (44-inch) width accessible pathway that leads to raised areas in the garden will be provided.

(5) *Water Easy* access to water, including an accessible path of travel, lever knobs on faucets, and coilable hoses, should be provided.

g. Gathering Places.

(1) *Pathways.* An accessible pathway will be provided to all gathering places.

(2) *Seating.* Seating along primary pathways will be accessible. Along auxiliary pathways, 50% of seating will be accessible. Bench design will meet accessibility standards for adults. For manufactured benches, backrests and arm supports that meet ASTM F 1487 requirements for entrapment will be provided. Informal seating, such as boulders and logs, do not require backrests and arm supports.

(3) *Picnic and Game Tables.* Picnic and game tables will be located on an accessible surface with an accessible path of travel leading to the picnic area. Every installed, fixed picnic table will be accessible. When fewer than five game tables are installed, one will be accessible. When five or more game tables are installed, a minimum of one or 10% will have two accessible seat spaces. A minimum of two or 10% will have one accessible seat space. Each table will have at least one side that is not blocked by a fixed seat or bench. Wheelchair clearance will be provided for this open space.

(a) *Wheelchair Clearance for Adults and Teens.* For adults and teens, a clear space 675 mm (27 inches) high, 600 mm (24 inches) deep, and 750 mm (30 inches) wide will be provided.

(b) *Wheelchair Clearance for Children Under 12 Years.* For accessible picnic tables for children under 12 years, a clear space 675 mm (27 inches) high, 300 mm (12 inches) deep, and 915 mm (36 inches) wide will be provided. The tops of these tables will be a maximum of 750 mm (30 inches) from the floor or ground.

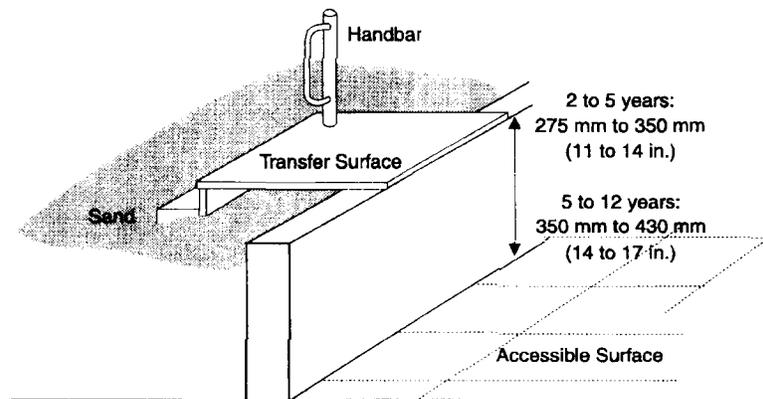


Figure 8-1. Transfer Point to Sand Surface.

(4) *Trash Receptacles.* Trash containers with easy-to-use openings will be provided in play areas. Trash containers will be located on accessible paths of travel. Trash container openings will be located no higher than 900 mm (36 inches) above the ground surface. Trash container lids will be provided that are operable without twisting or tight grasping. Spring-loaded mechanisms should not require more than 22 N (5 pounds) of operating force.

(5) *Planters.* Raised planters will be situated at a height of 500 to 750 mm (20 to 30 inches) above the ground surface to allow access to plant material.

h. Manufactured Play Equipment. Play equipment components will be accessible to children with disabilities. Accessible paths of travel, accessible safety surfaces, and transfer points or ramps onto equipment provide access for children with limited mobility. Manufactured play equipment is composed of one or more play events or activities, such as swings, climbers, and slides. Table 8-1 identifies recommended play events that may be accessible to children with physical, visual, auditory, or developmental disabilities. Design guidelines for manufactured play equipment are provided in chapter 10.

i. Plant Materials. Plant materials can be highly accessible. Important design considerations include providing access to plant materials through accessible pathways or raised planting, and selecting plant materials that provide sensory variety.

j. Landforms. Landforms can provide unique access opportunities for people with disabilities.

(1) *Accessible Hills and Mounds.* Slopes will conform to the requirements of accessible ramps. Ramps, handrails, guardrails, and level turning spaces may be required on pathways or at viewpoints.

(2) *Summit Points.* A level wheelchair turning space a minimum diameter of 1500 mm (60 inches) will be provided to accommodate wheelchair users at the “summit” points of hills and mounds.

(3) *Seating.* Seating along pathways or at summit points provides comfortable resting areas for children with limited stamina. Seating will not obstruct the minimum clear pathway width of 900 mm (36 inches).

k. Separation and Barriers.

(1) *Gates.* Pedestrian gates at entries and exits will have a minimum width of 1200 mm (48 inches). The gate opening force will not exceed 13 N (3 pounds) for play areas intended for children age 5 or less, and 22 N (5 pounds) for play areas intended for children older than 5 years.

(2) *Gate Hardware.* Hardware will be mounted on gates to meet accessibility standards for adults. When it is appropriate for children to open a gate, hardware will be mounted at heights for adults and at a height of 750 to 850 mm (30 to 34 inches) for children.

l. Signage. Signs will meet accessibility standards for adults. In addition, the following guidelines apply:

(1) *Height.* Signage height will meet accessibility standards for adults. If signs are intended for use by children, the appropriate mounting height is 1200 mm (48 inches) or lower, depending on the age of the primary user group. The height or heights that are most appropriate for users should be determined. Signs should be mounted at a consistent height throughout the site.

(2) *Location.* Signs should be visible and accessible from pathways and within reach for touch reading. Directional indicators will be clear.

(3) *Informative Signs.* Informative signs placed at the entry to a site should identify and locate accessible routes and facilities. Tactile maps can fulfill this purpose and can also be read by touch by people with limited vision.

m. Parking. Parking will meet accessibility standards for adults.

8-5. Noncompliance.

If a project can not be made accessible, in compliance with the guidelines presented in this manual, the designer will document the specific reason why the facility was not made accessible. This documentation will be maintained in the permanent project files.

Table 8-1. Play Events and Accessibility.

Play Event	Type of Disability				
	Physical ¹	Physical ²	Visual	Auditory	Developmental
Balance beam	x		x	x	x
Banister slide	x		x	x	x
Chinning/turning bar	x		x	x	x
Clatter bridge	x	x	x	x	x
Climber	x		x	x	x
Climber - arch	x		x	x	x
Climber - net	x		x	x	x
Fire pole			x	x	x
Game panel	x	x	x	x	x
Horizontal ladder	x		x	x	x
Parallel bars	x		x	x	x
Playhouse	x	x	x	x	x
Ring trek			x	x	x
Sand table	x	x	x	x	x
Slide			x	x	x
Spring rocking equipment	x	x	x	x	x
Stationary bridge	x	x	x	x	x
Swing - to-fro	x	x	x	x	x
Swing - rotating	x	x	x	x	x
Track ride			x	x	x
Tunnel	x		x	x	x
Composite structure	x	x	x	x	x

¹ With upper body strength.

² Without upper body strength.

x - Recommended play event.

CHAPTER 9

PLAY AREA COMPONENTS

9-1. Introduction.

A play area is more than a collection of play equipment. Many different component parts work together to support child development and play in a quality play environment. Some components create defined settings that support play activities, such as sand play, dramatic play, and pathways. Other play area components, such as gathering places and signage, provide comfort and convenience for users. This chapter provides design guidelines for play area components. For each component, design considerations, age appropriateness, safety considerations, and required level of maintenance is identified.

9-2. Maintenance Requirements.

Maintenance requirements are an important factor to consider when selecting play area components. Rough estimates of required maintenance for the play area components are summarized in table 9-1. Actual maintenance needs cannot be determined until the design elements for each component are selected.

9-3. Entry Area.

Play area entrances should create a welcoming feeling. Defined entrances may serve as social gathering

places and locations for displaying community information. Play components may also have a defined entry. For example, the entrance to the dramatic play component can be marked by an arch, flag, or banner. Entries may also include play activities, such as games or interactive exhibits.

a. Design Elements. An entry may include: arches and gateways, pathways, sculpture and other art work, community bulletin boards, informational signs, interpretive signs, graphic signage, interactive play events, surfacing, seating, tables, bike racks, drinking fountains, restrooms, shelters, vegetation, and trash receptacles. Temporary or permanent embellishments may include banners, flags, decorations, and posters.

b. Recommended Ages. All ages will use the entry.

c. Safety Concerns.

(1) *Visibility.* Visibility from the surrounding neighborhood should not be obstructed. Design elements such as vegetation should not block views into the play area from adjacent streets or housing.

(2) *Separation From Traffic.* Entries should be separated from parking and traffic with barriers, such as bollards.

(3) *Signage.* Entries are a good location for informational signage describing play area layout and the age groups served. However, it should not be assumed that children will read and understand warning signs.

d. Maintenance Level. The level of maintenance required for this play area component is low. A well-maintained entrance creates a positive first impression of the play area.

Table 9-1. Maintenance Requirements for Play Area Components.

Play Area Components	Maintenance Level		
	Low (< 3 hrs/mo)	Moderate (3-5 hrs/mo)	High (> 5 hrs/mo)
Entry area	x		
Pathways		x	
Sports and games	x		
Dramatic play			x
Sand play			x
Garden			x
Gathering place		x	
Manufactured play equipment		x	
Plant materials		x	
Landforms			x
Separation and barriers	x		
Signage	x		
Parking	x		

x - Maintenance level.

9-4. Pathways.

Two types of pathways may be provided. Primary pathways provide accessible routes of travel to the play area, around the play area, and to all accessible activities within a play area. Auxiliary pathways are secondary pathways.

a. Design Elements. Pathways may include: surfaces, curb cuts, ramps, crosswalk markings, curbs, vegetation, seating, signage, and lighting.

(1) *Pathways Layout.* Pathways should be installed along likely routes of pedestrian travel.

(2) *Primary Pathways Leading To and Around the Play Area.* When a road crossing cannot be avoided in order to reach the play area, curb cuts, ramps, and crosswalk markings should be provided.

(3) *Primary Pathways Within Play Areas.* Primary pathways connect various play area components, such as manufactured play equipment, sand play, and dramatic play.

(a) *LOOP Pathways.* Loop pathways are preferred to accommodate continuity of movement. Including branches and decision points increases the child development opportunities provided.

(b) *Bikeways.* Primary pathways should be designed to accommodate wheeled toys and bikes. In large parks and play areas where heavy bike traffic is anticipated, a separate bikeway may be constructed adjacent to primary pathways.

(4) *Auxiliary Pathways Within Play Areas.* Auxiliary or secondary pathways allow children to explore the environment. Surfacing materials, such as packed soil, gravel, and woodchips, which provide more challenge for children with disabilities, may be used on auxiliary pathways. Auxiliary pathways can accommodate a variety of play activities, including hiking, biking, wheeled toy play, interpretive activities, and hide and chase games. An auxiliary pathway with more challenging terrain can also serve as an adventure bike path for youth age 9 to 15.

(5) *Bicycle parking.* Bicycle parking areas should be located adjacent to pathways, but away from congested pedestrian areas. Bike racks should be provided.

(6) *Textures.* Changes in pathway texture may be used to indicate an interesting design feature, seating area, or sign location, or may serve as a warning texture for individuals with visual disabilities. Changes may be achieved by use of a different paving material, varied paving treatment such as multiple score joints, or a contrasting pavement color.

(7) *Service Vehicle Access.* A minimum 3 to 3.6 m (10- to 12-foot) wide maintenance access point should be provided.

b. *Recommended Ages.* All ages will use pathways.

c. *Safety Concerns.*

(1) *Crosswalks.* Auditory warnings and traffic lights are recommended at busy street crossings.

(2) *Dead-Ends and Congested Pathways.* Avoid creating dead-ends or inadequate, congested pathways where users might collide.

(3) *Pathways Within Use Zones.* Synthetic safety surfacing that is stable, firm, and slip-resistant will be installed on pathways within play equipment use zones.

(4) *Bold Patterns or Colors.* Bold patterns, such as checkerboards, or bright colors that may be disorienting over a continuous pathway surface should be avoided.

(5) *Conflict of Use.* Conflict of use is a major safety factor if bikeways are not separated from circulation paths, play areas, or vehicular traffic. Separate bike lanes or fast and slow lanes are recommended for primary bikeways that may be used for high speed travel.

(6) *Bike Racks.* Bike racks should be selected that are not tempting as a climbing structure.

(7) *Lighting.* Lighting should be provided along all primary pathways intended for night use.

(8) *Drainage Grates.* Drainage grates should be designed to prevent incorrect placement of grates by maintenance staff.

d. *Maintenance Level.* The level of maintenance required for this play area component is moderate.

9-5. Sports and Games.

Ball play is a universally popular play activity. The popularity of ball games varies with the seasons. Many ball play areas serve more than one function during the year. For example, some ball play areas accommodate both baseball and soccer. Guidance for the planning and design of outdoor sports facilities is provided in TM 5-803-10/AFM 88-33.

a. *Design Elements.* Sports and games components may include: multiple use hard surfaces or turf areas required for specific sports and games, surfacing, ball walls, fences, vegetation, drinking fountains, storage, lighting, seating, and trash receptacles.

(1) *Multiple Use.* Designs that can accommodate more than one type of sport, as well as community events, such as picnics and festivals, are preferred. An irregular boundary that accommodates the estimated distance of ball travel and is defined by a vegetative barrier adds visual interest and encourages multiple use.

(2) *Surfacing.* Surfacing is an essential consideration. Hard surfaces are required for some ball games. Turf is preferable for other sports and games.

(3) *Ball Walls.* Ball walls should be provided at a height of 3 to 3.6 m (10 to 12 feet) to contain balls. Several walls may be provided. Curved walls add interest. Ball walls also make excellent surfaces for murals.

(4) *Limited Space.* Sports and games components, such as half-court basketball, can be provided even when available space does not accommodate full-size sports fields. Smaller courts are easier to incorporate into an irregular layout and are often in high demand. When space allows, a full-size court may be provided that can also function as two half-courts. Badminton and volleyball do not require special court surfaces or regulation dimen-

sions for informal play, but a relatively flat surface should be provided. Tetherball is a game for school-age children that requires little space. Outdoor ping-pong tables have low space requirements and may be provided in low wind areas or in high wind areas if wind protection is adequate.

(5) *Drainage.* A minimum 2% slope for positive drainage should be provided for open turf areas and sports fields. Flat grades should be avoided.

b. Recommended Ages. Sports and games components are recommended for children ages 3 and older. Younger children participate in cooperative group activities while older children enjoy competitive sports.

c. Safety Concerns.

(1) *Multi-Use Hard Surfaces.* Multi-use hard-surfaced sports areas will not intrude into play equipment use zones.

(2) *Falls and Collisions.* Recognize that pedestrian falls onto hard surfaces and collisions are the most common forms of minor injury. These types of injuries are difficult to prevent.

(3) *Shade.* Partial shade should be provided for comfort.

(4) *Water.* Access to drinking water should be provided to prevent dehydration.

(5) *Lighting.* When night use is anticipated, lighting should be provided.

d. Maintenance Level. The level of maintenance required for this play area component is low.

9-6. Dramatic Play.

Children from preschool age to teenagers engage in dramatic play. At age 3, children play house and mimic domestic roles. At age 9, super heroes and “real life” role models, such as teachers, provide material for role plays. At age 15, dramatic play focuses on social interaction. Young children through teens enjoy attending and participating in performances. Because the types of dramatic play vary at different ages, the design elements included in dramatic play components intended for different age groups will vary.

a. Design Elements. Dramatic play components may include: playhouses, play platforms, pathways, vegetation, shade, water elements, and seating.

b. Recommended Ages. Dramatic play components are recommended for children ages 18 months to 15 years.

c. Safety Concerns. Surfaces that are trip- and slip-resistant under wet and dry conditions should be provided.

d. Maintenance Level. The level of maintenance required for this play component is high.

9-7. Sand Play.

Sand is an excellent medium for creative play and social interaction. When combined with water, sand offers even greater play potential. Sand can serve both as a play material and as a safety surface. Sand play components should be designed to accommodate groups of varying sizes.

a. Design Elements. Sand play components may include: sand; water elements; containment barriers; sand tables; seating; playing surfaces, such as boulders, tables, or shelves; and vegetation.

(1) *Type of Sand.* A fine, washed plaster sand is best for sand play and construction. Sand should be free of soil, clay, silt, oxides of iron, or other contaminants.

(2) *Depth of Sand.* A 450 to 600 mm (18- to 24-inch) depth of sand should be provided for sand play areas.

(3) *Water Supply.* A variety of water elements may be provided. A spring-loaded or dripping, tamperproof faucet is recommended. Hoses, hand water pumps, or trickling water troughs may also be used. Drinking fountains should be located away from sand play areas.

(4) *Ambient Microclimate.* The area should be protected from prevailing winds. Depending on site conditions, shade may be desirable. However, all sand play areas should receive sun for at least part of the day.

(5) *Drainage.* Positive drainage should be provided to avoid water-logging.

(6) *Barriers.* Barriers keep sand in place and discourage children in adjacent areas from disturbing the sand play of others. Barriers may include seating or sand shelves for play. A variety of places for individual and small group play for one to four children should be provided. These smaller areas may be connected to a larger sand area. Shallow sand benches or tables allow standup play and wheelchair accessibility.

(7) *Play Surfaces.* Play surfaces within the sand area include sand tables, boulders, and shelves. These surfaces may be used as work surfaces, seating, and back support.

(8) *Play Props.* Children like to play in sand with small toys, especially pocket-sized trucks, animals, and vehicles, or with props found onsite, including vegetation. A variety of play surfaces support this activity.

b. Recommended Ages. Sand play components are recommended for children ages 12 months to 8 years.

c. Safety Concerns.

(1) *Cleaning.* Sand play areas will require daily cleaning to remove litter, broken glass, and cat and

dog feces. Sunlight and adequate drainage should be provided to keep sand free of microorganisms.

(2) *Slip Hazards.* Sand creates slip hazards when spilled onto concrete or asphalt.

(3) *Sand Particles.* Sand particles may be ingested or inhaled by small children. The particles may cause eye abrasions when thrown, blown, or rubbed into the eye.

d. *Maintenance Level.* The level of maintenance required for this play area component is high.

9-8. Gardens.

Gardens allow children to observe plants throughout the life cycle and harvest plant materials for play, cooking, craft, and science activities.

a. *Design Elements.* Gardens may include: vegetation, planters, fencing, storage, water, irrigation, compost bins, tables, and seating. Fencing with lockable gates should be provided for formal gardens.

b. *Recommended Ages.* Gardens are recommended for children ages 3 years and older.

c. *Safety Concerns.*

(1) *Tools.* Lockable storage should be provided for tools.

(2) *Harmful Plants.* Poisonous plants and plants with thorns or berries should be avoided.

d. *Maintenance Level.* The level of maintenance required for this play area component is high.

9-9. Gathering Place.

Gathering places should be designed to accommodate groups of different sizes and people of all ages. Gathering places may include: boulders set in a circle as seating; seating constructed from large timbers or logs; a meadow enclosed on three sides by trees to create a room-like atmosphere for group gathering; and simple arrangements of site furnishings such as tables or benches.

a. *Design Elements.* Gathering places may include: tables, shelters, benches, infant crawl areas, trash receptacles, boulders, logs, timbers, shelters, and vegetation.

(1) *Shelters.* Covered shelters may be provided for shade and protection from weather.

(2) *Tables.* Tables should be provided for gathering, working, eating, and game playing.

(3) *Seating.* Comfortable adult seating should be provided. Adult seating should be located in both sunny and shaded locations and should allow clear supervision sight lines. Seating should be provided for children. Some seating should be located on the edge of play activity areas where children can observe activities. Seating may include benches, infant crawl areas, planter walls, boulders, logs, timbers, etc. Seating should be provided at 200 to 300

mm (8 to 12 inches) high for children under 5 years and 300 to 430 mm (12 to 17 inches) high for children ages 5 through 12 years old.

(4) *Infant Crawl Area.* Gathering places may include a turf-covered infant crawl area. The infant crawl area should be provided adjacent to adult seating areas. Crawl areas should be partially or fully shaded.

(5) *Trash Receptacles.* Trash receptacles should be provided along paths, near seating areas, in eating areas, and at play area entrances. Dumpsters should be located away from play areas for convenience and sanitation.

(6) *Vegetation.* Vegetation can be used to separate a gathering place from other parts of the play area, providing a feeling of privacy and reducing noise from adjacent play areas. Vegetation should be used to protect gathering places from cold winds and to provide shade.

b. *Recommended Ages.* Gathering places are recommended for all ages.

c. *Safety Concerns.*

(1) *Location.* Site furnishings should not conflict with play activities, block paths of travel, or create trip hazards. Seating should be located to allow adults to comfortably view children at play.

(2) *Trash Receptacles.* Trash receptacles with removable lids should be provided for easy trash removal. Drain holes in dumpsters and receptacles should be plugged or covered with mesh screening.

(3) *Harmful Plants.* The use of toxic plants, plants with thorns, plants with berries, and trees that drop limbs should be avoided.

(4) *Boulders.* Large boulders may be used for seating in play areas intended for children ages two and older. Boulders should be composed of granite, feldspar, schist, or other solid, noncrumbling rock. Artificial boulders such as those simulated from concrete may also be used. Boulders should be free of sharp corners, open cracks or holes. Boulders should be a maximum size of 600 mm (24 inches). Boulders should be set firmly into the soil to prevent rolling, rotation, or settling. At least 30% of a boulder should be buried.

(5) *Logs.* Logs with a maximum diameter of 600 mm (24 inches) should be selected. The logs should be set firmly into the soil to prevent rolling, rotation, or settling. At least 30% of a log should be buried.

(6) *Wood Preservatives.* Wood preservatives will meet the requirements of CPSC and ASTM F 1487.

(7) *Visibility.* Visibility into gathering areas should be provided from more than one location on the play area.

(8) Shade. Shade maybe especially desirable where people may be sitting for more than a few minutes. Shade can be provided with trees, canopies, trellises, etc.

d. Maintenance Level. The level of maintenance required for this play area component is moderate.

9-10. Manufactured Play Equipment.

Manufactured play equipment will be carefully selected to meet safety guidelines for the primary age group of the play area users. Safety surfacing will be provided in manufactured play equipment use zones.

a. Design Elements. Manufactured equipment components may include both freestanding equipment, such as climbers, swings, slides, and balance beams, and composite structures that include more than one play event.

b. Recommended Ages. Manufactured play equipment components are recommended for children from infant to 12 years. Separate age-appropriate manufactured play equipment areas should be provided for children under 5 years. Young children have been gravely injured while playing on equipment intended for older children, sometimes while parents are facilitating their play. Similarly, serious accidents may occur when older children use equipment designed for children under 5 years.

c. Safety Concerns. Children will use play equipment in ways that were never intended. Therefore, play area designers should design the environment so that children's misjudgments do not result in life-threatening injuries. Play equipment will meet all the safety guidelines provided by CPSC, ASTM F 1292, and ASTM F 1487, as well as all additional guidelines described in this manual. Safety surfacing will be provided throughout play equipment use zones.

d. Maintenance Level. The level of maintenance required for this play area component is moderate.

9-11. Plant Materials.

Plant material provides children with opportunities for nature exploration, props for play, settings for social interaction, and climbing opportunities. Existing vegetation provides a mature and unique character in the play area. Native plants or plants adapted to the local climate create a regionally appropriate character. Except when required for play value, plants with low life cycle costs and low maintenance requirements are preferred.

a. Design Elements. Design elements may include: plants selected from local plant lists; seating; water; irrigation; planters; containment barriers; ground surfaces; and tree guards.

b. Recommended Ages. Plant material is used by all age groups.

c. Safety Concerns. Important considerations include: toxic or undesirable plant material; surfacing; protrusions and entrapment; visibility; and use of pesticides, herbicides, and fertilizers.

d. Maintenance Level. The level of maintenance required for this play area component is moderate.

9-12. Landforms.

Landforms provide spatial variety and create the opportunity to experience three-dimensional space.

a. Design Elements. Design elements may include: hills, slopes, earth mounds, boulders, stepping stones, logs, seating, bridges, surfaces, and vegetation.

(1) Existing *Landforms.* Slopes, varied topography, and land forms satisfy many play needs. Existing landforms should be retained when possible.

(2) *Landform Site Improvements.* Earthmoving and related site improvements can be expensive. Site improvement opportunities will vary depending on existing site conditions and budget. A simple approach may include creating a small mound on a flat site by importing material. An extensive approach may involve complete regrading to create a continuously varied ground surface with topographic features.

(3) *Low Mounds.* Low mounds provide challenge without the potential of falls from elevated heights. Through careful manipulation of landforms, access can be provided without the use of ramps.

(4) *Berms.* Berms or natural hills may be used to provide access for children with disabilities up to and onto equipment.

(5) *Slides.* Slides that are incorporated into slopes can pose little potential for falls. Landforms may be designed to provide access to the slide entrance for children in wheelchairs.

b. Recommended Ages. All ages can make use of landforms.

c. Safety Concerns.

(1) *Slopes.* Slopes should be appropriate to the age of users. Steep slopes should be avoided.

(2) *Dropoffs.* Sudden dropoffs should be avoided.

(3) *Guardrails.* Paths and ramps should be evaluated to determine whether guardrails are needed.

(4) *Bridges.* Bridges between mounds should meet requirements for play equipment stationary bridges, including requirements for protective barriers, entrapment, and use zones.

d. Maintenance Level. The level of maintenance required for this play area component is high due to possible erosion and handmowing requirements.

9-13. Separation and Barriers.

Separation and barriers should be used to define the spatial organization of the site, to define the pattern movement, to enclose play component areas, and to protect plantings. Barriers, such as low walls or vegetation, should be used to separate age groups with conflicting safety needs or to prevent circulation through high activity areas.

a. Design Elements. Design elements may include: fencing, gates, pathways, vegetation, containment barriers, play walls, and art displays.

(1) *Height.* Separation and barriers should be high enough to stop direct forward movement into areas where traffic or adjacent land use features could create a hazard.

(2) *Materials.* Materials that support the design purpose should be selected. Separation and barriers may be transparent or solid. Undesirable views can be screened with solid barriers. Barriers may be metal, wood, chainlink, mesh, concrete, or vegetative.

(3) *Play Elements.* Play experiences may be incorporated into the design of fencing and barriers where appropriate. For example, peek-a-boo holes, chalking surfaces, child-created mosaic walls, and murals may be incorporated. Nooks and hangouts may be formed by varying fence lines.

(4) *Appearance.* Highly visible separation and barriers should be attractive from adjacent sites. Shrub plantings, ground covers, and vines should be used to screen unsightly fences.

b. Recommended Ages. Separation and barriers should be provided for all ages when needed.

c. Safety Concerns. The following safety concerns apply:

(1) *Enclosure.* When fencing is required to protect children from hazards, such as traffic or bodies of water, fences should be a minimum height of 1200 mm (48 inches). Fencing and gate designs that can be easily climbed or crawled through should be avoided.

(2) *Visibility.* Visibility into the play area should be provided from more than one location.

(3) *Entrapments.* The space between the bottom of the fence or gate and the ground surface should not exceed 50 mm (2 inches).

(4) *Sharp Objects.* If chainlink fencing is provided, the bottom of the fencing should have woven ends or continuous loops with no exposed sharp wires.

d. Maintenance Level. The level of maintenance required for this play area component is low.

9-14. Signage.

Signs should communicate information to people of all ages and abilities. Signs should be colorful and playful.

a. Design Elements. Signs may be informative, directional, or regulatory.

(1) *Informative Signs.* Informative signs present general information both with text and graphics for those who cannot read. Signs may address the site layout and programs available at the site. Signs can educate people about the historic or natural site features. Temporary signs, such as banners, may be used to advertise special events. Identification signs present information in both words and pictograms to identify specific features or facilities.

(2) *Directional Signs.* Directional signs indicate directions to a space or facility. Arrows or other graphic symbols should be used. Directional signs should be located at the site entry and all decision points.

(3) *Regulatory Signs.* Regulatory signs present notification of rules, requirements, warnings, and restrictions, and are used for traffic delineation and control. Regulatory signs may be used to convey safety information, such as the intended age group for a play area.

(4) *Design.* Graphic signs should be emphasized, especially for child-oriented or child-designed signs. International characters and symbols should be used when possible. Although there are no standardized graphic signs for playground areas, the American Institute of Graphic Arts (AIGA) has evaluated symbols used in transportation-related facilities and at international events. Based on their analysis, a standardized set of graphic symbols for public services, concessions, regulations, and transportation-related processing activities was developed. Some of these symbols may be appropriate for playground signage, such as the symbols developed for restrooms, drinking fountains, parking/no parking, no pets, no entry/exit, and litter disposal. Refer to *Symbol Signs* (AIGA) for guidance.

(5) *Play Activities.* Signs may be designed as play activities with tactile, auditory, interactive, or manipulative parts.

b. Recommended Ages. Signage is used by children 2 years and older, as well as by adults.

c. Safety Concerns. Regulatory signs may be used to provide information on play area safety. However, it should not be assumed that children will be able to read signs or to comprehend the implications of the message. Providing signage that identifies the age of the designated play area user group may assist parents in selecting safe play areas for children.

d. Maintenance Level. The level of maintenance required for this play area component is low.

9-15. Parking.

Offstreet parking areas may be provided for play areas serving the entire installation.

a. Design Elements. Design elements include bollards, hard surfaces, lighting, and signage.

(1) *Parking Design.* Military design standards should be followed for parking area design.

(2) *Signage.* Signage should be provided to identify dropoff zones and limit use of these zones to "pickup/dropoff" functions.

(3) *Lighting.* Adequate lighting should be provided.

b. Recommended Ages. Offstreet parking should be provided at neighborhood and destination parks serving all age groups.

c. Safety Guidelines.

(1) *Separation.* Parking areas should be separated from play and circulation areas.

(2) *Automobile Circulation.* One-way traffic circulation should be provided. Backup and turn-around maneuvers should be minimized through careful orientation of automobile circulation.

(3) *Dropoff Zone.* Where the dropoff zone is at the same grade as the adjacent walk, bollards or some other suitable device should be provided to separate the two functions.

(4) *Bollards.* Bollards should contrast in color with the ground surface. Lighting should be provided to minimize the risk of a person inadvertently walking into bollards.

d. Maintenance Level. The level of maintenance required for this play area component is low.

CHAPTER 11

PLAY AREA SURFACING

11-1. Introduction.

A variety of surfaces should be provided in play areas. Both soft and hard play surfaces are needed to support different types of play activity. Hard surfaces and safety surfaces are discussed in this chapter. Safety surfacing is mandatory throughout the use zones of all manufactured play equipment. Safety surfacing includes synthetic surfacing and loose-fill surfacing.

11-2. Hard Surfaces.

Hard surfaces include soil, concrete, asphalt, artificial grass, and decomposed granite. These surfaces support a variety of activities for all age groups, including: circulation, wheeled toy play, chase games, site exploration, and ball play. Hard surfaces are accessible to individuals with disabilities.

a. Design Considerations.

(1) *Concrete.* Concrete should be poured on a prepared base that is clean and free of debris. Color admixtures or surface paint may be added for interest and to provide opportunities for organized games and dramatic play.

(2) *Asphalt.* Asphalt should be contained with a concrete or timber edge to eliminate chipping and cracking around edges.

(3) *Pavers on Concrete.* The accessibility of this surface depends upon the surface texture of the pavers and the profile of the mortared joints. This material can provide a stable and easily maintained surface for both foot and vehicular traffic.

(4) *Crushed Stone and Decomposed Granite.* When compacted, this material is a good all-weather, accessible surface for picnic areas or pathways. Designers should be aware that maintenance is essential to continued accessibility.

(5) *Wood Decking.* This surfacing material is susceptible to deterioration and wear. It requires moderately high amounts of maintenance. Adequate drainage and ventilation of wood decking is necessary to avoid rot and to prevent the growth of moss. Wood decking can be easily painted to provide interest and to delineate areas.

(6) *Pavers on Sand.* This hard surface material is less expensive than pavers on concrete, and is permeable to allow for drainage. Similar to pavers on concrete, the accessibility of this surface depends on the surface texture of the pavers. This surfacing material is subject to erosion, and to heaving during freeze/thaw cycles. Displaced sand can present a slip hazard.

(7) *Artificial Grass.* Artificial grass is an expensive material that is suitable for general play and game areas. It should be laid on a hard surface.

(8) *Soil.* Untreated soil is variable. Soil may be acceptable for some situations if maintained to prevent erosion and eliminate poor drainage conditions. Soil condition changes significantly with precipitation, temperature, erosion, and wear.

(9) *Drainage.* Positive drainage should be provided. Flat grades or negative drainage should be avoided.

b. Recommended Ages. Hard surfaces are used by all ages.

c. Safety Guidelines.

(1) *Prohibited Use.* Hard surfaces will not be used in play equipment use zones or crawl areas for infants.

(2) *Slip Hazards.* Concrete finishes with a light texture, such as a broom finish, should be provided to reduce slipping when wet. Loose material, such as sand, gravel, and wood products, create slip hazards on hard surfaces. Where loose-fill materials are adjacent to hard surfaces, the level of loose-fill material should be installed 75 mm (3 inches) below the level of the hard surface. Loose-fill materials should be contained with barriers. Designers should consider that moss and mold on concrete and asphalt are a slip hazard and a maintenance issue.

(3) *Trip Hazards and Dropoffs.* Changes greater than 6 mm (1/4-inch) between levels on pathways should be avoided.

(4) *Drainage Grates and Utility Boxes.* Drainage grates and utility boxes will be locked and located outside of the play area where possible.

d. Accessibility.

(1) *Hard Surfacing Options.* All hard surfaces and primary pathways will be firm, stable, and slip-resistant. In the order of decreasing accessibility, the following hard surfacing choices include: concrete; asphalt; pavers on concrete; crushed stone or decomposed granite; wood decking; pavers on sand; artificial grass; and untreated soil.

(2) *Asphalt.* Asphalt will not be used in very hot, sunny locations because it may become soft and cause difficulty for people using wheelchairs. Asphalt used in these locations may also be a safety hazard when hot.

e. Maintenance. The maintenance level is low for most types of hard surfaces.

f. Cost. The initial cost is moderate. The cost of maintenance is low.

11-3. Safety Surfaces.

Adequate safety surfacing throughout play equipment use zones is an essential safety requirement. 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 includes tiles that are formed in the factory, or surfacing that is poured in place onsite. 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 sever 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 sur-

face 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 11-1 describes how the highest accessible height is determined for manufactured play 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 surface 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 often 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 the requirements in this chapter; 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 11-2 describes the recommended installed material depth for loose-fill surfacing.

Table 11-1. Highest Accessible Equipment Height.

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° or less.
Spring rocker	Measure from the seat.
Stationary equipment, climbable	Measure from the maximum height of the structure.
Stationary equipment, nonclimbable	Measure from maximum height of highest surface which is a minimum 50 mm (2 inches) wide and has a slope of 30° or less.
Swing	Measure from the height of the pivot point.

Table 11-2. 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)

11-4. Synthetic Surfacing.

Synthetic surfacing, such as synthetic tile and poured-in-place surfacing, is available in a variety of thicknesses to provide protection from falls from varying heights. Its major disadvantage is high initial cost. Its major advantages are low maintenance and consistent impact-attenuating performance.

a. Design Considerations.

(1) *Poured-In-Place Surfacing.* Poured-in-place surfacing is a relatively new product. It is made from a combination of chopped or shredded rubber and a flexible plastic binder that is mixed and poured on-site. The installation process is similar to the process used to install asphalt. Poured-in-place surfacing consists of a poured-in-place substrate layer, covered by a durable wear surface. The wear surface may be a poured-in-place, manufactured turf, or rubber sheet goods material.

(a) *Advantages.* Poured-in-place surfacing is suitable for any application or climate zone. The surfacing can be installed in any thickness. The material thickness can be varied where necessary to accommodate changing impact attenuation requirements under equipment of different heights. The material's edges can be shaped in freeform or straight lines, making it adaptable to many situations. Color patterns can be created with the surface material. Since the surface is composed of new rather than recycled rubber, the surface may be more resistant to fading. Poured-in-place surfacing is less expensive than synthetic tiles for application in large areas.

(b) *Disadvantages.* Poured-in-place surfaces are more difficult to repair than synthetic tiles. In addition, a qualified, experienced installer is essential to ensure durability and impact attenuation.

(c) *Installation Requirements.* Poured-in-place surfacing may be installed over asphalt, concrete, or compacted gravel subsurfaces. A geotextile fabric should be installed over the compacted gravel subsurface before installing the surfacing. The poured-in-place substrate is mechanically mixed on site in accordance with the manufacturer's recom-

mendations. The substrate should be installed in one continuous pour. A wear surface should be bonded to the substrate.

(2) *Synthetic Tiles.* Synthetic tiles are factory-molded geometric shapes. The tiles may combine an impact-attenuating substrate and a wear surface or consist of a uniform material that varies in density.

(a) *Advantages.* Synthetic tiles are recommended for small projects, for projects where a checkerboard pattern is desired, or for remote locations where experienced safety surfacing installers are not available. Individual damaged tiles may be replaced without replacing the entire safety surface.

(b) *Disadvantages.* For large areas, synthetic tiles may be more expensive than poured-in-place surfaces. When composed of recycled rubber, the surface may be more likely to fade. In addition, tiles may be vulnerable to vandalism.

(c) *Installation Requirements.* Depending on the manufacturer's recommendations, synthetic tiles may be installed over asphalt, concrete, or compacted gravel. When installed over a compacted gravel subsurface, a geotextile fabric should be installed over the subsurface before installing the tiles. The tiles may be secured by an adhesive or hardware in accordance with the manufacturer's recommendations. Cutouts should be filled with sealant to eliminate voids at play equipment.

(3) *Combination System.* The combination system includes modular substrate units overlaid with a bonded, manufactured turf-type or rubber sheet goods wear surface.

(a) *Advantages.* Combination systems provide many wear surface options. These wear surfaces may be especially desirable in areas where a nonabrasive surface is needed.

(b) *Disadvantages.* Combination systems may be less durable than other synthetic surfaces. These surfaces should be selected for areas with low activity levels, or where low use is expected.

(c) *Installation Requirements.* Depending on the manufacturer's recommendations, combination systems may be installed over asphalt, concrete, or compacted gravel. When installed over a compacted gravel subsurface, a geotextile fabric should be in-

stalled over the subsurface before installing the modular substrate. The substrate may be secured by an adhesive or by hardware in accordance with the manufacturer's recommendations. The wear surface should be bonded to the substrate with adhesive. Cutouts should be filled with sealant to eliminate voids at equipment.

(4) *Additional Selection Considerations.*

(a) *Appearance.* The synthetic surfacing should look attractive and should complement the appearance of playground equipment.

(b) *Rubbery Odor.* The material may have an unattractive rubbery odor. It should be determined whether the odor is acceptable.

(c) *Slip-Resistance.* The surface should be slip-resistant.

(d) *Installation.* The manufacturer should be contacted to determine the installation requirements of the proposed surface. Temperature and weather conditions may be important factors.

(e) *Drainage.* Positive drainage should be provided. Some surfaces allow water percolation. The designer should determine drainage requirements for the selected surface.

(f) *Maintenance.* Maintenance requirements for the safety surface should be determined. Techniques used to repair the surface should be established. It should be determined whether play equipment can be replaced or repaired without replacing the entire surfacing.

(g) *Durability.* The manufacturer's warranty and information about the expected durability of the product should be obtained.

(h) *Pests.* It should be determined whether pests, such as moles, may be likely to increase maintenance needs and to affect the surface's life span.

b. *Recommended Ages.* Synthetic safety surfacing may be used by all age groups.

c. *Safety Guidelines.*

(1) *Impact Attenuation.* Manufacturers will be required to produce testing data verifying that the product meets the requirements of ASTM F 1292 from the height specified by the purchaser. In addition,

manufacturers should provide written verification that the installed safety surfacing meets this criteria.

(2) *Hard Spots.* Be aware that the ASTM standards do not require testing for potential hard spots, such as seams and hardware. Some manufacturers may perform additional tests for potential hard spots. Manufacturers should provide product performance information for hard spots.

(3) *Flammability.* Some synthetic safety surfaces may be flammable. The surface's potential for burning should be determined.

(4) *Heat Retention.* Heat retention in darker materials may be a safety concern in hot climates. Light colored surfaces should be used in hot climates.

d. *Accessibility.* Synthetic surfacing is a fully accessible safety surface. It may be used to create circulation areas or accessible paths of travel within play equipment use zones.

e. *Maintenance.* The maintenance level is low.

f. *Cost.* Synthetic safety surfacing has the highest initial cost of any safety surface, but the cost of maintenance is low.

11-5. Organic Loose-Fill Surfacing.

Organic loose-fill surfacing includes wood mulch, bark mulch, and manufactured wood chips. The impact-attenuating ability of these materials depends on the air trapped within and between individual particles. Compared to the performance of other loose-fill materials, the impact-attenuating performance of wood products is less affected by hot, cold, and wet conditions. Although initially inexpensive, the cost of maintenance is high. The material is easy to obtain and install, less abrasive than sand when tracked into buildings, and easier to police for broken glass than sand. These materials are less likely than sand to attract cats and dogs, but are more likely to attract insects and snakes. Local pests and their habitats should be considered prior to selecting this surfacing. Material specifications for wood products are provided in table 11-3.

Table 11-3. Wood Product Material Specifications

Play Equipment	Highest Accessible Height
Bark mulch	Untreated chipped bark with a maximum size of 40 mm (1-1/2 inches) and no twigs, leaves, branches, thorns, dirt, or poisonous plants.
Wood mulch	Untreated chipped tree prunings with a maximum size of 40 mm (1-1/2 inches) and no thorns, dirt, or poisonous plants.
Manufactured wood chips	Particle sizes may vary from 3 mm (1/8-inch) to 12 mm (1/2-inch) thick by 25 mm (1-inch) to 75 mm (3 inches) long.

a. Design Considerations.

(1) *Wood Mulch.* Wood mulch is relatively inexpensive and easy to obtain. Mulch may be used as a surface covering in natural areas or as safety surfacing in play equipment use zones. It may be produced by "chippers" used in tree pruning operations. It is possible to acquire wood mulch from maintenance staff or tree trimming companies, but it must be free from harmful plants, pesticides, or other contaminants. Wood mulch may be produced from hardwoods or softwoods.

(2) *Bark Mulch.* Bark mulch is bark that has been stripped from trees and shredded. It is readily available from many nurseries or landscape supply companies.

(3) *Manufactured Wood Chips.* Some manufacturers produce uniform wood chips specifically for use as play area safety surfacing. For these products, ASTM F 1292 testing results may be available from the supplier. This material may be more consistent in type and quality than wood mulch or bark mulch.

(4) *Additional Selection Considerations.*

(a) *Appearance.* Determine whether the surface will look attractive and will complement the appearance of play equipment.

(b) *Drainage.* Positive drainage should be provided. For many play areas, subsurface drainage should be provided. A compacted gravel subsurface may also be considered.

(c) *Installation Requirements.* Wood products should be installed over a compacted subgrade covered with geotextile fabric. Wood products manufactured for the purpose of playground safety surfacing should be installed according to the manufacturer's instructions at the minimum depth specified in this manual. Surfacing should be contained with a barrier.

(d) *Play Activities.* Wood products surfacing materials can provide opportunities for manipulative play. Children can explore the surfacing materials for living organisms and other "finds," such as coins, bottle tops, and small plastic toys. The materials harbor and conceal various insects that are usually harmless and provide learning opportunities for children.

(e) *Maintenance.* It should be determined whether adequate maintenance can be provided to maintain the surface. Regular maintenance is necessary to maintain surfacing depth and to prevent the geotextile fabric from becoming a trip hazard.

(f) *Pests.* It should be determined if pests will increase the maintenance requirements and reduce the material's life span.

(g) *Manufactured Wood Chips.* When specifying manufactured uniform wood chips, test results

should be obtained from the manufacturer to verify that a fall onto this surface from the height specified by the purchaser results in a g-force rating of no more than 200 g's and a HIC value of no more than 1,000. In addition, photos of tested samples should be obtained from the manufacturer to compare with the purchased material. A copy of the product warranty and an estimate of the anticipated durability of the material should also be obtained.

(b) *Recommended Ages.* Wood products may be used as a safety surface in play areas designed for children ages 2 and older.

c. Safety Guidelines.

(1) *Variable Impact Attenuation.* The impact attenuation of different wood products varies, and specific test results for materials may not be available. Weather such as rain, high humidity, cold temperatures, or freezing conditions may affect impact attenuation. With the passage of time, the materials may decompose and become pulverized, reducing their impact-attenuating performance.

(2) *Installation.* Loose-fill surfacing materials will not be installed over concrete or asphalt surfaces.

(3) *Maintenance.* The material requires continuous maintenance, such as leveling, grading, and replenishing, to maintain its impact-attenuating ability. The materials are gradually displaced by wind or the playing action of children, reducing the thickness required for impact attenuation.'

(4) *Contaminants.* Unless a manufactured material is purchased, a consistent product that is free from contaminants may be difficult to obtain.

(5) *Splinters.* Chips may be splintery when first spread.

(6) *Microbial Growth.* When wet, organic loose-fill materials are subject to microbial growth.

(7) *Waste and Litter.* The material conceals animal excrement and other trash, such as broken glass, nails, pencils, and other sharp objects that puncture and cut. Daily removal of waste and litter is required.

(8) *Flammability.* Wood products are flammable.

d. Accessibility. The acceptability of wood products as an accessible surface for people with disabilities is still controversial. Some wood products may be accessible to wheelchair users when matted down. Wood products may not be accessible to children who walk with difficulty or use canes or crutches.

e. Maintenance. The required maintenance level is high. Continuous maintenance will be provided to preserve impact attenuation.

f. Cost. Wood products have a low initial cost and a high maintenance cost.

11-6. Inorganic Loose-Fill Surfacing.

Sand, gravel, and chopped tire are popular inorganic loose-fill surfaces. These materials absorb impacts by changing shape upon impact. Chopped tire also traps air between the particles to provide a cushioning effect. The primary advantage of sand, gravel, and chopped tire surfacing is that the materials are easy to install, and readily available. The materials are not ideal for microbial growth. Sand and gravel are nonflammable and initially inexpensive. The primary disadvantage of these materials is that continuous maintenance is required to preserve impact attenuation.

a. Design Considerations.

(1) *Sand.* The natural appearance of sand and its importance as a play material makes it a popular safety surface. Sand is an excellent manipulative play material, especially if provided in conjunction with water. However, separate sand play areas should be provided away from play equipment use zones. The impact-attenuating ability of sand is greatly reduced when wet. Therefore, it is not recommended for use as a safety surface in regions with wet climates, such as the Pacific Northwest. Sand is abrasive to floors when tracked indoors. Sand used as a safety surface will meet the following specification: Sand will be rounded naturally or by mechanical means; washed; free of dust, clay, soil, hazardous substances, or foreign objects; and sieved as shown in table 11-4.

(2) *Gravel.* Gravel drains well and does not easily freeze or compact. It is popular in cold and wet climates. It should not be used as a safety surface in play areas designed for children under 3 years because of the potential for choking. Gravel used as safety surfacing will meet the following specification: Gravel particles will be rounded naturally or by mechanical means; washed; free of dust, clay, soil, hazardous substances, or foreign objects; and sieved as shown in table 11-4.

(3) *Chopped Tire.* Chopped tire safety surfacing is highly effective, trapping air between particles to provide an impact-attenuating effect. Chopped tire is nonabrasive. It does not absorb moisture or attract cats, dogs, rodents, or insects. Select chopped tire manufactured specifically for safety surfacing. The results of impact attenuation tests should be obtained from the manufacturer. Chopped tire safety surfacing that is manufactured from steel belted tires will not be used. Chopped tire used as safety surfacing will meet the following specification: Chopped tire will be asymmetrical rubber par-

Table 11-4. Sieve Analysis of Sand and Gravel.

SAND	
Sieve Size	Percent Passing
10 mm (3/8-inch)	100%
#4	99-100%
#8	81-95%
#16	53-75%
#30	35-56%
#50	20-25%
#100	5-9%
#200	less than 2%
GRAVEL	
Sieve Size	Percent Passing
12 mm (1/2-inch)	100%
10 mm (3/8-inch)	75-85%

titles a maximum of 12 mm (1/2-inch) in size; and free of metal, harmful chemical, and foreign material.

(4) Selection Considerations.

(a) *Appearance.* It should be determined whether the material will look attractive and will complement the appearance of playground equipment.

(b) *Maintenance.* It should be determined whether a high level of maintenance can be provided to maintain impact attenuation.

(c) *Installation Requirements.* Sand or gravel should be installed over a compacted subgrade. Chopped tire should be installed over a subgrade of compacted gravel covered with geotextile fabric. Barriers should be provided to contain these loose-fill materials.

(d) *Drainage.* Positive drainage should be provided. Many play areas may require subsurface drainage under inorganic loose-fill surfaces.

(e) *Chopped Tire.* Test results should be obtained from the manufacturer verifying that a fall onto this surface from the height specified by the purchaser results in a g-force rating of no more than 200 g's and a HIC value of no more than 1,000. Photos of tested samples should be obtained from the manufacturer to compare with the purchased material. A copy of the warranty for the material and an estimate of the anticipated durability of the material should be obtained.

(f) *Pests and Vandalism.* It should be determined whether pests, such as fleas, or high vandalism will increase maintenance requirements,