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ABSTRACT

A study analyzed 82 cases of playground injuries and litigation (including 7 fatalities) in 28 states. In order of frequency, injuries happened in public schools, public parks, child care centers, apartment complexes, fast food restaurants, backyards, recreation camps, state parks, and state schools. Sixty-five percent of all injuries resulted from falls, either onto hard surfaces or from equipment, supporting the need for shock absorbing surfaces and "fall free" equipment. Other causes of injury, in order of frequency, include: (1) shearing action; (2) impact by swings; (3) head entrapment; (4) rowdy behavior; (5) choking on cords; (6) open S-hooks; (7) burns from bare metal; (8) cuts from glass; (9) equipment collapse; and (10) cuts from metal. Pieces of equipment involved in injuries include, in order of frequency: (1) swings; (2) slides; (3) merry-go-rounds; (4) horizontal ladders; (5) fire poles; (6) climbers; (7) superstructure components; (8) jungle gyms; and (9) ropes, geodesic domes, chinning bars, spring rides, concrete culverts, and bare metal. Of the children injured, 79 percent were between the ages of 3 and 7; 57 percent were boys, and 43 percent were girls. Results indicate that conforming to minimum safety criteria would prevent most fatalities and serious injuries. (Contains 10 references and 7 diagrams.) (JW)

ANALYSIS OF PLAYGROUND INJURIES AND LITIGATION

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"Every time someone gets 'accidentally' injured, someone, somewhere made a mistake. God ain't doing this stuff, we are." *

This is an analysis of 75 playground injuries and 7 fatalities resulting in litigation (law suits) in which the writer served as consultant between 1981 and 1995. Since most personal injury litigation (typically over 90 per cent) settles out of court, records are closed and professionals concerned with playground injuries and fatalities do not have access to pertinent data that influence injury reduction or safety on playgrounds. Consequently, this analysis provides information, without revealing names, places or information of a personal nature, not previously available. The data available to the writer in each case was voluminous and allowed extensive insight into the cause and nature of accidents, including interrogatories, productions, depositions, interviews with children and parents, and allowed extensive insight into the cause, nature and results of accidents.

Sites of Injuries

The 82 cases examined herein were filed over a fourteen year period with about two thirds during the last half (1988 - 1995) of that period. The injuries/fatalities/cases occurred in 28 states with 22 cases in Texas, three to eight in Virginia, Oklahoma, New York, Michigan, Indiana, California, Louisiana and Florida and the remainder scattered among 19 other states, including Alaska, Hawaii, and the District of Columbia.

The sites of the injuries and fatalities included, in order of frequency, most to least; public schools, public parks, child care centers, national chain child care centers, apartment complexes, fast food restaurants, back yards,

*Red Duke, M. D., Director of Trauma and Emergency Medical Services at Hermann Hospital in Houston, Texas (47,000 people are treated in this emergency complex each year). From Modern Maturity, July-August, 1995.

recreation camps, state parks, and state schools. Public schools were the most frequent sites of injury despite the fact that some states, including Texas, have tort liability (personal injury) immunity. This is consistent with the findings of three national surveys (Bruya & Langendorfer, 1988; Thompson & Bowers, 1989; Wortham & Frost, 1990) revealing that public schools have the most hazardous playgrounds of the major sites (public schools, public parks, preschools) in the United States.

Causes of Injuries and Fatalities

The data on causes of injuries in litigation are consistent with the data from the National Electronic Injury Surveillance System (NEISS), reported by the United States Consumer Product Safety Commission (CPSC) (1990). Fifty-five of the 82 litigation-related injuries/fatalities resulted from falling onto hard ground surfaces (45 cases) and equipment (10 cases) for a total of 65 per cent of all cases (Diagram 1). This finding supports the prevailing view that provision of shock absorbing surfacing under and around playground equipment and designing "fall-free" equipment is the most important variable in playground safety. Other factors contributing to injuries and fatalities, in order of frequency, most to least, were; shearing mechanisms, impact by swings, head entrapment, rowdy behavior of children, choking on cords/ropes, open S-hooks, burns on bare metal, cuts on glass, equipment collapse and cuts on metal.

(INSERT DIAGRAM NO. 1 HERE)

Equipment Implicated in Injuries

A wide range of equipment was involved in injuries and fatalities, led by swings (17 cases) and followed by slides (15), merry-go rounds (10), horizontal ladders (8), fire poles (7), climbers (7), superstructure components (6), jungle gyms (3) and one or two incidents on each; ropes, geodesic domes, chinning bars, spring rides, concrete culverts and bare metal.

The most common cause of injury was swing-related, with most being hit (6 cases) with heavy, "battering ram" type, resulting in very severe head injuries, including skull fractures, brain penetration, closed head injuries, brain damage and fatality. The second leading cause was falling out of swings onto hard surfaces - concrete, asphalt and hard-packed earth. other causes of injuries on swings included a broken swing chain and hitting a protruding

bolt. Two children died from choking - one on a cord and another on an open S-hook.

Slides were involved in 14 injuries and one fatality, with seven injuries resulting from falling onto hard ground surfaces (concrete, asphalt or hard-packed earth), and the remainder spread among hitting equipment, cut on metal, and collapse of equipment. One child died after a cord on his coat was entangled on protruding material.

Although numbers of merry-go-rounds on playgrounds are small compared to swings, slides and climbers, they figure prominently in law suits, for injuries may be very severe, including amputed digits and crushed or fractured arms and legs. These injuries most frequently (8 of 10 cases) resulted from contact with shearing mechanisms (one element of the device moving in close proximity to a fixed element). Old, antiquated, open base merry-go-rounds and a domed rotating device with shearing mechanisms underneath accounted for all these injuries. One case resulted from a fall onto concrete and another from a missing inspection plate allowing a child's legs to become entangled in the rotating mechanism.

(INSERT DIAGRAM NO. 2 HERE)

The data from this study and the experience of the writer indicate that falling from horizontal ladders may be the cause of most arm fractures on playgrounds. All eight law suits involving horizontal ladders were the result of children falling from the device onto hard surfaces (hard-packed earth or asphalt) and all resulted in arm, wrist and/or elbow fractures. Most of these injuries resulted in permanent impairment. Two major factors were involved; hard surfaces under and around equipment, and excessive height of equipment. In some cases, four-to-six-year-olds were playing on equipment seven to nine feet tall. No protective surfacing was in place at any of the sites.

Among the 82 law suits, the seven fire pole related injuries were among the most severe and the conditions leading to the injuries the most deceptive. Injuries included paraplegia, brain damage, spinal cord injuries, internal injuries and skull and leg fractures, all from falling onto concrete (6 cses) or asphalt (1 case). The most common error resulting in these injuries was failure to recess concrete footings well under base ground. The typical pattern was to finish concrete footings at ground level and cover with a thin layer of loose material. Failure to properly install and maintain loose surfacing created a deceptive condition. Neither adults or children using the

playgrounds were aware of the concrete footings (up to 24 inches wide) located less than an inch under thin layers of sand, dirt or mulch. A second factor involved in falls was failure to install protective barriers or hand loops at points of entry/exit to the fire pole. Children are commonly observed climbing up fire poles as well as sliding down them.

Various types of climbers accounted for most of the remaining injuries, with ropes, chinning bars, concrete culverts, spring rides and bare metal involved, collectively, in seven injuries/law suits. Ropes were involved only in fatalities.

Age of Child

In 79 per cent of the injuries and fatalities (61 of 82 cases) the children were between three and seven years old. The early information gathered and circulated by the National Electronic Surveillance System and the United States Consumer Product Safety Commission (1990) reported injury data into three age periods, "0-4", "5-14", and "OLDER". These broad distinctions mask the critical age periods for injury to children. The three to seven age range is the period commonly considered to be the early childhood period, or the preoperational period of development characterized as pre-logical (Piaget, 1962). During this period, children are developing cause-effect thinking and have limited conceptions of causality, space, time and speed. Consequently, they may not understand the hazards of high-risk behavior such as walking into the path of swings, inserting body parts into shearing assemblies, hanging cords around necks, jumping from excessive heights, falling onto hard surfaces, or jumping into deep water.

Only 10 of the 82 children injured in playground incidents were over age 7, with ages from eight to eleven. Two factors may help to account for this relatively smaller number of injuries among older compared to younger children. First, as children enter the elementary school their play interests gradually shift from dramatic, constructive, and exercise play involving various types of playground equipment to organized games which are less likely to result in falls from heights or contact with equipment. Second, most children of ages eight to eleven have developed cause-effect thinking or logical thought, allowing them to more quickly and accurately assess risks at play. Two adults were injured on playgrounds, one suffering a back injury in a fall from a slide and the second a broken back when a slide collapsed.

(INSERT DIAGRAM NO. 3 HERE)

Toddlers (one to three year olds) usually have only limited access to large, fixed playground equipment and they are usually in the context of closer adult supervision than are older children. This is wise practice for toddlers have very little awareness of the consequences of dangerous activity. For example, in one burn case and in dozens of additional burn cases revealed through the discovery process, toddlers were virtually the only children suffering serious burns from contact with bare metal playground slides and decks. The prevailing pattern was for the toddler to sit down on or place the hands on hot, bare metal and remain there, screaming in pain until an adult came to their rescue. This resulted in very serious burns, sometimes requiring plastic surgery and/or resulting in permanent scarring. A similar pattern was seen in snake bites, with the toddler being bitten and standing transfixed while the snake repeatedly struck.

(INSERT DIAGRAM NO. 4 HERE)

Unfortunately, the close supervision commonly given to toddlers on playground equipment does not prevail for swimming pools. Although not reported in data for this paper, the author participated in 25 swimming pool-related law-suits resulting from 21 drownings. Nineteen of the 21 children were one to five years of age and 14 were one to three years old. Fifteen of the 21 children who drowned entered the pool through defective gates or fences. These data are consistent with data from national studies (O'Connor, 1986; Present, 1987) revealing that most drowning victims are ages five and under and illustrate the importance of following national, regional, state and local regulations, guidelines or ordinances on swimming pool barriers (gates and fences). Pools are frequently located near playgrounds as well as at apartment complexes, hotels, and in back yards. Toddlers and young children are naturally attracted to water and lack cognitive awareness of water hazards.

Gender

Among the 82 injury/fatality playground cases, 57 per cent (47 cases) were boys and 43 per cent (35 cases) were girls. These percentages are consistent with data from the National Electronic Injury Surveillance System (Frost, 1992) but Tinsworth and Kramer (1990) reported equal numbers of boys and girls being injured on playgrounds. The higher incidence of injuries to boys is usually attributed to boys engaging in more physically challenging play and taking greater risks than do girls. This tendency appears to begin at

an early age. In the swimming pool drownings of toddlers discussed above, the number of boys drowning was twice the number of girls drowning.

(INSERT DIAGRAM NO. 5 HERE)

Violations of CPSC/ASTM Guidelines/Standards

Assessment of causes of injuries and fatalities in the 82 playground cases with respect to violations of United States Consumer Product Safety Commission Guidelines (1991) and American Society for Testing and Materials Standards (1993) revealed that 93 per cent (76 cases) of the injuries involved violations and 7 per cent (6 cases) did not. The most common violation (42 cases) was hard surface material (asphalt, concrete, or packed earth) in fall zones. Shearing mechanisms, protrusions, and maintenance followed in frequency of violations with seven to nine cases each. Maintenance was involved in other cases but was not the primary violation in those cases. Other violations with one to three cases each, were entrapment areas, insufficient clearance of components, unshaded bare metal, sharp metal, slick surface, loose rope, and high cable walk. "No violations" of CPSC/ASTM Guidelines/Standards were found in only six of 82 cases.

(INSERT DIAGRAM NO. 6 HERE)

Conclusion

The results of three national surveys, mentioned earlier, conclude that American public school, public park and preschool playgrounds are hazardous, antiquated, poorly maintained, and violate common safety criteria. An analysis of the 1989 catalogs of 25 major manufacturers of playground equipment (Frost, 1990) showed that most appeared to violate numerous CPSC criteria for equipment safety. By 1995, the violations apparent in catalogs and on new equipment in playgrounds had been markedly reduced, with a number of manufacturers achieving substantial gains but a few continuing to design, manufacture, and distribute equipment not conforming to CPSC criteria. A common pattern among those not conforming is to push nonconforming equipment to the back of catalogs and relegate the more prominent, front portion of the catalogs to newer, conforming equipment.

The message from playground injury litigation is clear - conforming to minimum safety criteria would prevent most fatalities and serious injuries. The all-too-common views of adults that play is frivilous and

inconsequential and that getting hurt is a natural consequence of growing up, continue to be major stumbling blocks to injury and fatality reduction among young children. The writer meets many of these damaged kids. They are real people and now number over 200,000 each year (personal communication, CPSC). Four factors - equipment design, installation, maintenance and supervision (Frost, 1994) - were most frequently involved in injuries and resulting litigation. Each can be controlled by respective parties - manufacturers, installers, and operators (e.g., schools, parks, child care centers).

The CPSC Guidelines and the ASTM Standards are the most authoritative playground safety criteria; they are very influential in most law suits; they represent reasonable care. A growing number of state legislatures have enacted (California and Texas) or are deliberating (e.g., Arkansas and Oklahoma) playground safety legislation. The growing level of consciousness that childhood playground accidents can be prevented without sacrificing play value has initiated a new generation of thought and action for enhancing playgrounds.

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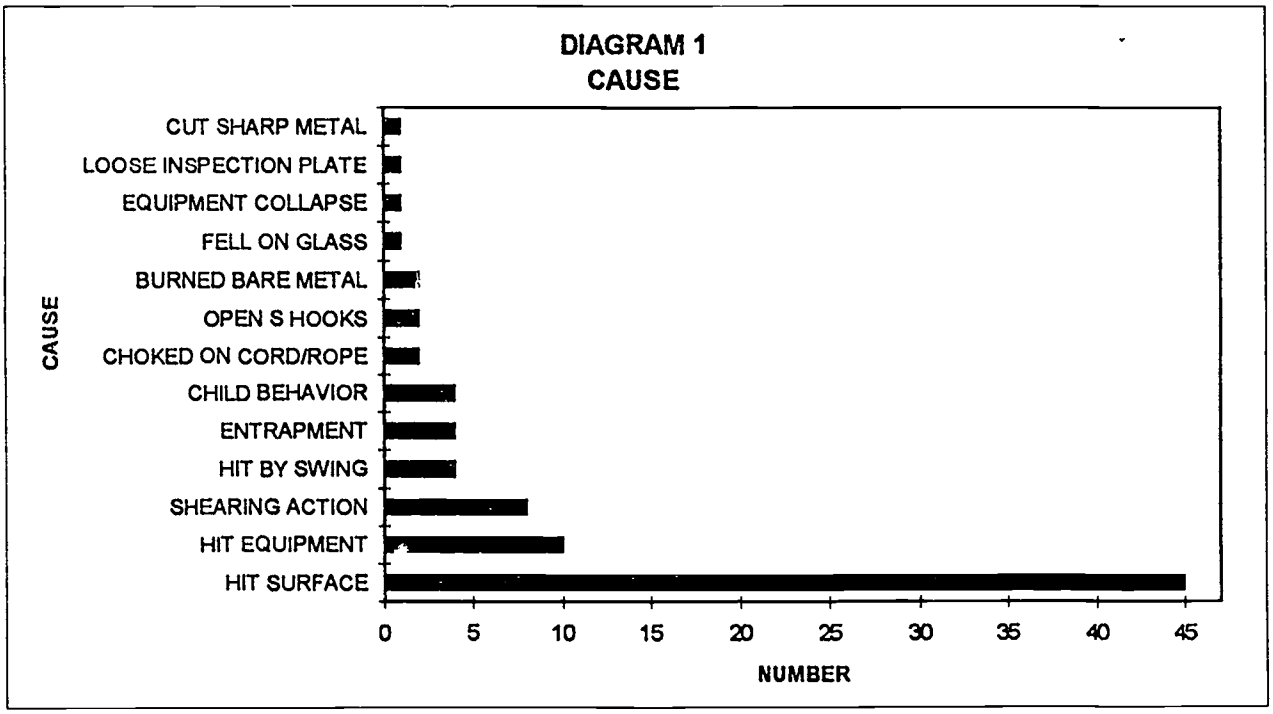
DIAGRAM 1
CAUSE
CUT SHARP METAL
LOOSE INSPECTION PLATE
EQUIPMENT COLLAPSE
FELL ON GLASS
BURNED BARE METAL
OPEN S HOOKS
CHOKED ON CORD/ROPE
CHILD BEHAVIOR
ENTRAPMENT
HIT BY SWING
SHEARING ACTION
HIT EQUIPMENT
HIT SURFACE
CAUSE
0
5
10
15
20
25
30
35
40
45
NUMBER

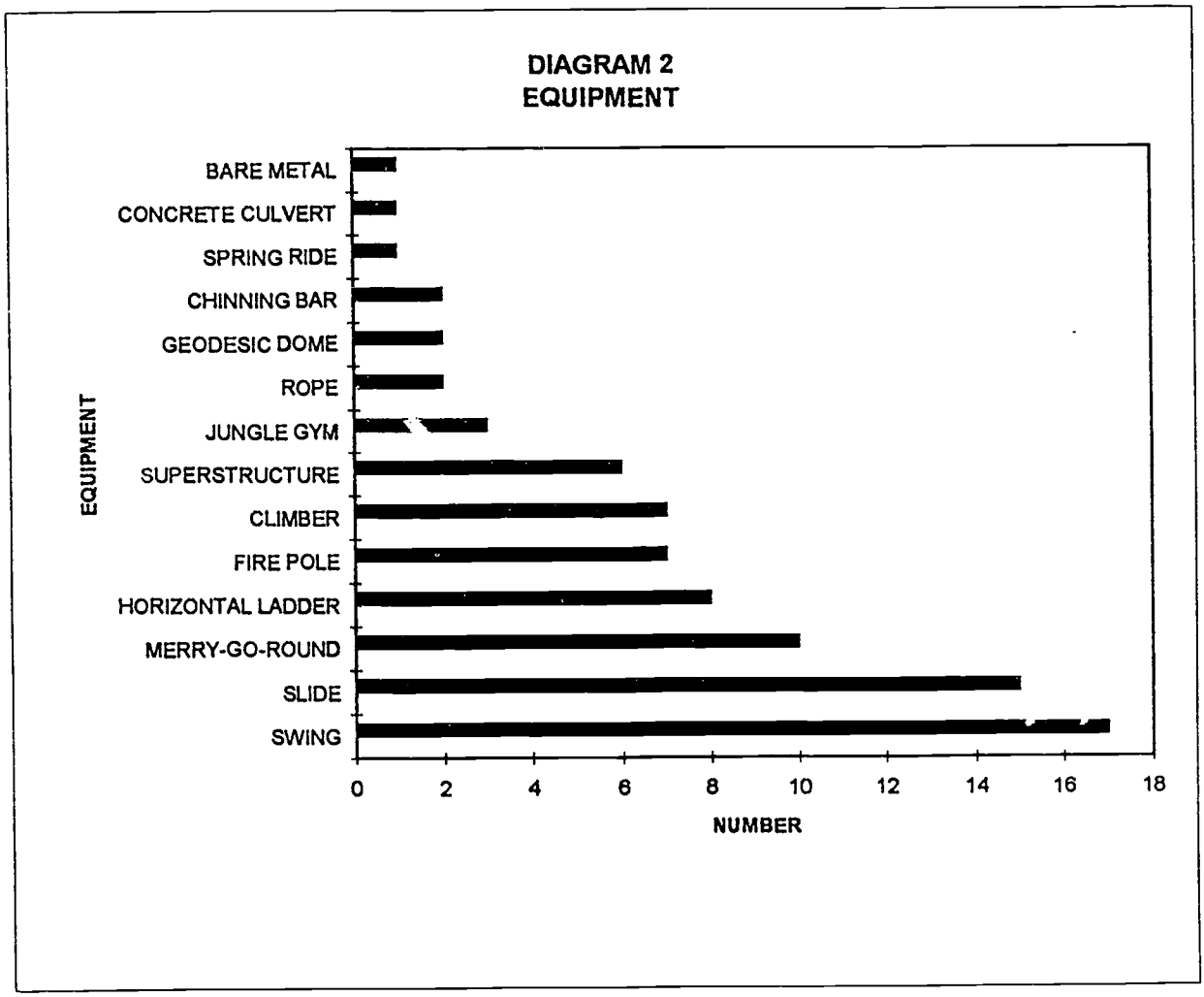
DIAGRAM 2
EQUIPMENT
BARE METAL
CONCRETE CULVERT
SPRING RIDE
CHINNING BAR
GEODESIC DOME
ROPE
JUNGLE GYM
SUPERSTRUCTURE
CLIMBER
FIRE POLE
HORIZONTAL LADDER
MERRY-GO-ROUND
SLIDE
SWING
EQUIPMENT
0
2
4
6
8
10
12
14
16
18
NUMBER

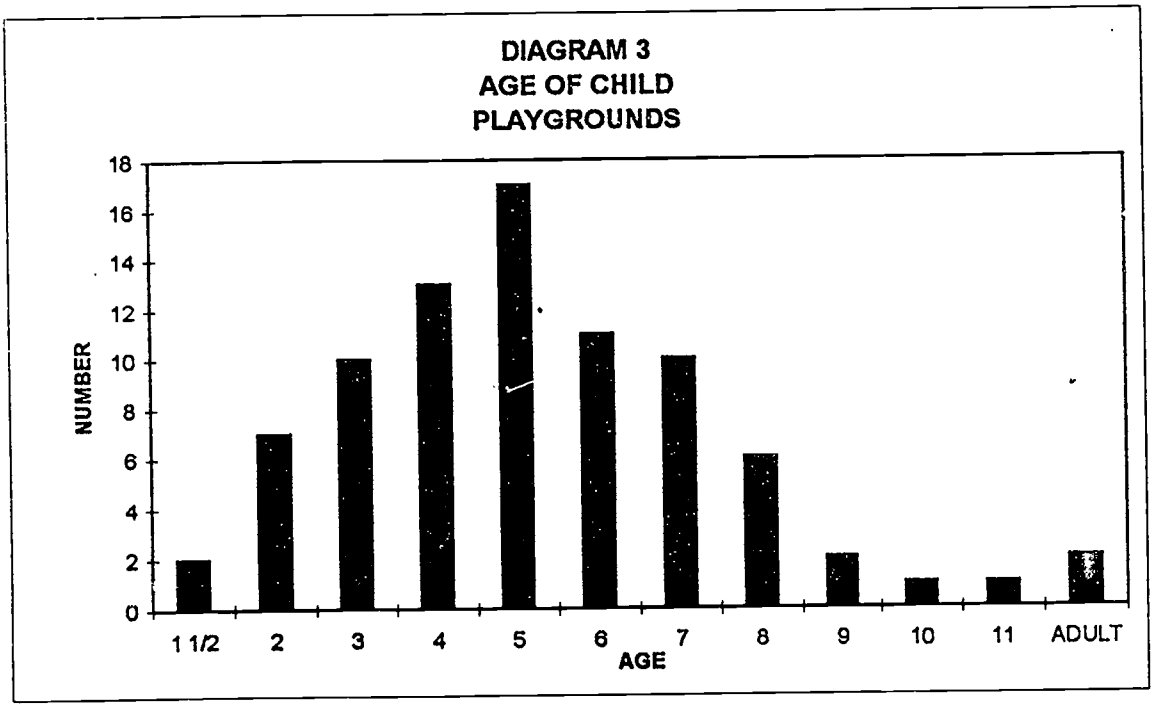
DIAGRAM 3
AGE OF CHILD
PLAYGROUNDS
NUMBER
18
16
14
12
10
8
6
4
2
0
1 1/2
2
3
4
5
6
7
8
9
10
11
ADULT
AGE

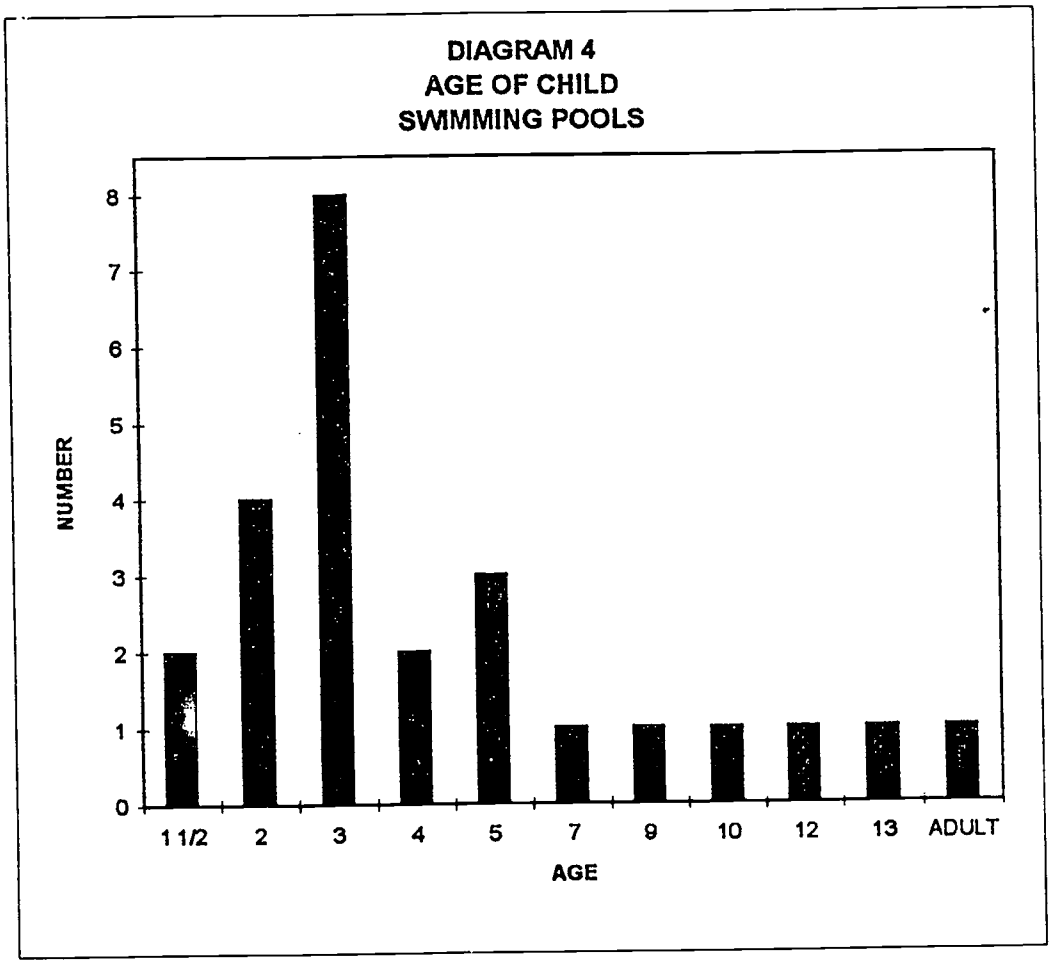
DIAGRAM 4
AGE OF CHILD
SWIMMING POOLS
NUMBER
0
1
2
3
4
5
6
7
8
1 1/2
2
3
4
5
7
9
10
12
13
ADULT
AGE

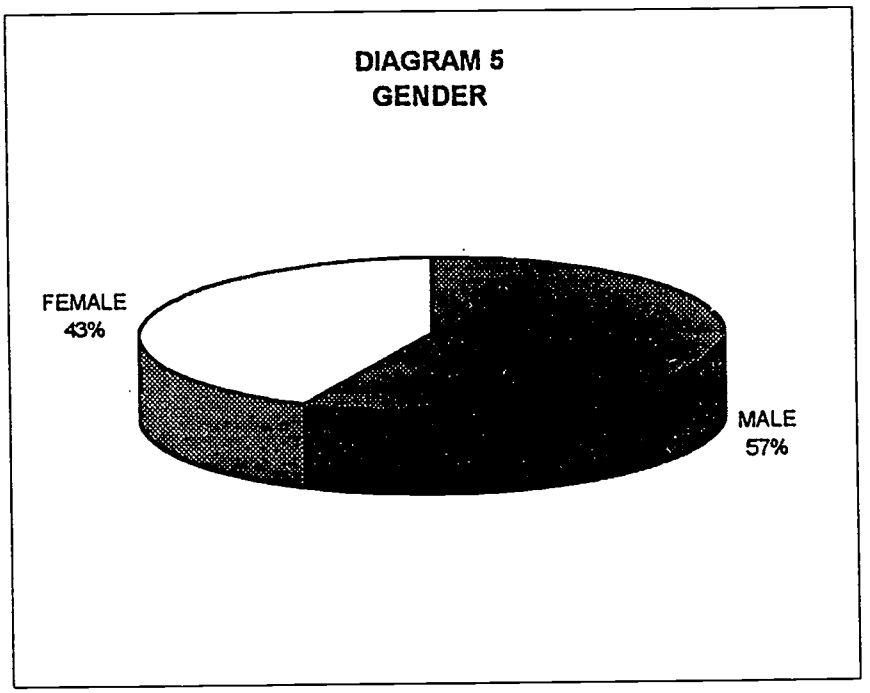
DIAGRAM 5
GENDER
FEMALE
43%
MALE
57%

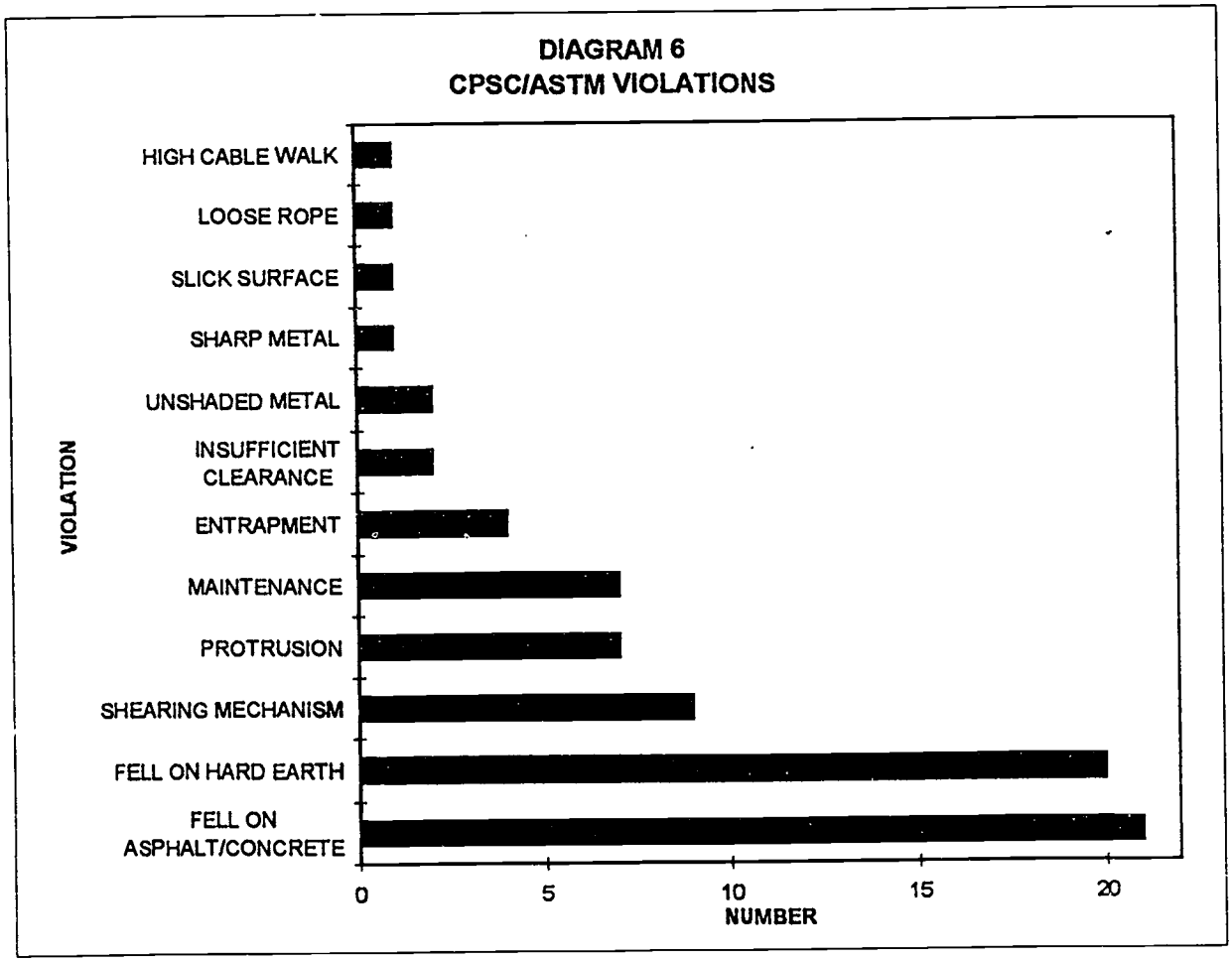
DIAGRAM 6
CPSC/ASTM VIOLATIONS
HIGH CABLE WALK
LOOSE ROPE
SLICK SURFACE
SHARP METAL
UNSHADED METAL
INSUFFICIENT CLEARANCE
ENTRAPMENT
MAINTENANCE
PROTRUSION
SHEARING MECHANISM
FELL ON HARD EARTH
FELL ON ASPHALT/CONCRETE
VIOLATION
0
5
10
15
20
NUMBER

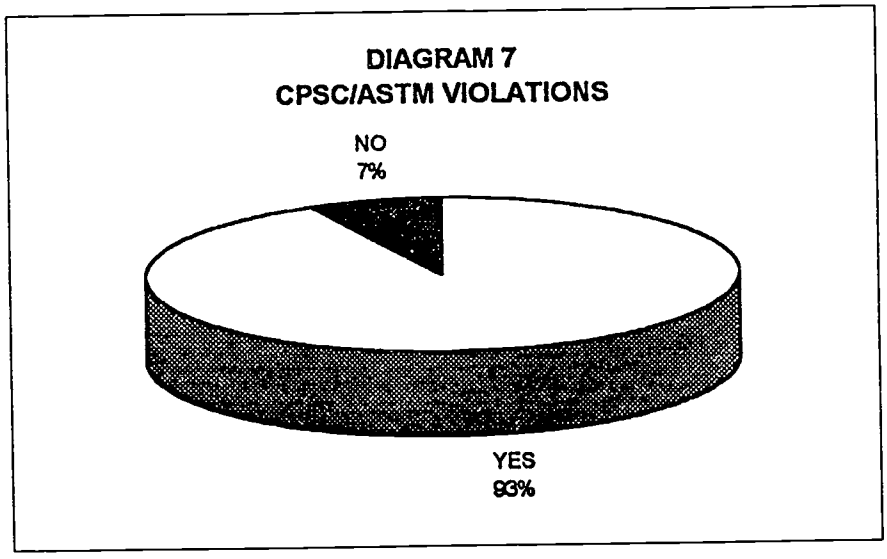
DIAGRAM 7
CPSC/ASTM VIOLATIONS
NO
7%
YES
93%