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Accessing Playground Safety: Design of an Audit and Maintenance System for the Playgrounds of Worcester, Massachusetts

An Interactive Qualifying Project Report
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by

David Sama

Elizabeth Whitaker

Devin Wolfe

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Approved:

Professor Leonard Albano, Major Advisor

Professor Elise Weaver, Co-Advisor

Executive Summary

Each year about 200,000 children under the age of 15 are sent to the emergency room due to injuries that occur on the playground (Hudson, 1999). Nevertheless, playground safety is currently an issue outside Federal regulation. This project seeks to minimize and/or prevent injuries on Worcester's public playgrounds. Working in conjunction with Worcester's Department of Parks, Recreation and Cemeteries, we achieved a significant step toward this goal, by designing an effective safety auditing and maintenance system for the individual playgrounds in the city of Worcester that can be updated frequently and accessed easily.

To successfully implement a comprehensive playground auditing and maintenance system, for the individual playgrounds of Worcester three main objectives had to be addressed and accomplished. The first objective was to design and construct a complete and user-friendly auditing system that enables certified playground inspectors to perform quick and thorough inspection of each playground of Worcester. It was determined through interviews conducted with the Commissioner of Parks, Recreation and Cemeteries that the auditing system was to be based on simple checklist form, which would guide the inspector through a set list of standards to perform a successful and complete inspection. Through archival research and interviews with various playground inspection agencies, the most commonly used playground standards were determined as well as a comprehensive format for the audit forms. In order to customize these forms to the playgrounds of Worcester, a visual inventory was completed of 10 parks (two from each political district) selected by the Commissioner. This inventory allowed us to remove any standards that were not applicable to the playgrounds, as well as to expand on other areas.

Once a draft version of the forms was complete beta testing was conducted, in the form of an actual inspection. The beta testing allowed us to view any problems that may occur with our forms when put to use, and correct them. Once these corrections were made, a usability study was conducted by inspecting the nine remaining playgrounds and evaluating the forms for user-friendliness and efficiency.

The Parks Department requested the ability to store inspection data and other playground related information electronically, thus the second objective of our project was the design and construction of a database system. By storing and evaluating data collected from the inspections, the Parks Department is able to rank and review the state of each playground and accordingly allocate funds for repair.

The design of this database was aided by the input of many different people as well as research into the usage of various database design software. Once the framework for the database was developed, a usability study was completed involving the pertinent Parks Department personnel. It was evaluated for the ease of use of its interface, the ability to store information, and the ability to organize the data based upon categories such as rank of overall condition, date of inspection, and by equipment type. Once each

of these attributes was achieved, the database was beta-tested with the first ten inspections performed, and re-evaluated. Any programming errors were then removed and the database was finalized for Parks Department usage.

In order to obtain consistent data from the audits and use of the database system an explanatory user's manual was developed that, in detail, instructs the users how to properly use both the auditing forms and database system. This manual will help to ensure that the inspection data will be collected and interpreted in a uniform manner. It was based on information gathered from both archival research and interviews conducted with personnel from the Parks Department, and was reviewed and revised by personnel from the Parks Department.

In conclusion, we believe that we have successfully accomplished our goal, to implement an effective playground safety and maintenance system for the individual playgrounds of the city of Worcester, that can be accessed easily and updated frequently. To strengthen the systems we have designed and tested, we recommend the following:

- Biannual audits
- Data analysis to properly allocate funds
- The implementation of an playground accident reporting system
- A public relations campaign based on playground safety

From the development and implementation of the auditing and maintenance database systems we hope, in turn, that an overall reduction in playground related injuries, will occur within the city of Worcester. It is also desired to see Worcester set an example for playground safety that will hopefully be recognized and adopted by other communities. By taking the initiative to develop their own guidelines, the city of Worcester sets a precedent, that perhaps will someday influence the establishment of national standards. These standards will then ensure that timely inspection and maintenance of all playgrounds will be required, not just those within the City, and that, in turn, will make playgrounds safer places for all children.

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Abstract

Each year about 200,000 children under the age of 15 are sent to the emergency room due to injuries that occur on the playground (Hudson, 1999). Nevertheless, playground safety is currently an issue outside Federal regulation. This project seeks to minimize and/or prevent injuries on Worcester's public playgrounds. As a major step toward this goal, we designed an effective safety auditing and maintenance system for the individual playgrounds in the city of Worcester that can be updated frequently and accessed easily.

To complete this project we conducted extensive archival research, interviewed playground safety experts within Worcester's Parks Department and beyond, carried out field research, created a new inspection checklist for use by auditors in the field, designed and implemented a database for maintaining audit data and identifying maintenance priorities, and conducted usability studies for our playground safety system, customized to the playgrounds of Worcester. From this safety maintenance and auditing system, we hope to make Worcester a model city in playground safety, setting the precedent for other towns and cities within the region.

Authorship Page

David Sama

- Inspection Analysis
- Rank and Scoring of each Playground

Devin Wolfe

- Contacting Playground Manufactures
- Database Design, Construction & Finalization
- Database Beta Testing

David Sama & Devin Wolfe

- Playground Inventory
- Audit Form Covers
- Audit Form Beta Testing
- Playground Inspections
- User's Manual Design and Construction
- Paper Filling System for Forms

Elizabeth Whitaker

- Contacting Playground Inspection Agencies
- Audit Form Construction & Finalization
- Report Edits
- Executive Summary

Group Accomplishments

- Background Research
- Interviews with Parks Personnel
- Design of Audit Forms
- Finalization of User's Manual
- Writing of Final Report & Presentation

Chapter 1: Introduction

200,000 children under the age of 15 were sent to the emergency room as a result of injuries suffered on the playground in 1997 (Hudson, 1999). It has been estimated that children from ages 5 to 9 make up about 56% of these injuries (NPSI, 2001). The most common cause of these injuries is impact due to inadequate surfacing on the playground. Approximately 80% of public playgrounds in the United States have inadequate surfacing material (Hudson, 1999).

Surprisingly, the federal government offers little guidance on playground safety. In response to the lack of federal regulation, several organizations such as the Consumer Product Safety Commission (CPSC), the American Society for Testing and Materials (ASTM), and the National Playground Safety Institute (NPSI) have developed standards on their own. These organizations have recognized the need for increased awareness about playground safety and have made a conscious effort to alert the public.

Our project seeks to define the components of a safe playground and investigate what needs to occur to ensure and maintain safety in Worcester's playgrounds. We will analyze the current state of the playgrounds, as well as research available existing standards. We will then utilize this information to design an effective safety auditing and maintenance system for the individual playgrounds in the city of Worcester that can be updated frequently and accessed easily. Our work promotes the goal of The Worcester Parks Department:

> To provide for efficient park, recreation, cemetery, and forestry services to city residents [and to provide facilities for public and private interments]. The Parks, Recreation, and Cemetery Department provides a comprehensive program of: parks and recreation services; efficient grounds maintenance and repairs to public buildings; the physical set up for all elections; the maintenance and care of the

grounds of Hope Cemetery and the maintenance and management of the City's urban forest (Worcester Parks Department Homepage, 2001).

As the primary agency responsible for playgrounds in the City, the Worcester Parks Department has expressed interest in the establishment of safety regulations for its playgrounds.

In order to achieve these goals, in-depth background research regarding playgrounds, their history and safety will be presented in Chapter 2, which consists of our review of literature relevant to the topic of playground safety. This report will also present a methodology in Chapter 3, were the methods used to accomplish our goal are discussed in detail. Chapter 4 presents the analyses and results of the beta testing and actual use of the designed auditing and maintenance database systems. Our final recommendations and conclusions regarding our goal of assessing Worcester's playgrounds and introducing a new system to help maintain the playgrounds throughout future years can be found in Chapter 5.

Chapter 2: Literature Review

2.0 Background

This literature review will provide background on playgrounds and playground safety in the United States, as well as provide information on the types and scope of playground hazards and injuries. The development of safety standards and what these standards entail will also be reviewed.

Playgrounds, which have been in the United States since 1880, are defined as any designated areas located at public use sites, such as schools, community parks, and child care centers, where stationary and manipulative play equipment is located to facilitate a child's physical, emotional, social, and intellectual development (Thompson, 1996). Since the development of the first playground, thousands have been built in the United States. Most of these playgrounds can be grouped into three categories: the traditional playground, the contemporary playground, and the adventure playground. While each playground has its own benefits and hazards, we will be dealing primarily with the traditional playground. The traditional playground consists of swings, slides, seesaws, and other basic playground equipment (Arnold, 1996).

There are two reasons why we will be focusing on the traditional playground: 1) The most current standards and regulations are set with traditional playgrounds in mind, and 2) Traditional playgrounds tend to be older playgrounds and are apt to be in the most disrepair. This disrepair results in more hazards, thus presenting a more urgent need to bring them into compliance with current standards (Eriksen, 1985).

2.1 The Importance of and Need for Playground Safety

Child psychologists note that play is a necessary element for proper social, physical, and cognitive child development (Noren-Bjorn, 1982). Through play, children begin to understand themselves and the world around them(Eriksen, 1985). Despite the recognized importance of play, the safety of play areas is an area in need of improvement. Hudson (1999) conducted a study that indicates that playground injuries are the most frequent types of injuries among school age children. In 1997 alone, over 200,000 children under the age of 15 in the United States were injured severely enough on a playground to require a trip to the emergency room. Out of these injuries, 17 were fatal (Hudson, 1999). Recently an effort has been made by non-governmental agencies to improvement the safety of nation's playgrounds. However, much still remains to be done. For example, Eriksen (1985) found that a majority of playgrounds were still in need of some form of improvement. The most frequent improvement conducted is the replacement of the protective surfacing material under and around equipment. Hudson (1999) confirmed Eriksen's study with findings that 80% of the playgrounds surveyed possessed inappropriate surface material, and that 30% were deficient in some other area of safety such as poorly maintained equipment.

2.1.1 What is a Safe Playground?

Studies have concluded that there are four major areas that need to be up to standard for a playground to be considered "safe:" adequate supervision, age-appropriate equipment, fall surfaces, and equipment maintenance (see Table 2.1) (Hudson, 1999). In

order to assure that a playground is not lacking in any of these areas is to perform an initial audit of all the playground equipment to prioritize immediate repairs, and to establish a set maintenance schedule to assess any future deterioration.

Table 2.1 - Four categories indicative of a safe playground

1. **Adequate supervision** – Forty percent of injuries could have been prevented with adequate supervision, therefore a safe playground should allow parents an unrestricted view of his or her child (King, 1990).

2. **Age Appropriateness** - A safe playground takes into consideration the physical limitations associated with age. A safe playground should divided the playground equipment into two suitable sections for the age groups of 2-5 years and 5-12 years (Hudson, 1999).

3. **Fall surfaces** –Eighty percent of playground injuries result from inadequate surfacing. (Hudson, 1999) Therefore, for a playground to be considered safe, it should conform to the standards that dictate both what is, and what is not, an acceptable surface material.

4. **Equipment maintenance** - Improperly maintained equipment has been implicated in 30% of playground accidents (Hudson, 1999). Faulty equipment may include any of the following: Broken swings, rusty bolts and protruding fasteners. Therefore a safe playground should be routinely inspected and repairs are performed as needed.

2.1.2 Common Hazards

By conducting various types of audits, the National Recreation and Park Association derived twelve common hazards that occur frequently in playgrounds. Table 2.2 summarizes the results.

Table 2.2 Twelve Common Playground Hazards

Type of Hazard	Resulting Injury	Method to Fix the Problem
Improper ground surfacing	Broken bones due to falls	Increase ground softness under areas where climbing occurs
Inadequate fall zones	Broken bones due to lack of padding	Excessively pad areas where falls are evident
Insufficient spacing of equipment	Overcrowding causes collisions	Place equipment far enough apart to prevent this from happening
Equipment Failure	Cuts and scrapes, possibly broken bones or death	Maintain equipment properly to prevent wear and tear as well as failure
Protrusion and Entanglement	Choking and strangulation	Cover exposed sharp edges to prevent clothing from getting entangled
Entrapment in openings	Head entrapment (Death)	Make sure openings are large enough to fit a child's body as well as it's head
Trips and falls	Cuts, scrapes, and broken bones	Fix exposed concrete footings, tree roots and stumps, and protruding rocks
Lack of parental supervision	Cuts, scrapes, and broken bones, and possibly death	Set up playground so parents can easily observe their children at play
Age Inappropriateness	Cuts and scrapes, possibly broken bones or death	Sectioned off areas and signs warning parents of suggested age limits
Maintenance	Cuts and scrapes, possibly broken bones or death	Implementation of maintenance program and routine inspections
Lack of guardrails	Impact injuries: cuts and scrapes, possibly broken bones or death	Inspections to ensure guardrails are present and in good condition
Equipment not recommended for public playgrounds	Cuts and scrapes, possibly broken bones or death	An inspection and maintenance system that is up-to-date

2.2 Safety Standards

Currently there are no federal regulations pertaining to playground safety. Several states have passed mandatory playground safety legislation, however. In January of 2000, California adopted compulsory regulations for playground safety and maintenance, and is the only state that mandates playground inspections (California Playground Safety Regulations, 2000). The remaining states have lumped playground safety into what is known as a legal "standard of care" in court (NPSI slides, 2001). As a result, several organizations have established what they deem to be a set of regulations and standards that ensure a safe playground. They have conducted various safety studies and offer advice on how playgrounds should be set up and maintained. They understand both "Children's love of freedom to take and calculate risks" as well as the need for a safe environment (Smith, 1998). These organizations include, but are not limited to: The U.S. Consumer Product Safety Commission (CPSC), The American Society for Testing & Materials (ASTM), The National Playground Safety Institute (NPSI), and The National Program for Playground Safety (NPPS).

2.2.1 Agencies

In 1981, the CPSC published *the Handbook for Public Playground Safety,* which recognizes a playground to be a fundamental part of childhood and also to be a safe haven for children (CPSC, 1997). It evaluates multiple types of playground equipment, surfacing and zoning, and lists recommendations on how to evaluate these items properly and safely. *The Handbook* can be viewed as "federal guidelines" for a safe playground (NPSI, 2001).

ASTM published a set of safety and performance standards similar to those of the CSPC. The purpose of these standards is to minimize the likelihood of life-threatening or debilitating injuries (ASTM, 1999). The ASTM publication reviews general performance and access requirements of playground equipment as well as layout, installation, structural integrity and maintenance and sets its guidelines accordingly.

In 1991, the NPSI conducted its first training session to certify playground safety inspectors. The course trains individuals on how to recognize playground hazards by means of audits and inspections (Christiansen, 1995). Upon completing the three-day program, the trainee becomes a certified playground safety inspector with the authority to examine playgrounds for compliance with the existing California regulations.

In 1995, under a grant for the Centers for Disease Control and Injury Prevention (CDC), the University of Northern Iowa established the NPPS. Its purpose is to address America's playground safety issues and reduce the number of injuries and deaths that are playground-related. Undertakings of this organization include hosting an informative web page that posts recent developments in playground safety (http://www.uni.edu/playground), conducting ongoing research in the area of injury prevention, and sponsoring National Playground Safety week (NPPS Web Page, 2001).

Despite the lack of federal regulation, the development of the CPSC and ASTM guidelines represent a step forward, initiating a formal approach to a concern for playground safety. Since their inception in the early nineties, much has been done in the field of playground safety, but much still remains. While the establishment of these standards represents a step forward, the adoption of these standards by any community not in California still remains voluntary. The lack of mandatory regulations in a majority

of the country leaves children vulnerable to injuries suffered on playgrounds. One incentive for communities to adopt these standards is the threat of litigation, as any agency can be found negligent in a lawsuit if a child is injured on playgrounds in their jurisdiction (Kutska, 1995).

2.2.2 Listing of Safety Standards

As previously indicated, several non-government organizations have developed recommended safety standards. A listing of standards from the Consumer Product Safety Commission can be found in Appendix A of this report.

2.2.3 Importance of Maintenance

Maintenance

In addition to the purchasing and installation of safe equipment, maintenance is an important factor in playground safety. Children will play on equipment regardless of whether it is in disrepair or not. Hudson (1999) found that 30% of all playground injuries are related to poor maintenance. Over time, equipment can deteriorate, corrode and be vandalized, making it a potential safety hazard for children. This makes it important to implement a standard playground maintenance program. A periodic maintenance program would ensure a standard level of care, as well as identify all new hazards that have developed on the playground(s) from vandalism, litter, storm damage, exposure, deterioration, wear and breakage (NPSI, 2001).

Record Keeping

To run a successful maintenance program, inspections should be performed periodically keeping detailed records of the equipment. Accidents that occur on the playground should also be noted in these records.

Frequency

Ideally, each playground should receive both high frequency and low frequency inspections (Kutska, 1998). During high frequency inspections, inspectors go out daily to check the playground for hazards such as open "S" hooks, sharp edges, missing or worn bolts, and loose, worn or cracked equipment pieces (Phillips, 1995). Manuals such as the *Handbook for Public Playground Safety* and the *Standard Consumer Safety Performance Specification for Playground Equipment for Public Use* recommend that low frequency inspections take place in public playgrounds at least twice a year. These inspections are the more important of the two and during them, trained staff should investigate all aspects of the playground.

Safety Ranking

Protective surfacing depth , rusty equipment , the security of the hardware, drainage and vandalism are all things the inspector should be noting. Once the inspection is complete for a piece of equipment, a safety ranking can be derived from the data collected. This ranking can help inspectors and playground agencies determine which pieces of equipment need the most attention.

It is vital that records of each inspection be carefully kept, and it is recommended that an identical form or checklist be used for each inspection. A suggested playground maintenance checklist from the CPSC can be found in Appendix A of this report. These

forms should be based upon the manufacturer's guidelines, agency policy and procedures and should be very easy to use. They should also be tailored to the conditions and the history of the equipment (NPSI, 2001). Keeping records allows the inspectors to track the progression of deterioration and wear of equipment and to estimate dates when certain pieces of equipment will wear out. Records are also useful in realizing which playgrounds are most frequently used (due to wear of equipment), and which playgrounds suffer from high vandalism rates. This data can help inspectors adjust and improve the playgrounds accordingly.

Background Documents

Along with these records, any documents from the manufacturer of the equipment and also a list of the personnel who install it should be kept. In addition, it is important that any documents that pertain to reducing hazards be included (CPSC, 1997).

Accident Reports

Accident reports can also help identify potential hazards on the playground (Hudson, 1999). It is difficult to foresee where children will injure themselves, since they do not always use the equipment as intended. By keeping accident reports, inspectors will be directed to give certain pieces of equipment a "closer look". They are also helpful in aiding the inspector in the processes of determining when to eliminate a piece of equipment due to injury rates.

A proper and complete maintenance program has many benefits to the owners of playgrounds. Not only will they see fewer injuries on their playgrounds, but they will also see advantages such as improved public relations, better cost accounting, and an effective

annual budget. In addition, agencies will have legal defense against neglect charges with the enforcement of a playground maintenance program (NPSI, 2001).

2.3 Hazard Identification and Removal

2.3.1 Identification of Common Hazards

Even with a complete inspection and maintenance program, there are still problems that cannot be fixed. These problems are not physical problems with the playground but are related to behavior of children (Christiansen, 1996). Children do not always play on the equipment in the manner that it was designed. Examples of inappropriate behaviors include: running up a slide, climbing up the side of the monkey bars, or hanging from a loose chain on a swing. Children tend to challenge themselves with broken equipment because they enjoy identifying unique ways of playing. The risks children take when playing on equipment can lead to injuries on a playground.

Luckily, various actions can be taken to minimize these risks. First, proper signs should be in full display all over the park to alert people that misuse of equipment can lead to serious injuries. Another method of prevention is proper supervision. Finally, it must be made clear what age groups are to play on which pieces of equipment. For example a two-year-old child should not be playing on a piece of equipment that was built for the age groups of five years old and up. Similarly, an older and larger child should not be playing on equipment built for smaller and younger children. Although the use by older children of equipment intended for younger children does not seem hazardous, there still are problems with a child being too large for the equipment. Older

children frequently become trapped and are too heavy to be supported by the structures made for smaller children (Christiansen, 1996).

There are three main types of playground hazards: priority one, two, and three hazards (Kutska, 1998). Priority one hazards consist of problems with the equipment that can cause permanent disabilities, loss of body parts, or loss of life. These types of hazards are extremely dangerous and require immediate correction. Priority two hazards are still very serious problems because they cause injury or illness resulting in a temporary disability, although loss of life usually is not a consequence. Priority three hazards are minor problems that occur from every day use such as broken glass on the ground and broken or cracked equipment. Because these hazards result in minor injuries, they usually are not responsible for disabling a child or seriously harming them in any way.

2.3.2 Hazard Removal

Table 2.3: A listing of the ten steps to make playgrounds safer.

1.)	**Identify existing equipment that has caused injuries in the past**: This is caused by poor maintenance and lack of repairs.
2.)	**Remove all equipment that is not recommended for public playgrounds.** Examples include rope swings, exercise rings and trapeze bar swings.
3.)	**Make sure that surfacing is consists made of acceptable material and is of adequate depth for equipment height.**
4.)	**Identify all high equipment that may require a landing surface that exceeds the maximum fall height of the existing surface material.**
5.)	**Adjust borders and relocate equipment to accommodate existing guidelines.**
6.)	Repair hazards. A thorough and complete inspection and maintenance procedure can help identify existing hazards.
7.)	Conduct a comprehensive audit of each playground identifying all hazards.

8.) Formalize the playground maintenance program policies and procedures.

9.) Establish a long-term action plan. Enabling to upgrade playground sites within the given range of resources (employees, budget etc).

10.) Continue the ongoing commitment of each person who is actively involved in providing safe and challenging playgrounds in the community (Kutska, 1998).

2.3.3 An Educated Public

Today, much is being done to educate parents and children on playground safety. Teaching the public about what constitutes a safe playground and informing them on the latest developments in playground safety is a goal of the Worcester Parks Department. An educated public will be able to spot hazards and prevent accidents and injuries before they occur.

A new approach to educate children about playground safety is a character similar to "Smokey the Bear." A mascot, named "Slyde the Playground Hound" promotes playground safety to kids across the country by attending various workshops. Parents as well as children find Slyde's humorous appearance amusing. The potential for amusement draws the crowd's attention, and they tend to listen and learn more (Harris, 2002). The adoption of Slyde as a symbol of safety is just one more step in educating the public on the importance of playground safety and will hopefully lead to a reduction in playground related injuries.

Another education tactic is to recognize National Playground Safety Day, April 29th. On this day, events around the country are held in an effort to better educate the public about playground safety. During these events, conferences are held to inform the public about what makes a playground safe and how to keep their children hazard-free while using a playground (IPEMA, 2002).

By maintaining an educated public, playground agencies have one more tool in preventing injuries on the playground. An informed public will be able to identify playground hazards and will hopefully be knowledgeable enough to avoid the risks. A playground agency will also have the benefit of a more watchful public. Since the public can identify the hazards, they will be more apt to report them to the responsible agency, who can then take immediate action to rectify the problematic condition.

2.4 Worcester's Playgrounds

Worcester first set aside land for public use during June of 1669. Twenty acres were reserved as the Worcester Common, which was the first public park in Worcester. In 1863, a Parks Commission was formed to maintain and run the City's parks. It was not until the Park System began to focus on recreational issues that the City created a playground budget to acquire and improve the playgrounds of Worcester (City of Worcester, 1994). From this initial budget and subsequent donations, Worcester today has 53 public playgrounds (O'Brien, 2001).

The Worcester Department of Parks, Recreation and Cemeteries (Worcester Parks Dept.) acknowledges the need for playground safety. In 1982, 1987, and 1994, the Worcester Parks Department conducted a study of all the parks and open spaces within the City. The purpose of these studies was to assess all of Worcester's parks and recreational areas and to submit a plan that would help the City to utilize and take full advantage of its resources (Parks, 1987).

In addition to the Worcester Parks Dept. studies, other groups have examined Worcester's playgrounds for their safety. In 1994, the Massachusetts Public Interest

Research Group (MassPirg) conducted a statewide inspection of public playgrounds, which included 10 playgrounds in Worcester (Monahan, 1994).

Table 2.4: Summary of various studies regarding Worcester's playgrounds.

Study	Findings
1982	Equipment in poor condition in need of replacement, repair and updating, vandalism destruction, playgrounds have poor maintenance
1987	Equipment in poor condition in need of replacement, repair and updating, vandalism destruction, playgrounds have poor maintenance
1994	Equipment in poor condition in need of replacement, repair and updating, vandalism destruction, playgrounds have poor maintenance
1994 MassPirg	Safety flaws: hard surfaces, head entrapment areas, vandalism, unsafe swings, lack of trash facilities, high equipment

Currently, there are no formal maintenance or inspection systems for public playgrounds in Worcester (O'Brien, 2001). The 1987 Open Space Study, performed by the Worcester Parks Department, estimated that playground equipment in Worcester tends to wear out within 3-5 years due to heavy usage. Table 2.3 summarizes findings of various studies; each study indicates a need for playground equipment improvements. The implementation of a complete and thorough maintenance and inspection system in Worcester will help ensure that the city's playgrounds remain safe, up-to-date and in overall good shape.

Chapter 3: Methodology

The purpose of this report is to document the design and testing of an effective safety auditing and maintenance system for the individual playgrounds for the city of Worcester that can be updated frequently and accessed easily. There were two main aspects to this task. The first was the creation of a complete and user friendly auditing system, which is customized to the public playgrounds of Worcester. The second aspect was the design of a maintenance database system that allows the Worcester Parks Department to record and view available information pertaining to the playgrounds.

The auditing system included the introduction of suitable forms to be used during the inspection. The following questions drove the design of these forms:

- What does an effective and complete auditing system consist of?
- Are there existing standards for playground inspection?
- How can the audit forms be customized for Worcester's playgrounds?
- How can these forms enable a high frequency of updating?

Once a beta version of the forms was complete, the following question was raised:

- How can the audit forms be made complete and user-friendly?

The design of the maintenance database system was driven by the following concerns:

- Ease of updating
- Comprehensiveness
- User-friendliness
- Functionality

- Uniformity of use of the system by different individuals
- Customization to Worcester's parks

Once both the auditing and maintenance systems were developed, a new question arose:

- How can we insure uniformity, in the usage of the designed systems?

The following pages will discuss each of the methods that were utilized to achieve each objective and answer our questions.

3.1 Developing the Auditing System

3.1.1 What entails an effective and complete auditing system?

Archival research was conducted to find any existing standards present as well as to locate any existing audit forms. An examination of existing standards, from sources such as: *Handbook for Public Playground Safety, Standard Consumer Safety Performance Specification for Playground Equipment for Public Use, Playground Safety is No Accident*, and *Points About Playgrounds,* helped us to develop a comprehensive list of the most commonly accepted and rigorous safety standards. Existing audit forms were gathered and compared, then later used as a guide for developing our own forms. Forms found in the book, *Playground Safety is No Accident* gave us a model of a form that can easily be accessed and updated. To be specific, we determined what constitutes an effective auditing and maintenance system via analysis of pre-existing auditing forms and standards.

3.1.2 What are the existing standards for playground inspection?

There are four organizations that provided the base material for our inspection instrument: The American Society for Testing and Materials (ASTM), The Consumer Product Safety Commission (CPSC), The National Playground Safety Institute (NPSI), and the California Parks Department. An Excel spreadsheet was complied which listed each organization, equipment type, and the recommended standard. The equipment types listed were classified into six categories after analysis of the commonalties across standards: Rotating and rocking equipment, stairways and ladders, climbing equipment, platforms, slides, and swings[1]. This examination indicated that each organization's standards agreed on all components. Essentially, each organization with standards based their standards upon the CPSC's *Handbook for Public Playground Safety*, resulting in uniformity across the spread.

After establishing the uniformity of standards, we designed a series of audit forms. As previously mentioned, each playground was categorized by component, and an audit form was created for each component. We analyzed these forms for clarity, visual presentation, and ease of use. The organizations that provided standards also provided sample forms. Each source provided some unique elements in their forms: elements such as scoring, ranking and standard categorization. Elements were selected based on relevance to the needs of the Worcester playgrounds and the equipment they

contained and either discarded as unnecessary, or used if we felt they were of benefit. Criteria for inclusion or exclusion of an element of the audit forms were based on:

- How user-friendly the element seemed to be.
- If the element applied to the playgrounds of Worcester.
- If the element fit the guidelines set by our liaison.

These ideas were presented to our sponsor for their input and approval, and then adopted (See Appendix B for a copy of the final forms).

Once the final set of forms was completed, a cover page was designed for playground component in the set. Each component had a separate cover page, but the same type of data is requested for all of them. The form contains important playground information on its cover page, such as location, playground name, surfacing around each particular component and the name of the inspector performing the audit. The priority ranking system, which will be discussed in a later chapter is also outlined on the cover page (See Appendix B for an example cover page).

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[1]. These categories were developed based on information obtained from our literature review concerning the categorization of playground components

3.1.3 How can we customize the audit forms for Worcester?

In order to customize the forms to the individual playgrounds of Worcester, we obtained copies of any available plans for each of the playgrounds as well as conducted a visual inventory. By doing this research we determined the range of equipment present in the playgrounds, and gained a general sense of the equipment condition. Since there is a large number of playgrounds in Worcester, it was overly time consuming and inefficient to look at plans and conduct an inventory for each one of the 53 playgrounds. A subset of ten playgrounds was selected for analysis in light of Worcester Parks Department current needs, and as a test run for the proposed system.

The method of choosing the 10 playgrounds was to include two from each of the five different political districts of Worcester. The ten playgrounds selected were the following: East Park, Green Hill Park, Duffy Park, Tacoma Street Park, Vernon Hill Park, Burncoat Street Playground, Banis Playground, University Park, Elm Park, and Beaver Brook Park.

Plans were obtained, when possible, for the selected playgrounds through the Worcester Parks Department and through the manufacturers of the playgrounds, Gametime. All ten sets of plans were not available to us; only three sets of plans were found for the following parks: Tacoma Street, Banis, and Vernon Hill. Visual inventory was used to analyze the remainder of the parks. When performing this inventory, digital photographs were taken of all the equipment, which allowed us to review the playgrounds and catalog their basic condition.

Based upon our plans and the results of the inventory, we re-analyzed our audit forms and began to customize them to each playground. This second analysis enabled us to remove any standards that we adopted that were irrelevant to Worcester, as well as add those that we overlooked or disregarded during the initial analysis.

3.1.4 Are our audit forms complete and user-friendly?

After completing a beta version of the audit forms, an interview was conducted with Deputy Commissioner Robert Antonelli to discuss his opinions on the forms. The main focus of this interview was:

- What changes, if any, need to be made to our forms to make them as thorough and comprehensive as possible?

During this meeting various ideas were discussed on how to improve our forms, and make our inspection system as easy and user-friendly as possible. He was very pleased with the structure of the forms and suggested instead of deleting the non-applicable standards to instead, place N/A in each of these sections. His view was backed up by the explanation, that if a new piece of equipment was ever added to one of the playgrounds, the form would still include it.

Once the forms were updated to reflect Mr. Antonelli's input, beta testing was conducted in the form of our first playground inspection. Beaver Brook Playground was chosen for our beta testing because of the variety of conditions present within this playground. One play structure had been built less than two years ago, and the other was found to be in poor condition and disrepair. The most recent version of the audit forms was used for this inspection. By performing an audit, we were able to see first hand the pros and cons of the developed system.

After the pre-testing was complete, interviews were conducted with personnel from the Worcester Parks Department. These interviews were conducted face-to-face and involved questions concerned primarily with changes or improvements that needed to be made to the audit forms to make them more comprehensible and user-friendly. The certified playground inspectors within the department were selected to be interviewed, as they will be the people using these forms. The interview questions were mainly opened-ended questions that allowed the auditor to express his opinion. Although open-ended questions are more difficult to analyze, by asking them we received more pertinent information (Singleton, 1999). Questions included:

- Were the forms difficult to interpret?
- Were all categories clearly defined?
- Were the ranking systems understandable?
- Were all the standards clearly defined, and presented in an appropriate manner?
- What are improvements you recommend to make our forms more comprehensible and user-friendly?

Based on these interviews, and the beta testing performed on the selected park, minor changes were made to the auditing forms. The next step in completing the forms was the finalization process, which covered the continuing maintenance system as well as ensuring uniformity in the usage of the designed systems.

3.2 Developing the Maintenance System

3.2.1 How can we construct a playground maintenance system that can be easily updated and is user-friendly?

To create a complete and effective maintenance system, a database was designed that included a file for each playground containing:

- Completed audit forms
- Any documents relevant to the equipment
- Accident log
- Any other miscellaneous information pertaining to the playground

To determine the best way to organize this database, data was collected from both archival research and interviews conducted with Worcester Parks personnel. By researching suggested standards from the ASTM and the CPSC, we hoped to find examples of what a proper maintenance system should be. Another outlet for archival research was to find models of database management systems. These models held suggestions on how to set up the system. While we were conducting the interviews about the audit setup, we also asked the Parks Department personnel questions about the design of a maintenance system for the playgrounds. Questions were asked such as:

- What is the most effective way to construct a database?
- What are all the necessary functions that the system needs to perform?

Once these were answered, we felt that the best way to approach this aspect of the project was to develop a Windows-based system in Microsoft Access. The database designed incorporated knowledge obtained from a tutorial book on Access (*Access 97*)

and ideas from interviews conducted with several Computer Science experts on campus. From the archival research as well as the interviews, we obtained a solid background and structure of how to develop this system and then shifted our focus to the process of constructing it.

3.2.2 What are the necessary functions that this system needs to perform?

After obtaining a working knowledge of Microsoft Access, and determining the appropriate functions our system should be able to accomplish, we began to craft a skeleton of the final product. Our liaison at the Worcester Parks Department indicated that at minimum, the database should include the park name, its address, political district, surfacing material, and the results of the audit. This information would allow the department to analyze each park and appropriate the necessary funds to those in the worst shape. While the initial framework was set, the system was not thorough enough or particularly user-friendly.

To remedy this problem, outside assistance was obtained from Brian L'Heureux, a computer science major, Michael Newcomb, an MIS major completing his MQP on a database, and Samuel Gutmann, another MIS major working on his MQP. Through the input they provided, both on a technical and developmental level, the database was redesigned to reflect the initial desires of our liaison and to improve its user-friendliness. The final product is easy to use, and very comprehensive regarding the information it can store. It allows the user to input all relevant data, as well as obtain reports on the equipment, by date or by park. This ensures continuity in the auditing process across

different audits, and makes it as easy as possible to update the results on each park as improvements are made. Once the database was complete, the next step was to get approval via beta testing of the instrument.

3.2.3 Is our system able to perform all the necessary functions?

Beta testing of the database was conducted to assess its functionality. After our initial inspection of Beaver Brook Playground, we entered of the data gathered on the paper forms into the database to test its capacity to carry out its functions. The next step was to assess its usability.

3.2.4 Is our database system user-friendly?

To answer this question, we conducted interviews and a training session with the auditors from the Worcester Parks Department. During the training session personnel from the Parks Department inputted sample data into the designed system themselves as well as experimented with the system on their own. After they had completed the data input into the system, we conducted interviews with them and questioned them on how user-friendly the database was, and how clearly they understood how to use all functions of the database. From this usability study, minor problems were determined and corrected. Once this was complete, we considered the question of how to ensure uniformity among users of our systems.

3.3 Ensuring Uniformity

We desired to ensure that our systems would be used in an appropriate and uniform manner by all users, which would, in turn, make the collection and storage of data more reliable and easier to analyze. The suggestion of a user's manual, which would explain in detail the appropriate manner to use both the auditing and maintenance database systems, was derived to ensure that this would occur. The purpose of the manual is to create a rapid learning curve for the forms as well as the database.

3.3.1 What should this manual include?

Interviews were conducted with Parks personnel to determine the content of the manual. Open-ended questions were asked such as:

- What do you think should be in the manual?
- How should we present the information?

After collecting feedback to these questions, a review was conducted on all the tasks accomplished over the past seven weeks. From the interview data and the compiled list of steps, a detailed user's manual was drafted, that explains down to the smallest detail what the auditor needs to do to perform and record a successful audit. A copy of the user's manual can be viewed in Appendix E.

3.3.2 Is the manual clear and easily understood?

The main purpose of the manual is to make the audit forms and the database clear and understandable. It was important that the manual, itself, be tested for its comprehensiveness and comprehensibility. Beta copies of the manual were distributed to the personnel of the Worcester Parks Department, with an attached note stating we desired feedback.

- Do they feel this manual is comprehensive and thorough enough?
- Is there anything that should be added or remove?
- Any other revisions needed?

With the feedback collected, the necessary changes we determined and made, completing the manual.

3.4 Conclusions

Through the archival methods and interviews, we developed an efficient playground safety and maintenance management system that allows for frequent and systematic inspections of Worcester's playgrounds. Through the usability study and interviews, we also developed a system of maintenance that is not only effective, but thorough and user-friendly as well. We hope that this, in turn will, result in safer and more enjoyable playgrounds in the city of Worcester.

Chapter 4: Data Analysis

4.1 Auditing System

4.1.1 What does an effective and complete auditing system include?

Initially, to start designing the auditing system for the playgrounds of the city of Worcester, we interviewed both Commissioner O'Brien and Deputy Commissioner Robert Antonelli, of the Worcester Parks Department. The purpose of this interview was to determine their expectations for these forms as well as to receive their suggestions on how to construct the forms. From these interviews, we gathered that our forms were to be used as a comprehensive checklist, in which the auditor has a listing of standards and simply has to go through this list in order to complete a thorough inspection.

We then proceeded to engage in archival research and to contact private playground inspectors, to determine the most effective way to construct a complete and user-friendly auditing system. Contacting private playground inspectors didn't prove to be a useful method. Seven different playground-inspecting agencies were contacted, via email and asked a series of questions, such as: Is it possible for us to view a sample audit form? How does your agency rank the safety of a given? Does your agency use any sort of ranking system to prioritize repairs? How do you store and organize your data? Only three out of the seven agencies responded to the email. All three sent vague responses and stated that we were not allowed to view a sample form from their agency.

We then focused on archival research. Our first task was to determine an appropriate basis for our inspection standards. We reviewed several sources on

playground safety, including the *Handbook for Public Playground Safety, Playground Safety is No Accident, Points About Playgrounds and Standard Consumer Safety Performance Specification for Playground Equipment for Public Use*. A spreadsheet was compiled, cross-referencing standards found in each source. It was found that most of these sources were based upon the CPSC's *Handbook for Public Playground Safety*, and this is the manual, on which we based our inspection standards.

Based upon our research, we discovered that the best format for a playground audit is that of a comprehensive questionnaire. Each type of playground equipment possesses its own set of explicit standards, therefore an effective system takes into account each individual structure of play equipment. There are many different categories of standards regarding the different aspects of each type of equipment, and each of these categories can include many different standards. In our audit forms, these standards are presented in a question format that enables the auditor to assess quickly and efficiently the condition of each type of equipment, and note whether or not it is in compliance the listed standards.

Once the standards were all accounted for, the next step was to establish a repair priority system that would allow the auditor to rank the severity of the needed playground repairs. We found a simple system that was recommended by many of the manuals we reviewed, also the Parks Department certified playground inspectors had also been exposed to this system. This system was as simple as ranking the repairs as either priority 1, 2, 3 or 4, with 1 being the most severe and 4 being of good condition, no injury possible.

This ranking system was both user-friendly and effective, but we still needed a way to weight the hazards accordingly. The need to weight the hazards accordingly was driven by the fact that not all hazards that scored as a certain priority would cause the same level of injury. An example of this is inadequate surfacing in comparison with handrail diameter. Both standards had the option of being assigned a priority of one, which is the most severe, but overall, the chances of inadequate surfacing resulting in severe injury are greater than those resulting from a handrail being one-tenth of an inch to narrow. This discrepancy resulted in a possible lack of uniformity in the auditing process, as different inspectors may possess different ideas about the seriousness of a standard infraction. As a result, we found that by limiting the possible priorities for the most serious infractions the range of interpretation was reduced on these issues, and it was assured that all repairs of a specific nature are given a uniform score regardless of the individual performing the audit.

It was also determined that to further narrow subjectivity by simplifying the prioritization system, a ranking system would be established via a weighting of the standard. The weighting system was derived from sample forms found in *Playground Safety is No Accident*. In these forms, each standard is assigned a weight. We felt this would enhance our forms as well as enable them to provide a clearer insight on the conditions of the playgrounds. As a result, we adapted a very similar weighting system for our audit forms. Each standard was assigned a multiplier, which was to be multiplied by the repair priority given by the inspector. This allows the more hazardous conditions to influence the overall equipment score on a larger scale.

Table 1 shows the results of the initial seven audits performed on playgrounds during formation of the form. It was during these audits that one flaw in the auditing system was exposed. According to the results, University Park received a score of 93, however this score was not indicative of the actual condition of the playground. University only possesses two bays of swings, when in fact, it is supposed to posses a child composite structure as well. This discrepancy could have resulted in a poor interpretation of the results of the audit, as initially, the audit was not prepared to consider the issue of an incomplete playground. Therefore, it was determined that the most effective way to overcome this deficiency is to assign any equipment that is supposed to be present, but is not, a score of zero. There fore, as shown later on, if the missing composite structure in University is taken into account as a zero, the overall score of the playground declines to a very low 46%. This ensures that each playgrounds score is an accurate representation of its actual condition.

Table 4.1: Playground Inspection Scores

Playground	Score
Green Hill	98.5
Banis	96.5
Vernon Hill	93.5
University	92.7
Duffy	91.8
Burncoat St.	89.6

In order to ensure that the audit can be used to make necessary repairs, there is a column on the audit form for additional comments. Here the auditor can make specific remarks and requests while on site, and can refer these comments to a specific part of the equipment. The purpose of this feature is to ensure that the inspector does not later forget any problems and specifics viewed in the field.

4.1.2 What defines a user-friendly auditing system?

Once our audit forms were complete, they needed to be tested. Beaver Brook playground was selected as the site to perform the beta testing of our audit forms. An inspection of this playground was completed to see first hand how effective and comprehensible our forms were out in the field.

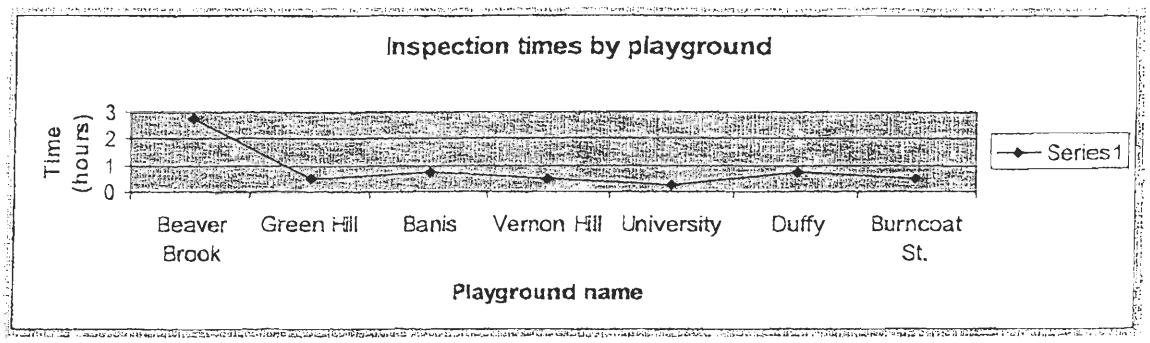
During the field inspection, the inspectors were carefully observed and questioned about the forms. The inspectors indicated that the forms were comprehensive in their coverage of possible standards, as well as simple to use, as checking a yes or no was a simple process. The inspector did indicate however, that the ranking/weighting system was perhaps too subjective. He indicated that while it was necessary to include such a system on the forms, the format left the determination of hazard severity to the individual inspector. As a result, it was at this time that the changes indicated in the previous section were completed to ensure uniformity via a simpler prioritization system. Despite this minor setback, it was found that the audit forms were fairly user-friendly and complete.

4.1.3 What is an efficient auditing system?

While the audit forms were deemed complete, one issue that remained unresolved was that of efficiency. It had been planned that this aspect would be evaluated during the initial beta test of the system, however the test was performed in seasonally cold weather. This resulted in the inability to judge the efficiency of the form as far as the time necessary to complete it, as the inspector frequently sought shelter from the cold; an accurate determination of the time taken was not possible. However, the time of two

hours and forty-five minutes was recorded and compared to the series of inspections that later occurred.

These later inspections were done on six different playgrounds unseasonably mild weather conditions. The times necessary to complete these inspections can be found in graph 4.1.



Graph 4.1. Comparison of times per playground

As shown by the graph, the six audits that occurred after the beta test all took an average time of just over a half an hour. While it was unseasonably warm during this audits, and that may have played a role, a more likely explanation for the disparity than the weather is the familiarity that the auditor developed with the form. During the beta-test, each standard had to be thoroughly explained to the auditor, and this resulted in a longer audit. As the audits progressed, the auditor became more familiar with the forms, and was able to quickly determine the condition of the standards listed on the form. Also, due to the repeated use of the forms, the auditor memorized certain questions, as he was able to provide answers to the questions on the audit prior to their being read. This also had an effect on the declining times for the audit. Finally, the amount of equipment on each playground play also affected the length of the audit. The more equipment a playground possessed, the longer the audit took.

4.2 How can we construct a playground maintenance system that can be easily updated and is user-friendly?

The Parks Department requested that they be able to store playground data electronically. As detailed in the methodology, this was done by designing and developing a database using Microsoft Access. In order to develop this system, we had to address several questions, the first two of which were "what is an effective database that could be updated easily?" and "what functions would such a system contain?". Again, as noted, we consulted several experts in the field of computer science about this very question, and obtained some very insightful feedback. The first person we contacted was our liaison who simply stated that the system should be able to contain all necessary information on each playground. After some consideration, we decided that this information included the name of the playground, the address of the park in which it is located, the political district of its location, the overall score for each playground as determined by the audit, the surfacing material for the playground, the date of installation, the date of the inspection and all audit materials, and the actual responses to the questions on the audit.

While this was simple in theory, the actual programming behind it was fairly complex, so ensuring the actual functionality of the database required the assistance of the aforementioned computer science specialists. They provided us the necessary guidance and helped us to ensure that all the functions worked. These functions included the ability to sort data by date, playground and overall score. Each of these functions will allow the Parks Department to make informed decisions about the playgrounds, both from a fiscal and a safety standpoint.

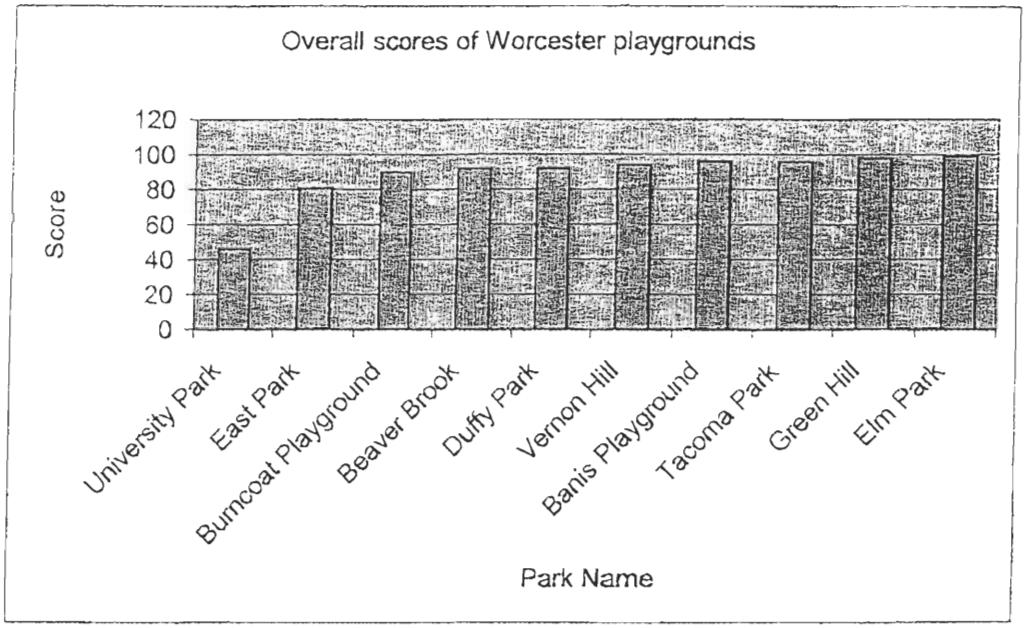
Appendix D is a screen shot of the main form used to input the results of each inspection. As evidenced by this shot, the form is simple and user friendly. This was verified by pre-testing done by Parks personnel who entered the data from preliminary inspections with ease. This final product will allow for easy updating and accessibility of the data for each playground.

4.3 How is uniformity ensured within the system?

The next step was to ensure that each of these systems will be used in a consistent and appropriate manner by all inspectors. The creation of a user's manual, which explains the usage of both the auditing and maintenance system was the solution to ensuring that the designed systems will be used in a consistent and appropriate manner. The purpose of such a document is two fold. First, it ensures that there is an existing record of the process necessary to complete the forms and database should questions arise in the future regarding these issues. Secondly, it allows inspectors hired by the Department at a later date to be trained on the system and it ensures their compliance with the recommendations for its usage. While the current inspectors were involved in the creation of the system, future employees will not have had the interaction and familiarity, and so will need to be trained to use this system. The user's manual will provide a complete overview of the system, and address the major concerns that anyone new to the system might posses. It also ensures that the subjectivity that was so prevalent during the design of the system remains limited to that which is irremovable. This, in turn, guarantees that each playground is audited according to the same standards and weighting system, and therefore each playground stands the same chance of having funds allocated for its repair.

4.4 What is the condition of Worcester's playgrounds

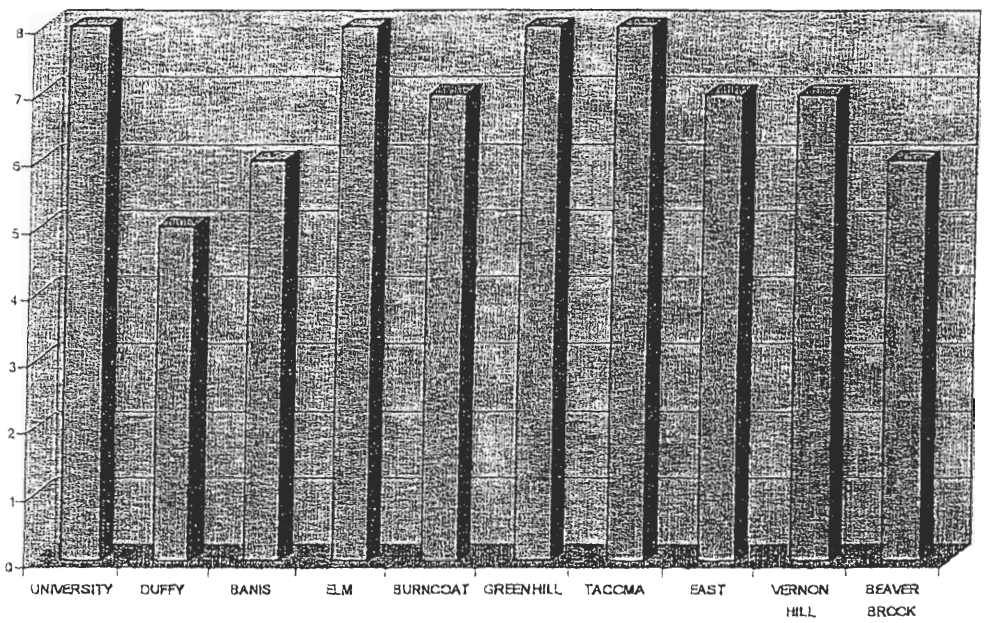
As indicated in the methodology, once the audit forms were completed, an inspection of ten of the playgrounds in Worcester was completed Graph 4.2 shows the results of each of these inspections, including park name and the score it received.



Graph 4.2. the first 10 completed playground inspections scores. 100 is the highest score possible

For a playground to be considered to be in "excellent" shape, it was necessary for it to receive a score 95% or higher. This number was determined during the formation of the weighting system, and is based on the recommendations presented in *Playground Safety is No Accident.* So, as evidenced from this table, the overall condition of these ten playgrounds is acceptable. With the exception of University park, all inspected playgrounds received a score within 15 points of 95. This indicates that while the majority of the playgrounds are in need of some repair, the picture presented of Worcester playgrounds is indicative of a safe play environment.

From the park ranking and score, the next question that needed to be answered was: What causes the most problems within the playgrounds? The surfacing on all of the parks was one of the major points mentioned when dealing with injuries, so it was analyzed further. The following graph shows the list of ten parks along the X-axis, and the bars represent the score each one got out of a possible eight points.

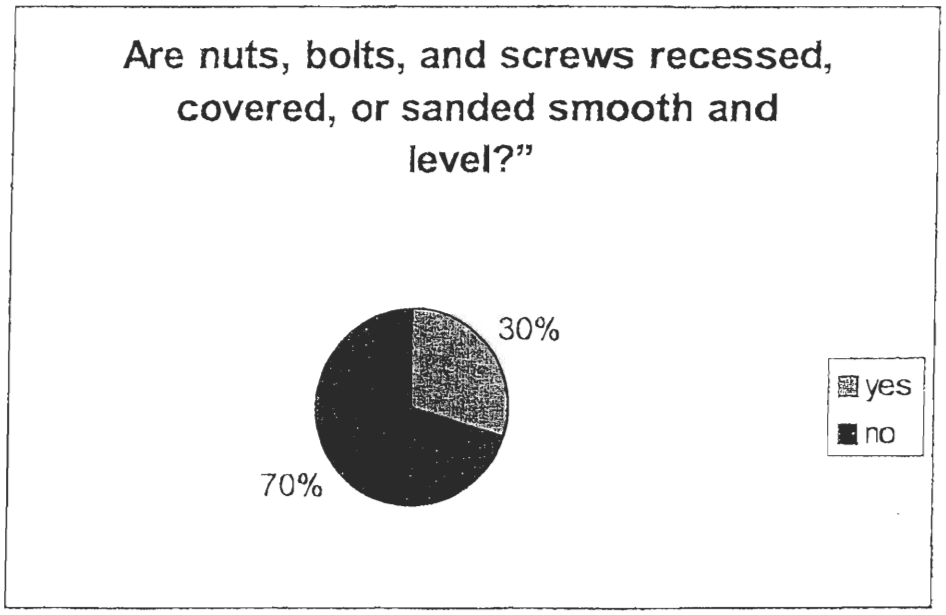


Graph 4.3: Surfacing Scores

Every park had acceptable surfacing underneath all of the equipment with the exception of Duffy Field, which had grass underneath the swings. The unacceptable surfacing is why the score is so low relative to the other nine. The largest problem that was uniform throughout all of the playgrounds was that the surfacing needed to be re-raked and leveled. This problem was most evident underneath swing sets because children frequently move the mulch or sand with their feet while swinging. Other than

re-raking, all of the surfacing on the ten parks was acceptable and met all critical height criteria.

The most prominent problem next to surfacing were protrusion infractions. One of the questions on the audit asks, "Are nuts, bolts, and screws recessed, covered, or sanded smooth and level?" and in many cases, the answer to this was no. At least one piece of equipment in each park failed this part of the audit, and as shown in graph 4.3, seventy percent of all equipment audited possessed a no answer, making it the most prevalent condition in Worcester's playgrounds.



Graph 4.3. Percentage of playground equipment complying with protrusion standards

Chapter 5: Conclusions and Recommendations

In conclusion we believe that we have successfully accomplished our goal, to implement an effective playground safety and maintenance system for the individual playgrounds of the city of Worcester, which can be accessed easily and updated frequently. Through extensive research, beta testing and interviews with the Parks Department personnel, we conclude that the auditing system designed will efficiently allow the Worcester Department of Parks, Recreation and Cemeteries, to conduct complete and precise inspections of all 53 of its public playgrounds. These forms were created as both Microsoft Word and Excel files and will be able to be easily updated over time. The Microsoft Access database designed will allow the Parks Department to store all of its playground related data in an efficient manner. This information can then be sorted and queried in various ways, and viewed by the public. To ensure that these systems be used uniformly throughout the years, an informative user's manual was constructed. This manual was based on our personal input, as well as information gathered through interviews with the current certified Parks Department playground inspectors, who have been actively involved with our project and exposed to our auditing and database systems. This manual provides an easy break down on how to properly use the systems designed, to inform future employees on the proper methods of using the systems.

5.1 Recommendations

As aforementioned, the overall condition of Worcester's playgrounds, as indicated by the first ten inspections, is shown to be acceptable, but with the need for repairs in specific areas such as surfacing and protrusions such as bolts. Therefore we recommend that the results of these audits be used to allocate funds to first those parks in the highest state of disrepair, and then to addressing those problems that are a concern in all parks.

Also, to strengthen the systems we have implemented we recommend the following be established:

- Biannual audits
- a playground accident reporting system
- a public relations campaign to increase awareness of playground safety.

These three tasks will help to make the public playgrounds of Worcester an even safer place for children.

We recommend that audits be carried out on a routine basis, twice a year. We believe the best time to conduct these audits would first be in early spring, (e.g., in April) and then again six months, in September). By conducting audits in early spring it can be ensured that the playgrounds have not been damaged from winter storms, and that they are safe for the upcoming summer. In September, the auditors can look for damage caused by excessive play that could have occurred during the warm days of summer. April and September also offer somewhat fair weather conditions that will make the inspections more efficient as evidenced in Chapter 4.

Children do not always play on equipment as intended. A piece of equipment that complies with safety standards may still be a source of injury. An accident reporting system could help the inspectors address this concern. By setting up an accident reporting system, by either contacting the local police department or the hospital responsible for taking ambulance calls, an inspector will be able to identify equipment that may be causing injuries. The inspector will then be able to give any problem-causing equipment a "closer look" when out on inspection, or if numerous calls come in about a specific piece of equipment the equipment could be eliminated.

An informed public is a more watchful public. By informing the public about importance of playground safety, they are more likely to watch for hazards on the playground and may be able to prevent injuries from occurring. As a result the initiative to inform the public is one that can only benefit those responsible for playground safety. As mentioned in Chapter 2, there are numerous ways to accomplish this task. From recognizing "National Playground Safety Day," to hosting informative events for parent and children alike, the public is an ally against playground injuries that should be fully utilized.

5.2 Future Hopes

By designing this playground safety auditing and maintenance system, the goal of an overall reduction in injuries occurring on the public playgrounds of Worcester becomes attainable. The City of Worcester also benefits from this project in regards to its public image, as it becomes an example for playground safety that will hopefully be recognized and adopted by the surrounding communities and possibly beyond. As stated

before, there are no federal guidelines in place for playground inspections. So by taking the initiative to develop their own guidelines, the city of Worcester sets a precedent that perhaps will be followed by the eventual establishment of national standards. These standards will then ensure that all playgrounds will require these audits, not just those in the city, and that, in turn, will make playgrounds safer places for all children.

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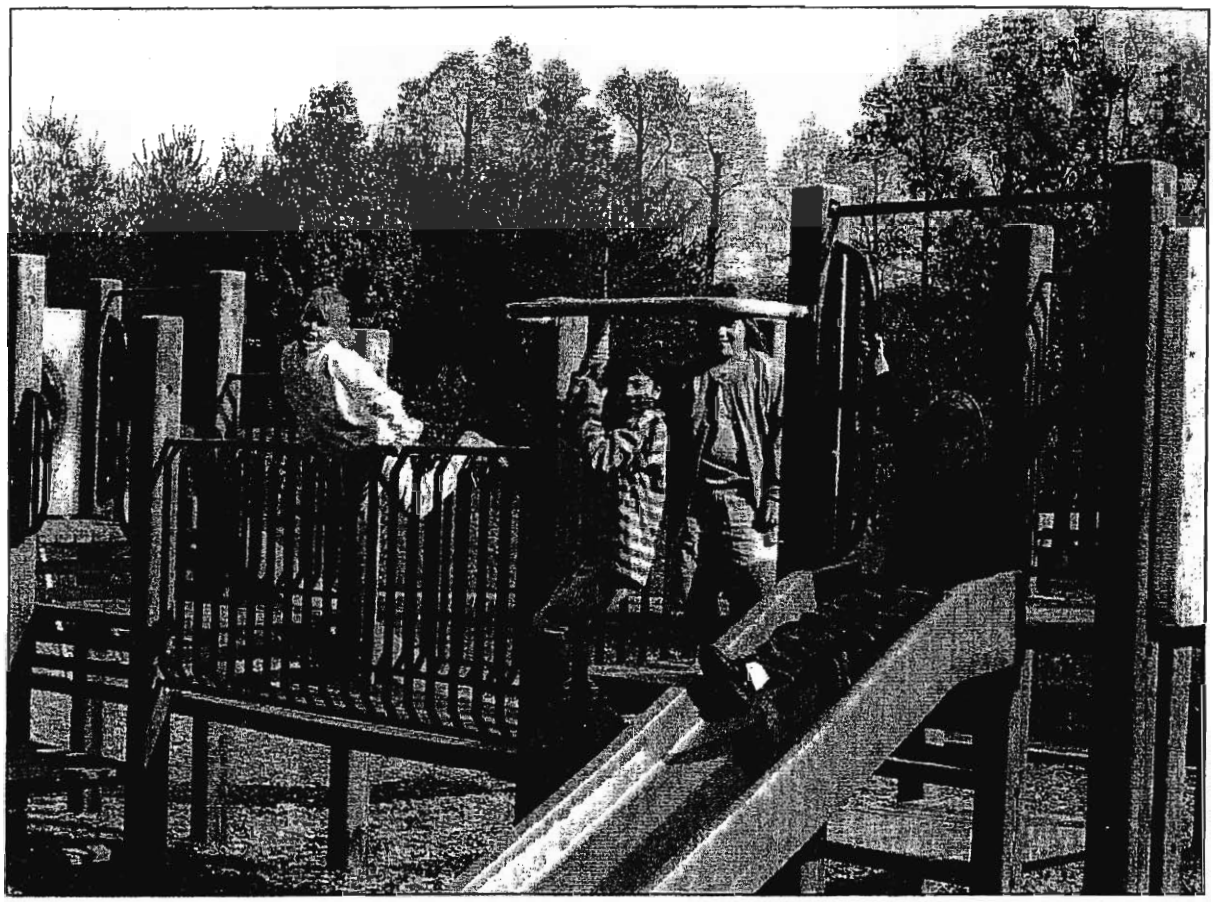
Appendix A

Listing of Safety Standards

Handbook for Public Playground Safety



U.S. Consumer Product
Safety Commission
Washington, DC 20207

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Table of Contents

1. INTRODUCTION

1.1 Scope

This handbook presents safety information for public playground equipment in the form of guidelines. Publication of the handbook is expected to promote greater safety awareness among those who purchase, install, and maintain public playground equipment.

"Public" playground equipment refers to equipment for use in the play areas of parks, schools, child care facilities, institutions, multiple family dwellings, restaurants, resorts and recreational developments, and other areas of public use. The recommendations in this handbook address the typical user ages 2 through 12 years.

The handbook is intended for use by parks and recreation personnel, school officials, equipment purchasers and installers, and any other members of the general public concerned with public playground safety such as parents and school groups.

The guidelines are not intended for amusement park equipment, equipment normally intended for sports use, soft contained play equipment, equipment found in water play facilities, or home playground equipment. The guidelines also do not apply to fitness trail exercise equipment intended for adult use, provided that these are not located on or adjacent to a children's playground. Equipment components intended solely for the disabled and modified to accommodate such users are also not covered by these guidelines.

Because many factors may affect playground safety, the U.S. Consumer Product Safety Commission (CPSC) believes that guidelines, rather than a mandatory rule, are appropriate. The guidelines are not a mandatory standard. Therefore, the Commission is not endorsing these guidelines as the sole method to minimize injuries associated with playground equipment. The Commission believes, however, that the recommendations in this handbook will contribute to greater equipment safety.

1.2 Background

These guidelines were first published in a two-volume Handbook for Public Playground Safety in 1981. These were superseded by a single-volume handbook in 1991 which was republished in 1994 with some minor revisions. The safety guidelines in the 1991 handbook were based on recommendations provided to the CPSC by COMSIS Corporation in a March 1990, report [1]*. Falls and head injuries are the leading hazards associated with public playground equipment.

This handbook contains revisions that are based in part on a staff review of recent changes to a voluntary standard for public playground equipment, ASTM F1487 that was first published in 1993 and revised in 1995 [2]. ASTM F1487 contains more technical requirements than this handbook and is primarily intended for use by equipment manufacturers, architects, designers, and any others requiring more technical information. A voluntary standard for home playground equipment, ASTM F1148 [3], contains a number of provisions that are similar to the recommendations in this handbook.

The revisions also are based on inputs from interested parties received during and after a playground safety roundtable meeting held at CPSC in October 1996, and letters received in response to a May 1997 request for comments on the proposed revisions.

Two significant changes in this revision are the criteria used to evaluate certain protrusions to minimize clothing entanglement and a reduction in the use zone (formerly fall zone) around certain pieces of playground equipment. Other changes to the 1994 version of the handbook clarify certain recommendations and reduce conflicts with the ASTM voluntary standard. Noteworthy changes are listed in Appendix E.

1.3 General Discussion

The safety of each individual piece of playground equipment as well as the layout of the entire play area should be considered when evaluating a playground for safety. The installation and maintenance of protective surfacing under and around all equipment is crucial.

Because all playgrounds present some challenge and because children can be expected to use equipment in unintended and unanticipated ways, adult supervision is recommended. The handbook provides some guidance on supervisory practices that adults should follow. Appropriate equipment design, layout, and

Numbers in brackets indicate references that are listed at the end of this handbook.

maintenance, as discussed in this handbook, are essential for increasing public playground safety.

A playground should allow children to develop progressively and test their skills by providing a series of graduated challenges. The challenges presented should be appropriate for age-related abilities and should be ones that children can perceive and choose to undertake.

Preschool and school-age children differ dramatically, not only in physical size and ability, but also in their cognitive and social skills. Therefore, age-appropriate playground designs should accommodate these differences with regard to the type, scale, and the layout of equipment. Recommendations throughout this handbook address the different needs of preschool and school-age children: "preschool-age" refers to children 2 through 5 years, and "school-age" refers to children 5 through 12 years. The overlap between these groups is realistic in terms of playground equipment use, and provides for a margin of safety.

The recommendations in this handbook are based on the assumption that the minimum user will be a 2-year-old child. Therefore, playground equipment fabricated in accordance with these recommendations may not be appropriate for children under 2 years of age.

Playground designers, installers and operators should be aware that The Americans with Disabilities Act of 1990 (ADA) prohibits discrimination on the basis of disability in employment, public services, transportation, public accommodations (including many services operated by private entities) and telecommunications. Title III of the legislation includes within the definition of public accommodation: "a park, zoo, amusement park, or other place of recreation; a school, including nursery schools; a day care center; and a gymnasium, health spa, or other places of exercise or recreation." Specific Federal requirements for accessibility to playgrounds by the disabled are expected to be published in the future. These requirements could necessitate changes to existing playgrounds as well as when new playgrounds are planned or existing playgrounds refurbished.

2. PLAYGROUND INJURIES

The U. S. Consumer Product Safety Commission has long recognized the potential hazards that exist with the use of public playground equipment. A Commission study [4] of playground equipment-related injuries treated in U.S. hospital emergency rooms indicated that the majority resulted from falls from equipment. These were primarily falls to the ground surface below the equipment rather than falls from one part of the equipment to another part.

Other hazard patterns involved impact by swings and other moving equipment, colliding with stationary equipment, and contact with such hazards as protrusions, pinch points, sharp edges, hot surfaces, and playground debris. Fatal injuries reported to the Commission involved falls, entanglement of clothing or other items on equipment such as slides, entanglement in ropes tied to or caught on equipment, head entrapment in openings, impact from equipment tipover or structural failure, and impact by moving swings.

The recommendations in this handbook have been developed to address the hazards that resulted in these playground-related injuries and deaths. The recommendations include those which address the potential for falls from and impact with equipment, the need for protective surfacing under and around equipment, openings with the potential for head entrapment, the scale of equipment and other design features related to user age, layout of equipment on a playground, installation and maintenance procedures, and general hazards presented by protrusions, sharp edges, and pinch points.

3. DEFINITIONS

Composite Structure — Two or more play structures, attached or directly adjacent, to create one integral unit that provides more than one play activity (e.g., combination climber, slide, and horizontal ladder).

Critical Height — The fall height below which a life-threatening head injury would not be expected to occur.

Designated Play Surface — Any elevated surface for standing, walking, sitting or climbing, or a flat surface greater than 2 inches wide having an angle less than 30° from horizontal.

Embankment Slide — A slide that follows the contour of the ground and at no point is the bottom of the chute greater than 12 inches above the surrounding ground.

Entrapment — Any condition that impedes withdrawal of a body or body part that has penetrated an opening.

Footing — A means for anchoring playground equipment to the ground.

Guardrail — An enclosing device around an elevated platform that is intended to prevent inadvertent falls from the platform.

Infill — Material(s) used in a protective barrier to prevent a user from passing through the barrier e.g., vertical bars, lattice, solid panel, etc.

Loose-Fill Surfacing Material — A material used for protective surfacing in the use zone that consists of loose particles such as sand, gravel, wood fibers, or shredded rubber.

Non-Rigid Component — A component of playground equipment that significantly deforms or deflects during the normal use of the equipment.

Preschool-Age Children — Children 2 years of age through 5 years of age.

Protective Barrier — An enclosing device around an elevated platform that is intended to prevent both inadvertent and deliberate attempts to pass through the barrier.

Protective Surfacing — Surfacing material in the use zone that conforms to the recommendations in Section 4.5 of this handbook.

Roller Slide — A slide that has a chute consisting of a series of individual rollers over which the user travels.

School-Age Children — Children 5 years of age through 12 years of age.

Slide Chute — The inclined sliding surface of a slide.

Stationary play equipment — Any play structure which does not move or does not have components that move during its intended use.

Tot Swing — A swing generally appropriate for children under 4 years of age that provides support on all sides of the occupant.

Tube Slide — A slide in which the chute consists of a totally enclosed tube or tunnel.

Unitary Surfacing Material — A manufactured material used for protective surfacing in the use zone that may be rubber tiles, mats or a combination of rubber-like materials held in place by a binder that may be poured in place at the playground site and cures to form a unitary shock absorbing surface.

Upper Body Equipment — Equipment designed to support a child by the hands only (e.g., horizontal ladder, overhead swinging rings).

Use Zone — The surface under and around a piece of equipment onto which a child falling from or exiting from the equipment would be expected to land.

4. SURFACING

The surface under and around playground equipment can be a major factor in determining the injury-causing potential of a fall. A fall onto a shock absorbing surface is less likely to cause a serious injury than a fall onto a hard surface. Because head impact injuries from a fall have the potential for being life threatening, the more shock absorbing a surface can be made, the greater is the likelihood of reducing severe injuries. However, it should be recognized that some injuries from falls will occur no matter what playground surfacing material is used.

4.1 Determining Shock Absorbency of a Surfacing Material

No data are available to predict precisely the threshold tolerance of the human head to an impact injury. However, biomedical researchers have established two methods that may be used to determine when such an injury may be life threatening.

One method holds that if the peak deceleration of the head during impact does not exceed 200 times the acceleration due to gravity (200 G's), a life threatening head injury is not likely to occur. The second method holds that both the deceleration of the head during impact and the time duration over which the head decelerates to a halt are significant in assessing head impact injury. This latter method uses a mathematical

formula to derive a value known as Head Injury Criteria (HIC) [5]. Head impact injuries are not believed to be life threatening if the HIC does not exceed a value of 1,000.

The most widely used test method for evaluating the shock absorbing properties of a playground surfacing material is to drop an instrumented metal headform onto a sample of the material and record the acceleration/time pulse during the impact. Test methods are described in an ASTM Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment, ASTM F1292 [6].

4.2 Critical Height

This is a term originating from Europe and is used to describe the shock absorbing performance of a surfacing material. As used in this publication, the Critical Height for a surfacing material is defined as the maximum height from which the instrumented metal headform, upon impact, yields both a peak deceleration of no more than 200 G's and a HIC of no more than 1,000 when tested in accordance with the procedure described in ASTM F1292. Therefore, the Critical Height of a surfacing material can be considered as an approximation of the fall height below which a life-threatening head injury would not be expected to occur.

The surfacing material used under and around a particular piece of playground equipment should have a Critical Height value of at least the height of the highest designated play surface on the equipment. This height is the fall height for the equipment.

4.3 Fall Heights for Equipment

Recommendations for the fall heights for various pieces of playground equipment are as follows.

Climbers and Horizontal Ladders — The fall height is the maximum height of the structure.

Elevated Platforms Including Slide Platforms — The fall height is the height of the platform.

Merry-Go-Rounds — The fall height is the height above the ground of any part at the perimeter on which a child may sit or stand.

See-Saws — The fall height is the maximum height attainable by any part of the see-saw.

Spring Rockers — The fall height is the maximum height above the ground of the seat or designated play surface.

Swings — Since children may fall from a swing seat at its maximum attainable angle (assumed to be 90° from the "at rest" position), the fall height of a swing structure is the height of the pivot point where the swing's suspending elements connect to the supporting structure.

4.4 Equipment to Which Protective Surfacing Recommendations Do Not Apply

Equipment that requires a child to be standing or sitting at ground level during play is not expected to follow the recommendations for resilient surfacing. Examples of such equipment are sand boxes, activity walls, play houses or any other equipment that has no elevated designated playing surface.

4.5 Acceptability of Various Surfacing Materials

Hard surfacing materials, such as asphalt or concrete, are unsuitable for use under and around playground equipment of any height unless they are required as a base for a shock absorbing unitary material such as a rubber mat. Earth surfaces such as soils and hard packed dirt are also not recommended because they have poor shock absorbing properties. Similarly, grass and turf are not recommended because wear and environmental conditions can reduce their effectiveness in absorbing shock during a fall.

Acceptable playground surfacing materials are available in two basic types, unitary or loose-fill.

Unitary Materials — are generally rubber mats or a combination of rubber-like materials held in place by a binder that may be poured in place at the playground site and then cured to form a unitary shock absorbing surface. Unitary materials are available from a number of different manufacturers, many of whom have a range of materials with differing shock absorbing properties. Persons wishing to install a unitary material as a playground surface should request test data from the manufacturer identifying the Critical Height of the desired material. In addition, site requirements should

TABLE 1 — CRITICAL HEIGHTS (in feet) OF TESTED MATERIALS

MATERIAL	UNCOMPRESSED DEPTH			COMPRESSED DEPTH
	6 inch	9 inch	12 inch	9 inch
Wood Chips*	7	10	11	10
Double Shredded Bark Mulch	6	10	11	7
Engineered Wood Fibers**	6	7	>12	6
Fine Sand	5	5	9	5
Coarse Sand	5	5	6	4
Fine Gravel	6	7	10	6
Medium Gravel	5	5	6	5
Shredded Tires***	10-12	N/A	N/A	N/A

* This product was referred to as Wood Mulch in previous versions of this handbook. The term Wood Chips more accurately describes the product.

** This product was referred to as Uniform Wood Chips in previous versions of this handbook. In the playground industry, the product is more commonly known as Engineered Wood Fibers.

*** This data is from tests conducted by independent testing laboratories on a 6 inch depth of uncompressed shredded tire samples produced by four manufacturers. The tests reported critical heights which varied from 10 feet to greater than 12 feet. It is recommended that persons seeking to install shredded tires as a protective surface request test data from the supplier showing the critical height of the material when it was tested in accordance with ASTM F1292.

be obtained from the manufacturer because, as stated above, some unitary materials require installation over a hard surface while some do not.

Loose-Fill Materials — can also have acceptable shock absorbing properties when installed and maintained at a sufficient depth. These materials include, but are not confined to, sand, gravel, shredded wood products and shredded tires. Loose-fill materials should not be installed over hard surfaces such as asphalt or concrete.

Because loose-fill materials are generally sold for purposes other than playground surfacing, many vendors are unlikely to be able to provide information on the materials' shock absorbing performance. For that reason, CPSC has conducted tests to determine the relative shock absorbing properties of some loose-fill materials commonly used as surfaces under and around playground equipment. Appendix D contains a description of the tested materials. The tests were conducted in accordance with the procedure in the voluntary standard for playground surfacing systems, ASTM F1292. Table 1, above, lists the critical height (expressed in feet) for each of eight materials when tested in an uncompressed state at depths of 6, 9, and 12 inches. The table also reports the critical height when a 9 inch depth of each material was tested in a compressed state.

Table 1 should be read as follows: If, for example, uncompressed wood chips is used at a minimum depth of 6 inches, the Critical Height is 7 feet. If 9 inches of uncompressed wood chips is used, the Critical height is 10 feet. It should be noted that, for some materials, the Critical Height decreases when the material is compressed.

The Critical Heights shown in the above table may be used as a guide in selecting the type and depth of loose-fill materials that will provide the necessary safety for equipment of various heights. There may be other loose-fill materials such as bark nuggets that have shock absorbing properties equivalent to those in the above table. However, CPSC has not conducted any tests on these materials.

The depth of any loose fill material could be reduced during use resulting in different shock-absorbing

properties. For this reason, a margin of safety should be considered in selecting a type and depth of material for a specific use. When loose-fill materials are used, it is recommended that there be a means of containment around the perimeter of the use zone. Also, depending on playground location, weather conditions and frequency of use, frequent maintenance may be necessary to insure adequate depth and to loosen the materials which may have become packed (see additional maintenance discussion in Appendix C).

Installers of playground equipment are encouraged to attach markers to the equipment support posts that indicate the correct level of loose-fill protective surfacing material under and around the equipment. Such markers will assist maintenance workers in determining when replenishment of the material is necessary.

4.6 Other Characteristics of Surfacing Materials

Selection of a surfacing material for a specific location may be governed by the environmental conditions at that location. Appendix C lists some characteristics of surfacing materials that may influence the choice for a particular playground.

5. USE ZONES FOR EQUIPMENT

The use zone is an area under and around the equipment where protective surfacing is required. Other than the equipment itself, the use zone should be free of obstacles that children could run into or fall on top of and thus be injured.

5.1 Recommendations for Use Zones for Different Types of Playground Equipment

5.1.1 Stationary Equipment (excluding slides)

The use zone should extend a minimum of 6 feet in all directions from the perimeter of the equipment.

The use zones of two stationary pieces of playground equipment that are positioned adjacent to one another may overlap if the adjacent designated play surfaces of each structure are no more than 30 inches above the protective surface (i.e., they may be located a minimum distance of 6 feet apart). If adjacent designated play surfaces on either structure exceed a height of 30 inches, the minimum distance between the structures should be 9 feet.

5.1.2 Slides

The use zone in front of the access and to the sides of a slide should extend a minimum of 6 feet from the perimeter of the equipment. Note: This does not apply to embankment slides. However, the following recommendation applies to all slides, including embankment slides.

The use zone in front of the exit of a slide should extend a minimum distance of H + 4 feet where H is the vertical distance from the protective surface at the exit to the highest point of the chute (see Figure 1). However, no matter what the value of H is, the use zone should never be less than 6 feet but does not need to be greater than 14 feet. The use zone should be measured from a point on the slide chute where the slope is less than 5° from the horizontal. If it cannot be determined where the slope is less than 5° from the horizontal, the use zone should be measured from the end of the chute.

The use zone in front of the exit of a slide should never overlap the use zone of any other equipment.

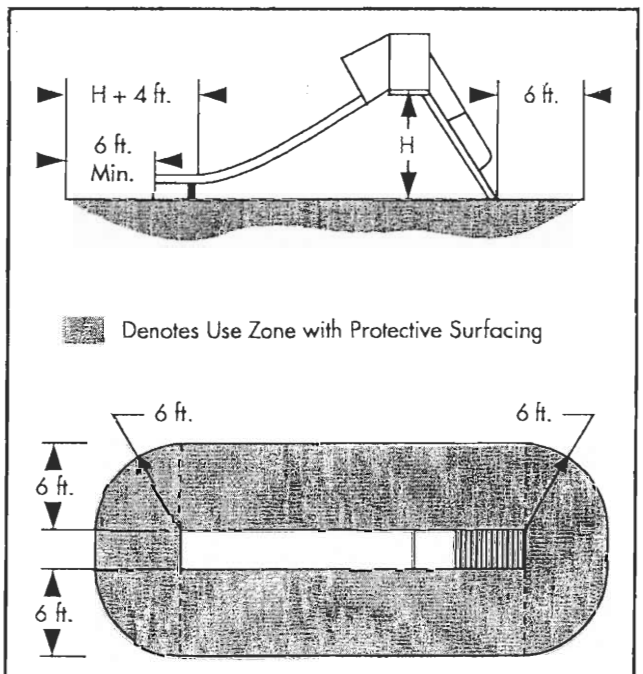


Figure 1. Use Zone for Slides

5.1.3 Single-Axis Swings

Because children may deliberately attempt to exit from a single-axis swing while it is in motion, the use zone in front of and behind the swing should be greater than to the sides of such a swing. It is recommended that the use zone extend to the front and rear of a single-axis swing a minimum distance of twice the height of the pivot point above the surfacing material measured from a point directly beneath the pivot on the supporting structure (see Figure 2). The use zone to the sides of a single-axis swing should follow the general recommendation and extend a minimum of 6 feet from the perimeter of the swing structure in accordance with the general recommendation for use zones. This 6 foot zone may overlap that of an adjacent swing structure.

The use zone to the front and rear of tot swings should extend a minimum distance of twice the height of the pivot point measured from a point directly beneath the pivot to the lowest point on the occupant seating surface when the swing is occupied.

The use zone to the front and rear of single-axis swings should never overlap the use zone of any other equipment.

5.1.4 Multi-Axis Swings

The use zone should extend in any direction from a point directly beneath the pivot point for a minimum distance of 6 feet + the length of the suspending members (see Figure 3). This use zone should never overlap the use zone of any other equipment. In addition, the use zone should extend a minimum of 6 feet from the perimeter of the supporting structure. This 6 foot zone may overlap that of an adjacent swing structure or other playground equipment structure in accordance with the recommendations in Section 5.1.1.

5.1.5 Merry-Go-Rounds

The use zone should extend a minimum of 6 feet beyond the perimeter of the platform. This use zone should never overlap the use zone of any other equipment.

5.1.6 Spring Rockers

The use zone should extend a minimum of 6 feet from the "at rest" perimeter of the equipment.

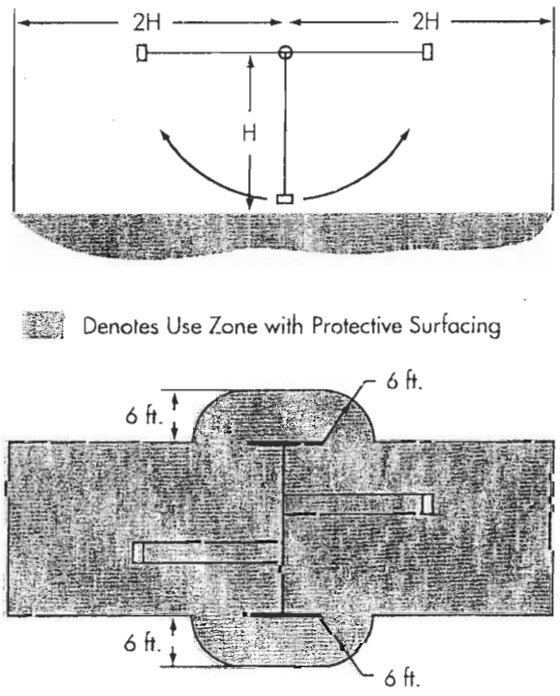


Figure 2. Use Zone for Single-Axis Swings

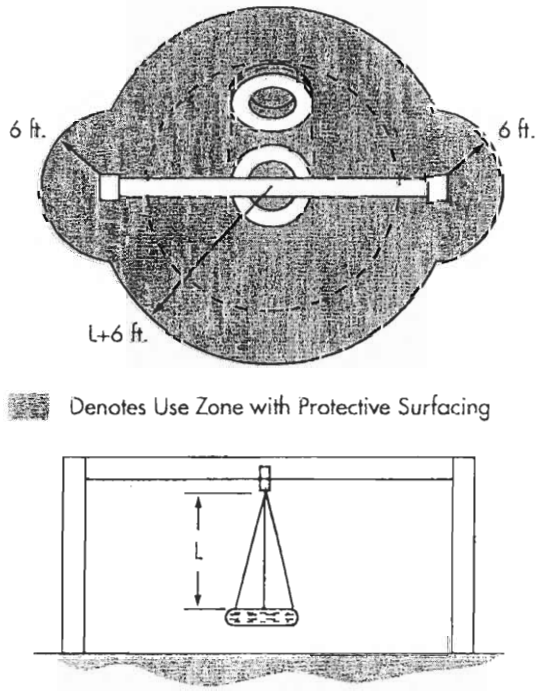


Figure 3. Use Zone for Multi-Axis Swings

5.1.7 Composite Play Structures

The above recommendations for individual pieces of equipment should be used as a guide in establishing the use zone around the perimeter of a composite play structure. Note that in Sections 12.6.2 and 12.6.4 it is recommended that swings not be attached to a composite structure.

In playgrounds where occasional overcrowding is likely, a supplemental circulation area beyond the use zone is recommended. Whether to provide such a supplemental circulation area should be based on the professional judgement of the playground designer and/or owner/operator.

6. LAYOUT AND DESIGN OF PLAYGROUNDS

6.1 Choosing a Site

When planning a new playground, it is important to consider hazards or obstacles to children traveling to or from the playground. A barrier surrounding the playground is recommended if children may inadvertently run into a street. Such a barrier should not prevent observation by supervisors. If fences are used for such barriers, it is recommended that they conform to applicable local building codes.

When selecting a site, consideration should be given to slope and drainage, especially if loose-fill surfacing materials are going to be installed. While a gentle slope may aid in drainage, steep slopes could result in loose fill materials becoming washed away during periods of heavy rain. Such sites may require re-grading.

6.2 Locating Equipment

The playground should be organized into different areas to prevent injuries caused by conflicting activities and children running between activities. Active, physical activities should be separate from more passive or quiet activities. Areas for play equipment, open fields, and sand boxes should be located in different sections of the playground.

In addition, popular, heavy-use pieces of equipment or activities should be dispersed to avoid crowding in any one area. The layout of equipment and activity areas should be without visual barriers so that there are clear sight lines everywhere on the playground to facilitate supervision.

Moving equipment, such as swings and merry-go-rounds, should be located toward a corner, side or edge of the play area while ensuring that the use zones around the equipment, as recommended in Section 5, are maintained. Slide exits should be located in an uncongested area of the playground. Use zones for moving equipment, such as swings and merry-go-rounds, and at slide exits should not overlap the use zone of other equipment, regardless of height.

Composite play structures have become increasingly popular on public playgrounds. Care should be taken to ensure that the play and traffic patterns of children using adjacent components on composite structures are complementary.

6.3 Age Separation of Equipment

It is recommended that for younger children, playgrounds have separate areas with appropriately sized equipment and materials to serve their developmental levels. The following items of playground equipment are not recommended for preschool-age children (2 through 5 years):

- Chain or Cable Walks
- Free Standing Arch Climbers
- Free Standing Climbing Events with Flexible Components
- Fulcrum Seesaws
- Log Rolls
- Long Spiral Slides (more than one turn — 360°)
- Overhead Rings
- Parallel Bars
- Swinging Gates
- Track Rides
- Vertical Sliding Poles

In this handbook, there are several specific recommendations for equipment designed for preschool-age children. These recommendations, together with references to the sections in which they are discussed, are as follows:

- Rung Ladders, Stepladders, Stairways and Ramps (Table 2)

- Handrail Height (10.3.1)
- Guardrails and Protective Barriers (11.3, 11.4, and 11.5)
- Stepped Platforms (11.7)
- Climbers (12.1.2)
- Horizontal Ladders and Overhead Rings (12.1.5)
- Merry-Go-Rounds (12.2)
- Spring Rockers (12.5)
- Single-Axis Swings (12.6.2)
- Tot Swings (12.6.3)

The intended user group should be obvious from the design and scale of equipment. Some playgrounds, often referred to as "tot lots," are designed only for preschool-age children, so separation is not an issue.

In playgrounds intended to serve children of all ages the layout of pathways and the landscaping of the playground should show the distinct areas for the different age groups. The areas should be separated at least by a buffer zone, which could be an area with shrubs or benches. Signs posted in the playground area can be used to give some guidance to adults as to the age appropriateness of the equipment.

6.4 Supervision

Playgrounds that are designed, installed and maintained in accordance with safety guidelines and standards can still present hazards to children in the absence of adequate supervision.

Depending on the location and nature of the playground, the supervisors may be paid professionals (full-time park or school/child care facility staff), paid seasonal workers (college or high school students), volunteers (PTA members), or the parents of the children playing in the playground. The quality of the supervision depends on the quality of the supervisor's knowledge of safe play behavior. Therefore, supervisors should understand the basics of playground safety.

Playground supervisors should be aware that not all playground equipment is appropriate for all children who may use the playground. Supervisors should look for posted signs indicating the appropriate age of the users and direct children to equipment appropriate for their age. Supervisors may also use the information in Section 6.3 of this handbook to determine the suitability of the equipment for the children they are supervising.

It is important to recognize that preschool-age children require more attentive supervision on playgrounds than older children.

7. INSTALLATION AND MAINTENANCE OF EQUIPMENT

7.1 Assembly and Installation

Proper assembly and installation of playground equipment are crucial for structural integrity, stability, and overall safety. The people who assemble and install playground equipment should not deviate from the manufacturer's instructions. After assembly and before its first use, equipment should be thoroughly inspected by a person qualified to inspect playgrounds for safety.

The manufacturer's assembly and installation instructions, and all other materials collected concerning the equipment, should be kept in a permanent file.

7.1.1 Stability

When properly installed as directed by the manufacturer's instructions and specifications, equipment should withstand the maximum anticipated forces generated by active use which might cause it to overturn, tip, slide, or move in any way. Secure anchoring is a key factor to stable installation, and because the required footing sizes and depths may vary according to equipment type, the anchoring process should be completed in strict accordance with the manufacturer's specifications.

7.2 Maintenance

Inadequate maintenance of equipment has resulted in injuries on playgrounds. Because the safety of playground equipment and its suitability for use depend on good inspection and maintenance, the manufacturer's maintenance instructions and recommended inspection schedules should be strictly followed.

A comprehensive maintenance program should be developed for each playground. All equipment should be inspected frequently for any potential hazards, for corrosion or deterioration from rot, insects, or weathering. The playground area should also be checked frequently for broken glass or other dangerous debris. Loose-fill surfacing materials should be inspected to

insure they have not become displaced or compacted in high traffic areas such as under swings and at slide exits. Any damage or hazards detected during inspections should be repaired immediately in accordance with the manufacturer's instructions for repair and replacement of parts.

For each piece of equipment, the frequency of thorough inspections will depend on the type of equipment, the amount of use, and the local climate. Based on the manufacturer's recommendations regarding maintenance schedules for each piece of equipment, a maintenance schedule for the entire playground can be created. The detailed inspections should give special attention to moving parts and other components which can be expected to wear. Inspections should be carried out in a systematic manner by trained personnel.

One possible procedure is the use of checklists. Some manufacturers supply checklists for general or detailed inspections with their maintenance instructions. These can be used to ensure that inspections are in compliance with the manufacturer's specifications. Inspections alone do not constitute a comprehensive maintenance program. All hazards or defects identified during inspections should be repaired promptly. All repairs and replacements of equipment parts should be completed in accordance with the manufacturer's instructions. A general checklist that may be used as a guide for frequent routine inspections of public playgrounds is included at Appendix A. This is intended to address only general maintenance concerns. It does not provide a complete safety evaluation of a specific equipment design and layout. For example, it does not address the risk of falls from equipment, moving impact incidents, or head entrapment. Therefore, the use of this checklist is only for general maintenance purposes. The detailed design recommendations contained in this handbook can be used to evaluate the safety of each piece of equipment and the playground as a whole.

Records of all maintenance inspections and repairs should be retained, including the manufacturer's maintenance instructions and any checklists used. When an inspection is performed, the person performing it should sign and date whatever form is used. A record of any accident and injury reported to have occurred on the playground should also be retained. This will help identify potential hazards or dangerous design features that should be corrected.

8. MATERIALS OF MANUFACTURE AND CONSTRUCTION

8.1 Durability and Finish

Purchasers should be sure that the equipment is manufactured and constructed only of materials that have a demonstrated record of durability in the playground or similar outdoor setting. Any new materials should be documented or tested accordingly for durability by the playground equipment manufacturer.

A major concern for playground equipment materials is corrosion or deterioration. Metals should be painted, galvanized, or otherwise treated to prevent rust.

All paints and other similar finishes must meet the current CPSC regulation for lead in paint [**7**] (0.06% [600 ppm] maximum lead by dry weight). The manufacturer should ensure that, as a result of contact with playground equipment, the users cannot ingest, inhale, or absorb potentially hazardous amounts of preservative chemicals or other treatments applied to the equipment. Purchasers and installers of playground equipment should obtain documentation from the manufacturer that the preservatives or other treatments that have been used do not present a health hazard to the users.

Testing by CPSC and various state and local agencies revealed that some older playground equipment in schools, parks, and communities across the U.S. has leaded paint that over time has deteriorated. When playground equipment paint deteriorates, the resulting chips and dust may be ingested by young children who regularly touch the equipment while playing and then transfer the paint chips or dust from their hands to their mouths. The amount of paint that may be ingested can contribute to a hazardous and unnecessarily high lead exposure.

A strategy for identifying and controlling leaded paint on playground equipment is available from CPSC. A case-by-case approach is recommended since there are many factors to consider when developing a hazard assessment and plans for appropriate controls. Playground managers should consult an October 1996 report, CPSC Staff Recommendations for Identifying and Controlling Lead Paint on Public Playground Equipment [**8**].

Wood should either be naturally rot and insect-resistant or treated to avoid such deterioration. The most common wood treatments used in playground equipment are the inorganic arsenicals. Chromated copper arsenate (CCA) is acceptable for use as a treatment of playground equipment wood, if the dislodgeable arsenic (arsenic that might be removable from the wood surface by skin contact or wiping with testing materials) on the surface of the wood is minimized. Inorganic arsenicals should be applied by the manufacturer or wood preserver in accordance with the specifications of the American Wood Preservers Association C17 standard. This standard states that the treated wood should be visibly free of residues which may contain high levels of arsenic (the greenish coloration of CCA treated wood is acceptable). Wood preservers and playground equipment manufacturers should practice technologies and procedures that minimize the level of dislodgeable arsenic. CPSC has found that technology and practices exist to treat playground equipment wood with CCA so that dislodgeable arsenic is below detectable levels [**9**].

Installers, builders, and consumers who perform woodworking operations such as sanding, sawing, or sawdust disposal on pressure treated wood should read the consumer information sheet often available at the point of sale [**10**]. The sheet contains important health precautions and disposal information. Creosote, pentachlorophenol, and tributyl tin oxide are too toxic or irritating and should not be used as preservatives for playground equipment wood. Pesticide-containing finishes should also not be used. Other preservatives that have low toxicity and may be suitable for playground equipment wood are copper or zinc naphthenates, and borates.

8.2 Hardware

When installed and tightened in accordance with the manufacturer's instructions, all fasteners, connectors and covering devices should not loosen or be removable without the use of tools. Lock washers, self-locking nuts, or other locking means should be provided for all nuts and bolts to protect them from detachment. Hardware in moving joints should also be secured against unintentional or unauthorized loosening. In addition, all fasteners should be corrosion resistant and be selected to minimize corrosion of the materials they connect. Bearings used in moving joints should be easy to lubricate or be self-lubricating. All hooks, including S-hooks, should be closed (see also Section 12.6.1). A hook is considered closed if there is no gap or space greater than 0.04 inches. It is appropriate to measure this gap with a feeler gauge but, in the absence of such a gauge, the gap should not admit a dime.

8.3 Metal Surfaces

To avoid the risk of contact burn injury, bare or painted metal surfaces on platforms and slide beds should be avoided unless they can be located out of direct sun. Alternatively, platforms may be wood, plastic or vinyl coated metal and slide beds may be plastic (see also Slides in Section 12.4.4).

9. GENERAL HAZARDS

There are a variety of general hazards common to many types of playground equipment. The guidelines in this section apply to all elements of the playground.

9.1 Sharp Points, Corners, and Edges

There should be no sharp points, corners, or edges on any components of playground equipment that could cut or puncture children's skin. Frequent inspections are important to prevent injuries caused by sharp points, corners, or edges that could develop as a result of wear and tear on the equipment. The exposed open ends of all tubing not resting on the ground or otherwise covered should be covered by caps or plugs that cannot be removed without the use of tools.

Wood parts should be smooth and free from splinters. All corners, metal and wood, should be rounded. All metal edges should be rolled or have rounded capping. There should be no sharp edges on slides. Metal edges on the exit end and the sides along a slide bed can result in serious lacerations if protective measures are not taken (see also Section 12.4.5).

9.2 Protrusions and Projections

⚠ **WARNING:** Children have died when hood or neck drawstrings on their jackets or sweatshirts caught on slides or other playground equipment. Parents are advised to remove hood and neck drawstrings from clothing to prevent entanglement and strangulation.

Protrusions or projections on playground equipment should not be capable of entangling children's clothing, because such entanglement can cause death by strangulation. Particular attention should be given to avoid protrusions or projections on slides to minimize the risk of entanglement with clothing. Jackets and sweatshirts with hoods and/or drawstrings have been involved in such entanglement/strangulation incidents. Jewelry, such as necklaces and rings, has also resulted in injuries from entanglement. The diameter of a protrusion should not increase in the direction away from the surrounding surface towards the exposed end (see Figure 4).

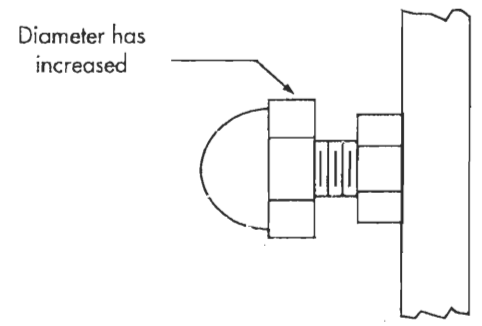


Figure 4. Protrusion Increases in Diameter From Plane of Initial Surface

When tested in accordance with the procedure in Paragraph 9.2.1, no protrusion should extend beyond the face of any of the three gauges having dimensions shown in Figure 5. These gauges may be purchased from the National Recreation and Park Association (NRPA) [**12**].

9.2.1 Protrusion Test Procedure

Successively place each gauge (see Figure 5) over any protrusion or projection and determine if it projects beyond the face of the gauge (see Figure 6).

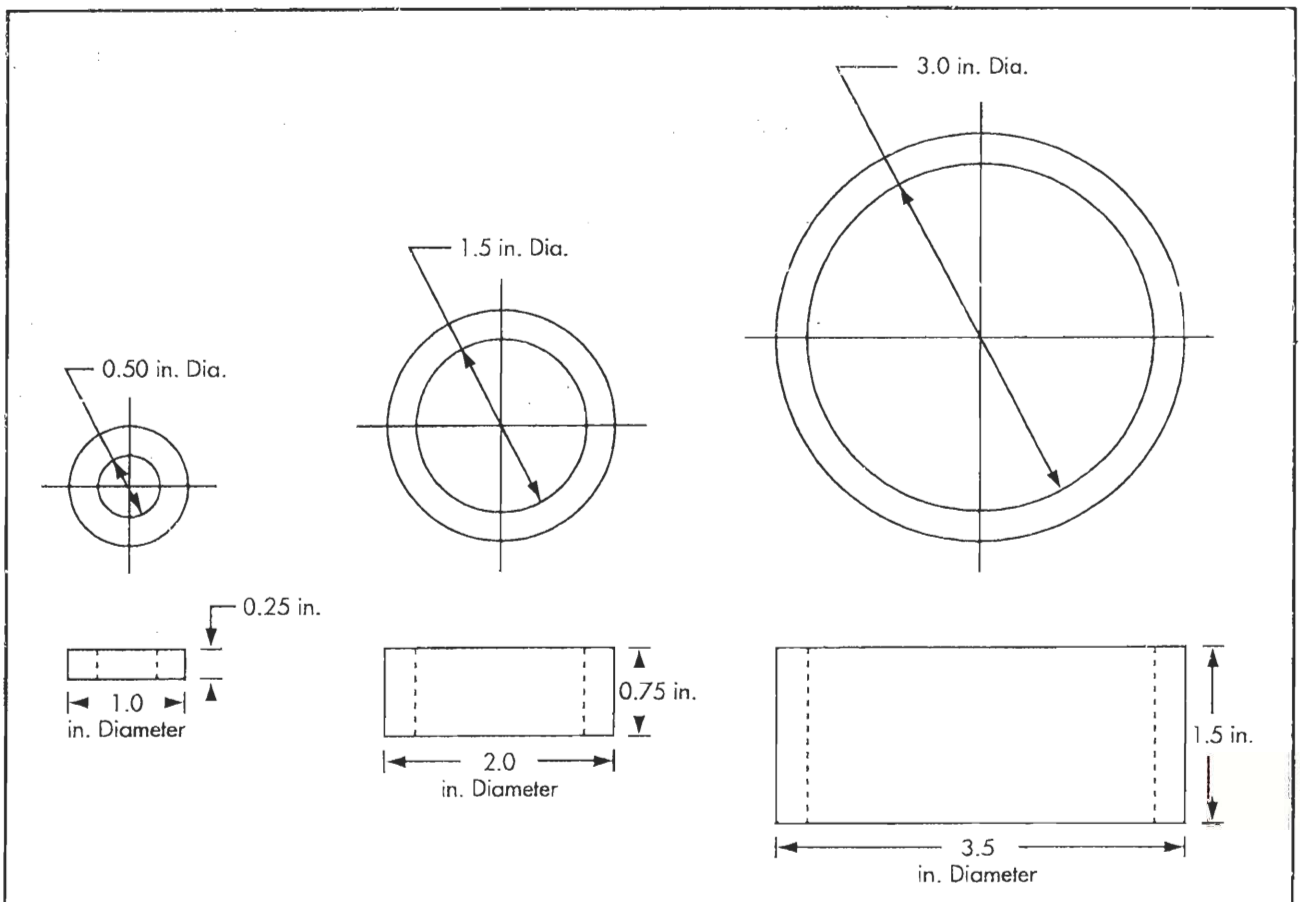


Figure 5. Protrusion Test Gauges

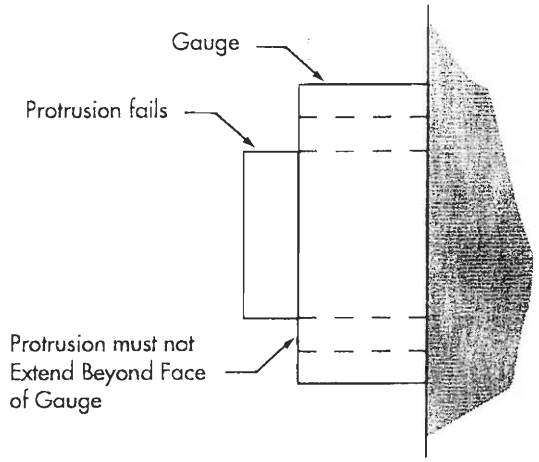


Figure 6. Protrusion Test

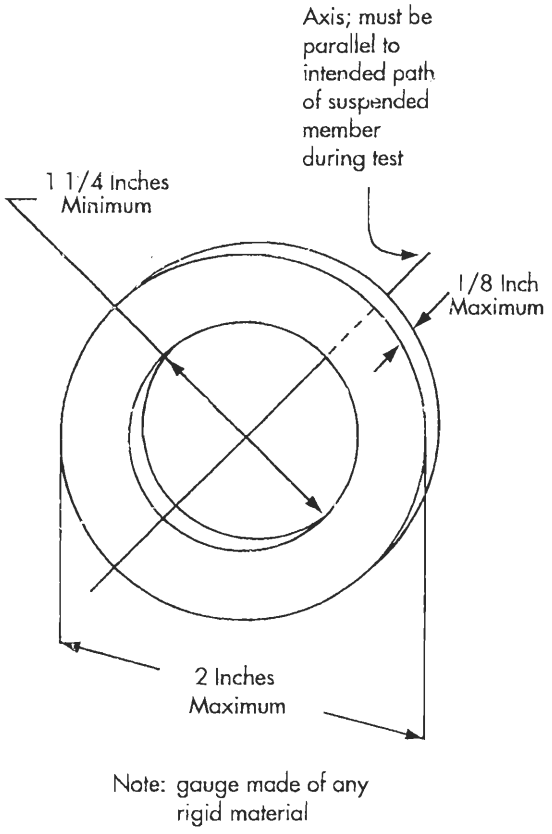


Figure 7. Protrusion Test Gauge for Suspended Swing Assemblies

9.3 Protrusions on Suspended Members of Swing Assemblies

Because protrusions on swings can be extremely hazardous, given the potential for impact incidents, a special test gauge (see Figure 7) and procedure are recommended. No bolts or components in the potential impact region on suspended members should protrude through the hole beyond the face of the specified gauge, when tested in accordance with the following method.

Conduct the test with the suspended member in its rest position. Place the gauge over any protrusion on the front or rear surface of the suspended member such that the axis of the hole in the gauge is parallel to both the intended path of the suspended member and a horizontal plane. Visually determine if the protrusion penetrates through the hole and beyond the face of the gauge.

9.4 Protrusions that Project Upwards and Protrusions on Slides

To minimize the likelihood of clothing entanglement, protrusions that fit within any one of the three gauges shown in Figure 5 and also have a major axis that projects upwards from a horizontal plane should not have projections perpendicular to the plane of the surrounding surface that are greater than 1/8 inch (see Figure 8). This recommendation also applies to protrusions on slides no matter what their orientation if the protrusions fall within the area depicted in Figure 9. NOTE: The underside of a slide chute is not subject to the protrusion recommendation in this section but is subject to the general recommendations for protrusions in Section 9.2. For a slide chute with a circular cross section, the portion of the underside not subject to the protrusion recommendation in this section is shown in Figure 19.

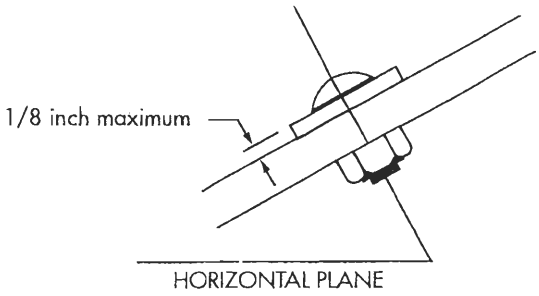


Figure 8. Upwards Facing Protrusion

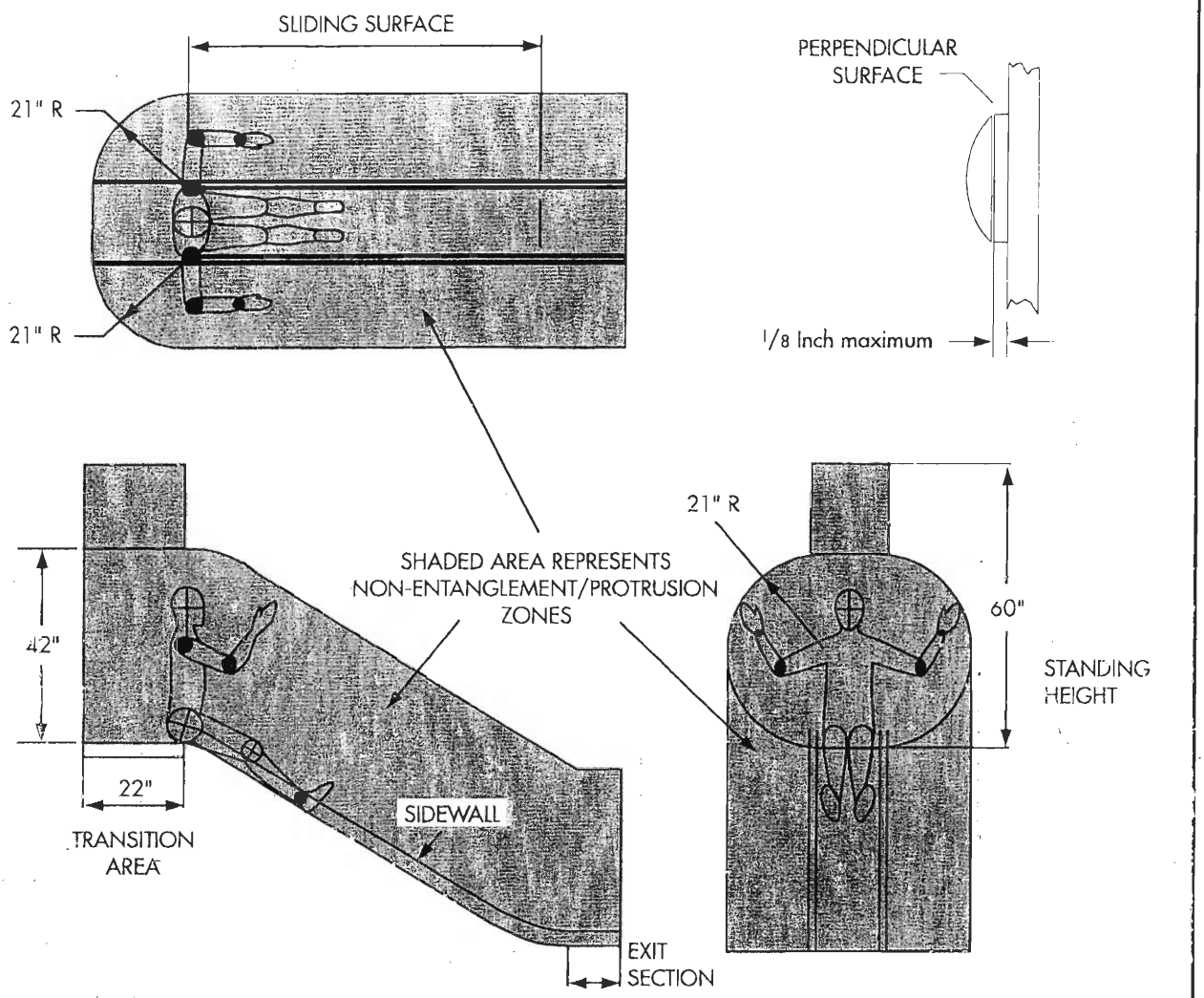


Figure 9. Area on Slides Subject to Protrusion Recommendations in Section 9.4

9.5 Pinch, Crush, and Shearing Points

There should be no accessible pinch, crush, or shearing points on playground equipment that could injure children or catch their clothing. Such points can be caused by components moving relative to each other or to a fixed component when the equipment moves through its anticipated use cycle. To determine if there is a possible pinch, crush or shear point, consider the likelihood of entrapping a body part and the configuration and closing force of the components. Additional information on pinch, crush, and shear points is provided in the recommendations addressing specific pieces of equipment in Section 9.

9.6 Entrapment

9.6.1 Head Entrapment

A component or a group of components should not form openings that could trap a child's head. A child's head may become entrapped if the child enters an opening either feet first or head first. Head entrapment by head-first entry generally occurs when children place their heads through an opening in one orientation, turn their heads to a different orientation, then are unable to withdraw from the opening. Head entrapment by feet-first entry involves children who generally sit or lie down and slide their feet into an opening that is large enough

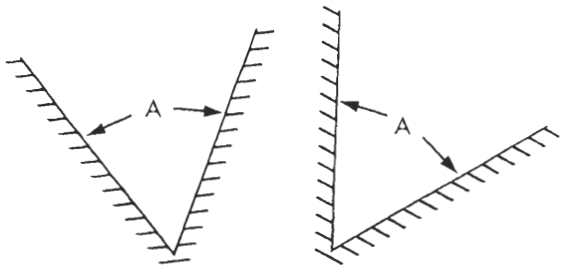
to permit passage of their bodies but is not large enough to permit passage of their heads.

Generally, an opening presents an entrapment hazard if the distance between any interior opposing surfaces is greater than 3.5 inches and less than 9 inches. When one dimension of an opening is within this range, all dimensions of the opening should be considered together to evaluate the possibility of entrapment. This recommendation applies to all completely-bounded openings (see Figure B-1 in Appendix B) except where the ground serves as an opening's lower boundary. Further, it applies to all openings regardless of their height above the ground (see Figure B-1). Even openings that are low enough for children's feet to touch the ground can present a risk of strangulation for an entrapped child, because younger children may not have the necessary cognitive ability or motor skills to extricate their heads especially if scared or panicked.

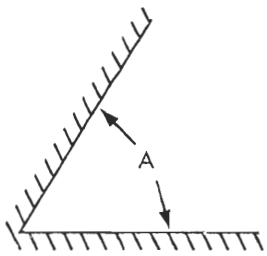
To determine whether an opening is hazardous, use the recommended test fixtures, test methods and performance recommendations described in Appendix B. These recommendations apply to all playground equipment for both preschool-age and school-age children. Fixed equipment as well as moving equipment (in its stationary position) should be tested for entrapment hazards. There are two special cases for which separate procedures are given: completely bounded openings where depth of penetration is a critical issue (see Section B5), and openings formed by non-rigid climbing components (see Section B6).

9.6.2 Angles

The angle of any vertex formed by adjacent components should be greater than 55 degrees, unless the lower leg is horizontal or projects downwards (see Figure 10). An exception to this recommendation can be made if a rigid shield is attached to the vertex between adjacent components and the shield is of sufficient size to prevent a 9 inch diameter circular template from simultaneously touching components on either side of the vertex (see Figure 11).



Angle A should exceed 55°



Angle A is not subject to the greater than 55° recommendation if one leg of the vee is horizontal or slopes downward from the apex

Figure 10. Recommendations for Angles

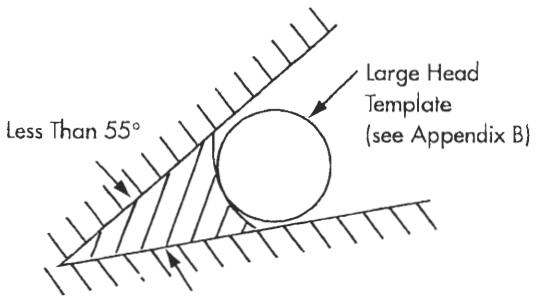


Figure 11. Shield for Angle Less than 55°

9.7 Tripping Hazards

All anchoring devices for playground equipment, such as concrete footings or horizontal bars at the bottom of flexible climbers, should be installed below ground level, beneath the base of the protective surfacing material, to eliminate the hazard of tripping. This will also prevent children who may fall from sustaining additional injuries due to exposed footings.

Low retaining walls are commonly used to help contain loose surfacing materials. In order to minimize trip hazards, retaining walls should be highly visible and any

change of elevation should be obvious. The use of bright colors can contribute to better visibility.

9.8 Suspended Hazards

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

10. STAIRWAYS, LADDERS AND HANDRAILS

10.1 General

Access to playground equipment can take many forms, such as conventional ramps, stairways with steps, and ladders with steps or rungs. Access may also be by means of climbing components, such as climbing nets, arch climbers, and tire climbers (see Figure 12). Such climbing components are generally intended to be more challenging than stairways and stepladders, and so require better balance and coordination of the children. Rung ladders are generally considered to present a level of challenge intermediate between stairways or stepladders and climbing components.

Rung ladders and climbing components such as climbing nets, arch climbers, and tire climbers, should not be used as the sole means of access to equipment intended for preschool-age children.

Platforms over 6 feet in height (with the exception of free-standing slides) should provide an intermediate standing surface where a decision can be made to halt the ascent and to pursue an alternative means of descent.

10.2 Stairways and Ladders

Stairways, stepladders, and rung ladders are distinguished by the range of slopes permitted for each of these types of access. However, in all cases the steps or rungs should be evenly spaced, including the spacing between the top step or rung and the surface of the platform. Table 2 contains recommended dimensions for:

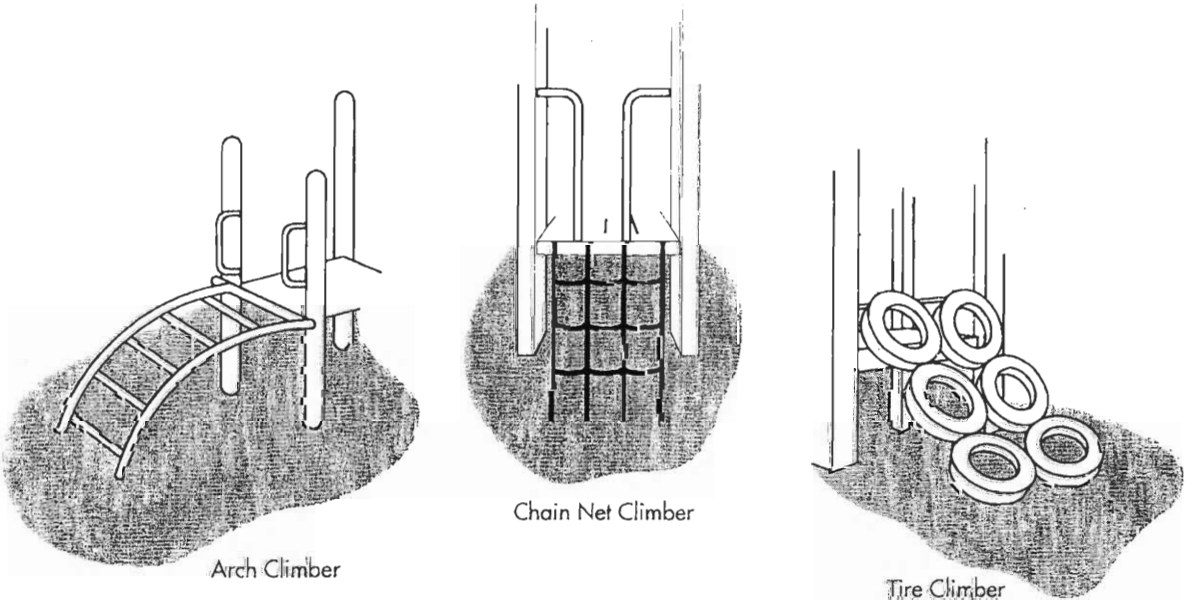


Figure 12. Examples of More Challenging Modes of Access

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

Type of Access	Age of Intended User	
	2-5 Years	5-12 Years
Rung Ladders		
Slope	75°–90°	75°–90°
Rung Width	≥ 12"	≥ 16"
Vertical rise (tread to tread)	≤ 12"**	≤ 12"**
Rung Diameter	0.95"–1.55"	0.95"–1.55"
Stepladders		
Slope	50°–75°	50°–75°
Tread Width – Single File	12"–21"	≥ 16"
– Two-Abreast	*	≥ 36"
Tread Depth – Open Riser	≥ 7"	≥ 3"
– Closed Riser	≥ 7"	≥ 6"
Vertical Rise (tread to tread)	≤ 9"**	≤ 12"**
Stairways		
Slope	≤ 35°	≤ 35°
Tread Width – Single File	≥ 12"	≥ 16"
– Two-Abreast	≥ 30"	≥ 36"
Tread Depth – Open Riser	≥ 7"	≥ 8"
– Closed Riser	≥ 7"	≥ 8"
Vertical Rise (tread to tread)	≤ 9"**	≤ 12"**
Ramps (not intended for access by the disabled)***		
Slope (vertical:horizontal)	≤ 1:8	≤ 1:8
Width – Single File	≥ 12"	≥ 16"
– Two-Abreast	≥ 30"	≥ 36"

* Not recommended for preschool-age children

** Entrapment provisions apply

*** For information on requirements for access to playground equipment by disabled children contact the U.S. Architectural and Transportation Barriers Compliance Board [**11**].

Note: ≥ means equal to or greater than and
≤ means equal to or less than

access slope, tread or rung width, tread depth, rung diameter, and vertical rise for rung ladders, stepladders, and stairways. Table 2 also contains slope and width recommendations for ramps. However, these recommendations are not intended to address ramps designed for access by wheelchairs.

Openings between steps or rungs and between the top step or rung and underside of a platform should prevent the possibility of entrapment. Risers on stairways and stepladders should be closed if the distance between opposing interior surfaces of consecutive steps is between 3.5 and 9 inches (see Section 9.6). Since the design of rung ladders does not permit risers to be closed, the space between rungs should not be between 3.5 and 9 inches.

When risers are closed, treads of stairways and ladders should prevent the accumulation of sand, water, or other materials on or between steps.

10.2.1 Rungs and Other Handgripping Components

Whereas the steps of stairways and stepladders are used only for foot support, the rungs of rung ladders are used for both foot support and for hand support by a climbing child since rung ladders generally do not have handrails.

Rungs are generally round in cross section and should have a diameter or maximum cross sectional dimension between 0.95 and 1.55 inches. Other components intended to be grasped by the hands such as the bars of climbers should also have a diameter or maximum cross sectional dimension between 0.95 and 1.55 inches.

To benefit the weakest child in each age group, a diameter of 1.25 inches is preferred. All rungs should be secured in a manner that prevents them from turning.

10.3 Handrails

Handrails on stairways and stepladders are intended to provide hand support and to steady the user. Continuous handrails extending over the full length of the access should be provided on both sides of all stairways and stepladders, regardless of the height of the access. Rung ladders do not require handrails since rungs or side supports provide hand support on these more steeply inclined accesses.

10.3.1 Handrail Height

Handrails should be available for use at the appropriate height, beginning with the first step. The vertical distance between the top front edge of a step (tread nosing) and

the top surface of the handrail above it should be as follows:

- Preschool-Age Children: between 22 and 26 inches.
- School-Age Children: between 22 and 38 inches.

10.3.2 Handrail Diameter

The diameter or maximum cross-sectional dimension of handrails should be between 0.95 and 1.55 inches. To benefit the weakest child in each age group, a diameter of 1.25 inches is preferred.

10.4 Transition from Access to Platform

On any transition from an access mode to a platform, handrails or handholds should be adequate to provide support until the child has fully achieved the desired posture on the platform. Any opening between a handrail and an adjacent vertical structure (e.g., vertical support post for a platform or vertical slat of a protective barrier) should not pose an entrapment hazard (see Section 9.6).

On accesses that do not have handrails, such as rung ladders, flexible climbers, arch climbers, and tire climbers, hand support should provide for the transition between the top of the access and the platform. Options include vertical handrails and loop handgrips extending over the top of the access.

11. PLATFORMS, GUARDRAILS AND PROTECTIVE BARRIERS

11.1 Design Considerations

Platforms should be within $\pm 2°$ of a horizontal plane and openings should be provided to allow for drainage.

11.2 Guardrails and Protective Barriers

Either guardrails or protective barriers may be used to prevent inadvertent or unintentional falls off elevated platforms. Protective barriers, however, to provide greater protection, should be designed to prevent intentional attempts by children seeking to defeat the barrier either by climbing over or through the barrier.

For example, guardrails may have a horizontal top rail with infill consisting of vertical bars having openings that are greater than 9 inches. Such openings would not present an entrapment hazard but would not prevent a child from climbing through the openings. A protective barrier should prevent passage of a child during deliberate attempts to defeat the barrier. Any openings between uprights or between the platform surface and lower edge of a protective barrier should prevent passage of the small torso template (see Figure B-3 in Appendix B).

11.3 Minimum Elevation Requiring Guardrails and Protective Barriers

Guardrails or protective barriers should be provided on platforms, walkways, landings, and transitional surfaces in accordance with the following minimum elevation recommendations.

Preschool-Age Children: Since younger children have poorer coordination and balance and are more vulnerable to injury than school-age children, guardrails or protective barriers are warranted at lower elevations. An elevated surface that is more than 20 inches above the protective surfacing should have a guardrail or protective barrier to prevent falls. Guardrails are acceptable for platforms over 20 inches but not over 30 inches high, but a full protective barrier may be preferable for this age group since it affords a greater degree of protection from falls. Protective barriers should always be used for platforms that are over 30 inches above the protective surfacing.

School-Age Children: An elevated surface that is more than 30 inches above the protective surfacing should have a guardrail or protective barrier to prevent falls. For platforms over 30 inches but not over 48 inches high, guardrails are acceptable, although a full protective barrier always provides greater protection. Platforms that are over 48 inches above the protective surfacing should always have a protective barrier.

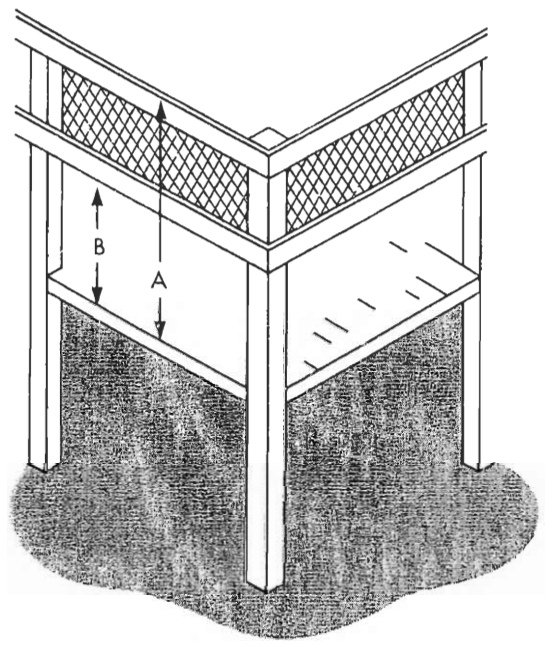
An elevated surface is exempt from these recommendations if a guardrail or protective barrier would interfere with the intended use of the equipment; this includes most climbing equipment, and platforms that are layered so that the fall height does not exceed 20 inches on equipment intended for preschool-age children or 30 inches on equipment intended for school-age children.

11.4 Minimum Height of Guardrails

The minimum height should prevent the largest child from inadvertently falling over the guardrail. In addition, the guardrail should extend low enough to prevent the smallest child from inadvertently stepping under it (see Figure 13).

Preschool-Age Children: the top surface of guardrails should be at least 29 inches high and the lower edge should be no more than 23 inches above the platform.

School-Age Children: the top surface of guardrails should be at least 38 inches high and the lower edge should be no more than 28 inches above the platform.



A = 38" minimum for school-age children
29" minimum for preschool-age children

B = 28" maximum for school-age children
23" maximum for preschool-age children

Note: Guardrails should be designed to prevent inadvertent or unintentional falls off the platform, to discourage climbing on the barrier, to prevent the possibility of entrapment, and to aid supervision. Refer to text for detailed recommendations regarding infill.

Figure 13. Guardrails on Elevated Platforms

11.5 Minimum Height of Protective Barriers

The minimum height should prevent the largest child from inadvertently falling over the protective barrier. In addition, because the protective barrier should not permit children to climb through or under it, openings in the barrier should preclude passage of the small torso template (see Section 9.6).

Preschool-Age Children: the top surface of protective barriers should be at least 29 inches high. Vertical infill for protective barriers may be preferable for younger children because the vertical components can be grasped at whatever height a child chooses as a handhold.

School-Age Children: the top surface of protective barriers should be at least 38 inches high.

11.6 Other Design Considerations for Guardrails and Protective Barriers

Guardrails or protective barriers should completely surround an elevated platform except for entrance and exit openings necessary to access a play event.

Both guardrails and protective barriers should be designed to prevent inadvertent or unintentional falls off the platform, preclude the possibility of entrapment, and facilitate supervision. Horizontal cross-pieces should not be used as infill for the space below the top rail because they provide footholds for climbing. When solid panels are used as infill, it is recommended that there be some transparent areas to facilitate supervision and to permit viewing from the platform. To prevent head entrapment, guardrails should conform to the entrapment recommendations in Section 9.6.

11.7 Stepped Platforms

On some composite structures, platforms are layered or tiered, so that a child may fall onto a lower platform rather than the ground surface.

Unless there is an alternate means of access/egress, the maximum difference in height between stepped platforms should be:

- Preschool-Age Children: 12 inches.
- School-Age Children: 18 inches.

The space between the stepped platforms should follow the recommendations for entrapment in enclosed openings in Section 9.6. If the space exceeds 9 inches and the height of the lower platform above the protective surfacing exceeds 30 inches for preschool equipment or 48 inches for school-age equipment, infill should be used to reduce the space to less than 3.5 inches.

12. MAJOR TYPES OF PLAYGROUND EQUIPMENT

12.1 Climbing Equipment

12.1.1 General

The term climbers refers to a wide variety of equipment, including arch climbers, sliding poles, chain or net climbers, upper body equipment (overhead horizontal ladders, overhead rings), dome climbers, parallel bars, balance beams, cable walks, suspension bridges, and spiral climbers, as well as composite structures with linked platforms (see Figure 14 for examples). Climbing equipment is generally designed to present a greater degree of physical challenge than other equipment on public playgrounds.

Older children tend to use climbing equipment more frequently and proficiently than younger ones. Because very young children have not yet developed some of the physical skills necessary for certain climbing activities (including balance, coordination, and upper body strength), they may have difficulty using more challenging climbing components such as rung ladders, non-rigid climbers, arch climbers, and upper body devices.

12.1.2 Design Considerations

Since the more challenging modes of access discussed in Section 10 are also intended to be used as climbing

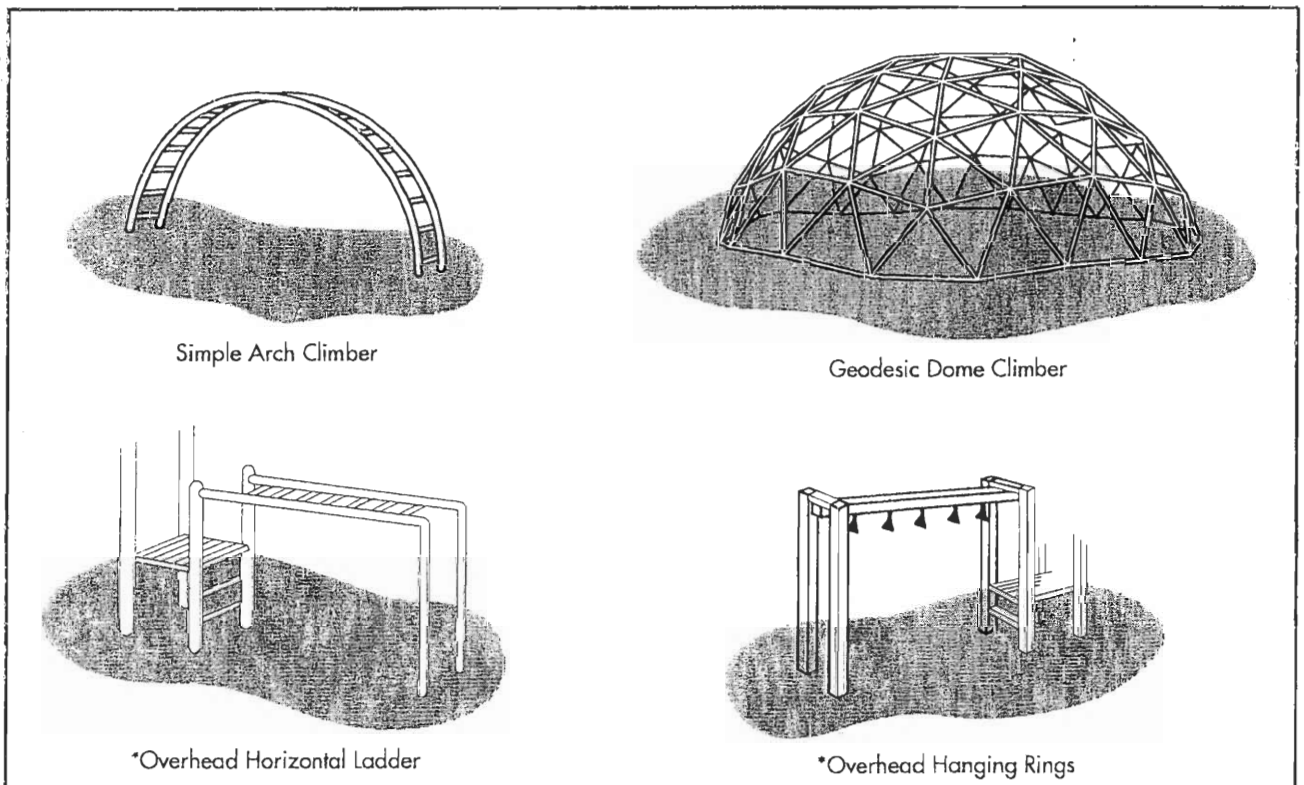


Figure 14. Typical Climbing Equipment

devices, the recommendations for the size of hand-gripping components and stepped platforms covered in that section are applicable to climbing equipment.

Climbers should not have climbing bars or other structural components in the interior of the structure onto which a child may fall from a height of greater than 18 inches.

Climbing equipment should allow children to descend as easily as they ascend. One way of implementing this recommendation is to provide an easier, alternate means of descent, such as another mode of egress, platform, or piece of equipment. For example, a stairway can be added to provide a less challenging mode of descent than a vertical rung ladder or flexible climbing device. The levels of challenge that characterize different types of access are discussed in Section 10.

Preschool-Age Children: Offering an easy way out is particularly important on climbing devices intended for preschoolers, since their ability to descend climbing components emerges later than their ability to climb up the same components.

12.1.3 Climbers With Non-Rigid Components

Net and chain climbers use a flexible grid of ropes or chains for climbing. Tire climbers are also described as flexible climbers. These may have the tires secured tread-to-tread in the form of a sloping grid or the tires may be suspended individually by chains or other means to provide access to an elevated platform. Since net, chain, and tire climbers have flexible components that do not provide a steady means of support, they require more advanced balance abilities than conventional ladders.

Flexible grid climbing devices which provide access to platforms should be securely anchored at both ends. When one end is connected to the ground, the anchoring devices should be installed below ground level, beneath the base of the protective surfacing material.

Connections between ropes, cables, or chains within the climbing grid or between tires should be securely fixed. Spacing between the horizontal and vertical components of a climbing grid should satisfy all entrapment criteria (see Section 9.6).

Flexible grid climbing devices are not recommended as the sole means of access to equipment intended for preschool-age children.

12.1.4 Arch Climbers

Arch climbers consist of metal or wood rungs attached to convex side supports. They may be free standing (see Figure 14) or be provided as a more challenging means of access to other equipment (see Figure 12). Because of this extra challenge, they should not be used as the sole means of access to other equipment. A less challenging option will ensure that children use the arch climber because they are willing to assume the challenge and not because they are forced to use it. Free standing arch climbers are not recommended for preschool-age children.

The rung diameter and spacing of rungs on arch climbers should follow the recommendations for rung ladders in Table 2.

12.1.5 Horizontal Ladders and Overhead Rings

Four-year-olds are generally the youngest children capable of using upper body devices such as these. The recommendations below are designed to accommodate children 4 through 12 years of age.

The space between adjacent rungs of overhead ladders should be greater than 9 inches to satisfy the entrapment recommendations (see Section 9.6). The center-to-center spacing of horizontal ladder rungs should be as follows:

- Preschool-Age Children: no more than 12 inches.
- School-Age Children: no more than 15 inches.

This recommendation does not apply to the spacing of overhead rings because, during use, the gripped ring swings through an arc and reduces the distance to the gripping surface of the next ring.

Horizontal ladders intended for preschool-age children should have rungs that are parallel to one another and evenly spaced.

The first handhold on either end of upper body equipment should not be placed directly above the platform or climbing rung used for mount or dismount. This

minimizes the risk of children impacting rigid access structures if they fall from the first handhold during mount or dismount.

The maximum height of upper body equipment measured from the center of the grasping device to the protective surfacing should be:

- Preschool-Age Children: 60 inches.
- School-Age Children: 84 inches.

If overhead swinging rings are suspended by chains, the maximum length of the chains should be 12 inches.

12.1.6 Sliding Poles

Vertical sliding poles are designed to be more challenging than some other types of climbing equipment. They are not recommended for preschool-age children who may lack the upper body strength and coordination to successfully slide down the pole. Furthermore, once younger children have grasped the pole, they would be forced to slide down it since there is no alternative option.

Sliding poles should be continuous with no protruding welds or seams along the sliding surface and the pole should not change direction along the sliding portion.

The horizontal distance between a sliding pole and the edge of the platform or other structure used for access to the sliding pole should be at least 18 inches. This minimum distance applies to all points down the sliding pole.

No point on the sliding pole at or above the level of the access structure, where a child is likely to reach for the pole, should be more than 20 inches away from the edge of the access structure.

The pole should extend at least 60 inches above the level of the platform or other structure used for access to the sliding pole.

The diameter of sliding poles should be no greater than 1.9 inches.

Sliding poles and their access structures should be located so that traffic from other events will not interfere with the users during descent.

12.1.7 Climbing Ropes

A climbing rope should be secured at both ends and not be capable of being looped back on itself creating a loop with an inside perimeter greater than 5 inches.

12.1.8 Balance Beams

To avoid injuries during falls, balance beams should be no higher than:

- Preschool-Age Children: 12 inches.
- School-Age Children: 16 inches.

12.1.9 Layout of Climbing Components

When climbing components are part of a composite structure, their level of challenge and mode of use should be compatible with the traffic flow from adjacent components.

Upper body devices should be placed so that the swinging movement generated by children on this equipment cannot interfere with the movement of children on adjacent structures, particularly other children descending on slides.

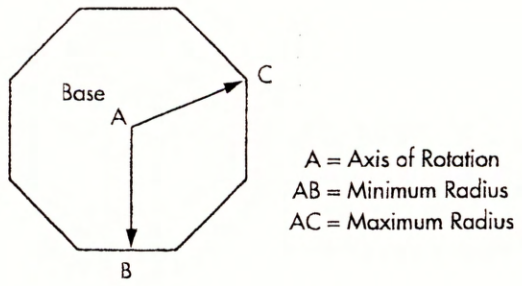
The design of adjacent play structures should not facilitate climbing to the top support bars of upper body equipment.

12.2 Merry-Go-Rounds

Merry-go-rounds are the most common type of rotating equipment found on public playgrounds. Children usually sit or stand on the platform while other children or adults push the merry-go-round to make it rotate. In addition, children often get on and off the merry-go-round while it is in motion.

Merry-go-rounds may present a physical hazard to preschool-age children who have little or no control over such products once they are in motion. Therefore, children in this age group should always be supervised when using merry-go-rounds. Following are recommendations for merry-go-rounds:

The rotating platform should be continuous and approximately circular. The difference between the minimum and maximum radii of a non-circular platform should not



The difference between dimensions AC and AB should not exceed 2.0 inches.

Figure 15. Minimum and Maximum Radii of Non-Circular Merry-Go-Round Platform

exceed 2.0 inches (see Figure 15). No components of the apparatus, including handgrips, should extend beyond the perimeter of the platform. The underside of the perimeter of the platform should be no less than 9 inches above the level of the protective surfacing.

Children should be provided with a secure means of holding on. Where handgrips are provided, they should conform to the general recommendations for hand-gripping components in Section 10.2.1.

There should not be any accessible shearing or crushing mechanisms in the undercarriage of the equipment. The rotating platform of a merry-go-round should not have any sharp edges. The surface of the platform should be continuous with no openings between the axis and the periphery that permit a rod having a diameter of 5/16 inch to penetrate completely through the surface.

A means should be provided to limit the peripheral speed of rotation to a maximum of 13 ft/sec.

Merry-go-round platforms should not be provided with an oscillatory (up and down) motion.

12.3 Seesaws

The typical seesaw (also known as a "teeter totter") consists of a board or pole supported at the center by a fulcrum and having a seat at each end (see Figure 16). Seesaw use is quite complex because it requires two children to cooperate and combine their actions.

Younger children do not generally have the skills required to effectively use fulcrum seesaws. Therefore, seesaws are not recommended for preschool-age children unless they are equipped with a spring centering device to prevent abrupt contact with the ground should one child elect to dismount.

There is a trend to replace fulcrum seesaws on public playgrounds with spring-centered seesaws which have the advantage of not requiring two children to coordinate their actions in order to play safely (see discussion of Spring Rocking Equipment in Section 12.5).

The fulcrum of fulcrum seesaws should not present a pinch or crush hazard.

Partial car tires, or some other shock-absorbing material, should be embedded in the ground underneath the seats of fulcrum seesaws, or secured on the underside of the seats. This will help prevent limbs from being crushed between the seat and the ground, as well as cushion the impact. Fulcrum see-saws may also be equipped with a spring centering mechanism to minimize the risk of injury due to impact with the ground.

Handholds should be provided at each seating position for gripping with both hands and should not turn when grasped. Handholds should not protrude beyond the sides of the seat. Footrests should not be provided on fulcrum see-saws unless they are equipped with a spring centering mechanism to minimize the likelihood of impact with the ground.

Fulcrum seesaws should be constructed so that the maximum attainable angle between a line connecting the seats and the horizontal is 25°.

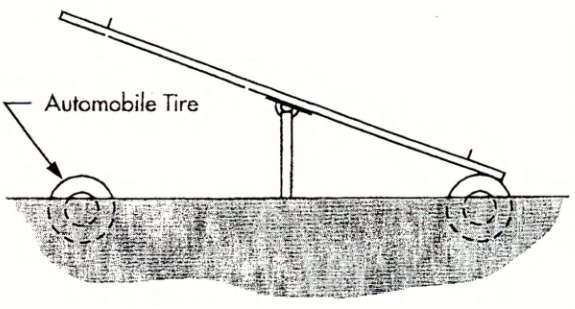


Figure 16. Typical Fulcrum Seesaw

12.4 Slides

12.4.1 General

Although children under 6 years of age may be more likely to play on slides, older children will still use slides depending on their availability relative to other types of equipment. Children can be expected to descend slide chutes in many different positions, rather than always sitting and facing forward as they slide. They will slide down facing backward, on their knees, lying on their backs, head first, and will walk both up and down the chute. Younger children in particular often slide down on their stomachs, either head or feet first.

Slides may provide a straight, wavy, or spiral descent either by means of a tube or an open slide chute. They may be either free-standing (see Figure 17), part of a composite structure, or built on the grade of a natural or man-made slope (embankment slide). The recommendations in this section do not apply to water slides or swimming pool slides.

12.4.2 Slide Access

With the exception of embankment slides, access to a slide may be by means of a ladder with rungs or steps, a stairway with steps, or the slide may be a component of a composite play structure to which access is provided by other means. Whatever means of access is provided to a slide, it should conform to the guidelines specified in the general discussion of access to all playground equipment (see Section 10).

12.4.3 Slide Platform

All slides should be provided with a platform with sufficient length to facilitate the transition from standing to sitting at the top of the inclined sliding surface. The length of the platform will usually not be an issue when the slide is attached to the deck of a composite structure, because decks are generally at least 3 feet square. However, in the case of a free-standing slide, it is recommended that the platform have a minimum length of at least 22 inches.

The platform should be horizontal and have a width at least equal to the width of the slide.

Guardrails or protective barriers should surround a slide platform and should conform to the guidelines specified in the general discussion of platforms (see Section 11).

Slides should not have any spaces or gaps between the platform and the start of the slide chute.

With the exception of tube slides, handholds should be provided at the entrance to all slides to facilitate the

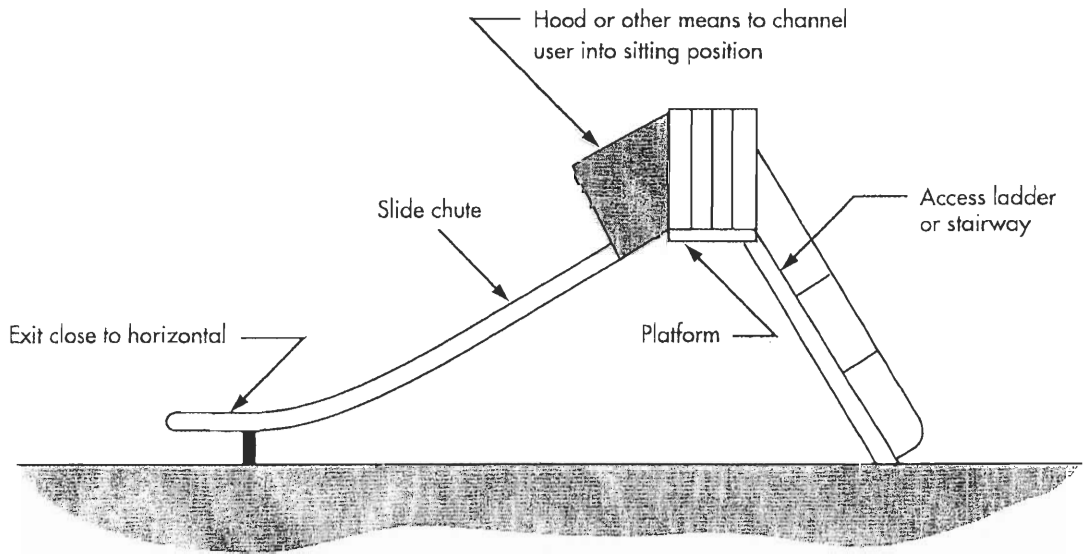


Figure 17. Typical Free-Standing Straight Slide

transition from standing to sitting and decrease the risk of falls. These should extend high enough to provide hand support for the largest child in a standing position, and low enough to provide hand support for the smallest child in a sitting position.

At the entrance to the chute there should be a means to channel a user into a sitting position. This may be a guardrail, a hood, or other device. Whatever means is provided, it should be of a design that does not encourage climbing.

12.4.4 Sliding Section of Straight Slides

It is recommended that the average incline of a slide chute be no more than 30 degrees. This can be measured by determining that the height to length ratio (as shown in Figure 18) does not exceed 0.577. No span on the slide chute should have a slope greater than 50 degrees.

Straight slides with flat open chutes should have sides with a 4 inch minimum height extending along both sides of the chute for the entire length of the inclined sliding surface.

The sides should be an integral part of the chute, without any gaps between the sides and the sliding surface. [Note: Roller slides are excluded from this recommendation.]

Slides may have an open chute with a circular, semicircular or curved cross section provided that:

a. the vertical height of the sides is no less than 4 inches when measured at right angles to a horizontal line that is 12 inches long when the slide is intended for preschool-age children and 16 inches long when the slide is intended for school-age children (see Figure 19);

or

b. the vertical height of the sides is no less than 4 inches minus two times the width of the slide chute divided by the radius of the slide chute curvature (see Figure 20).

Metal slides should be placed in shaded areas to prevent burns caused by direct sun on the slide chute.

12.4.5 Exit region

All slides should have an exit region to help children maintain their balance and facilitate a smooth transition from sitting to standing when exiting.

The exit region should be essentially horizontal and parallel to the ground and have a minimum length of 11 inches.

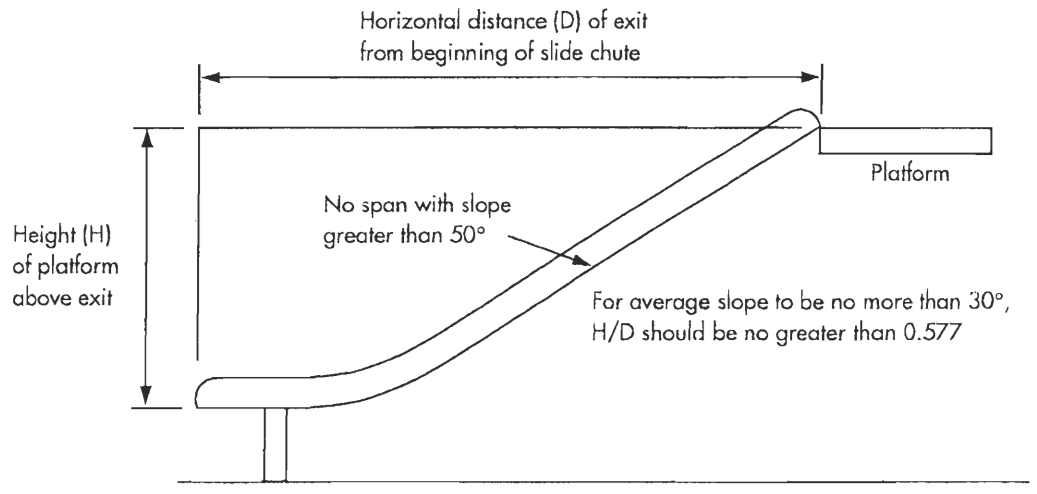


Figure 18. Slide Slope

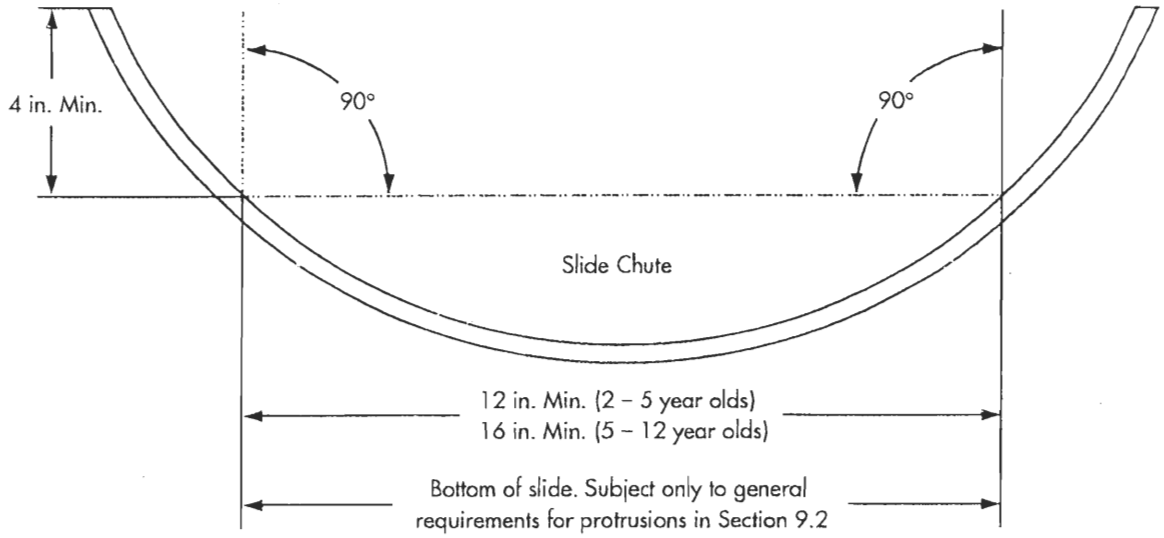
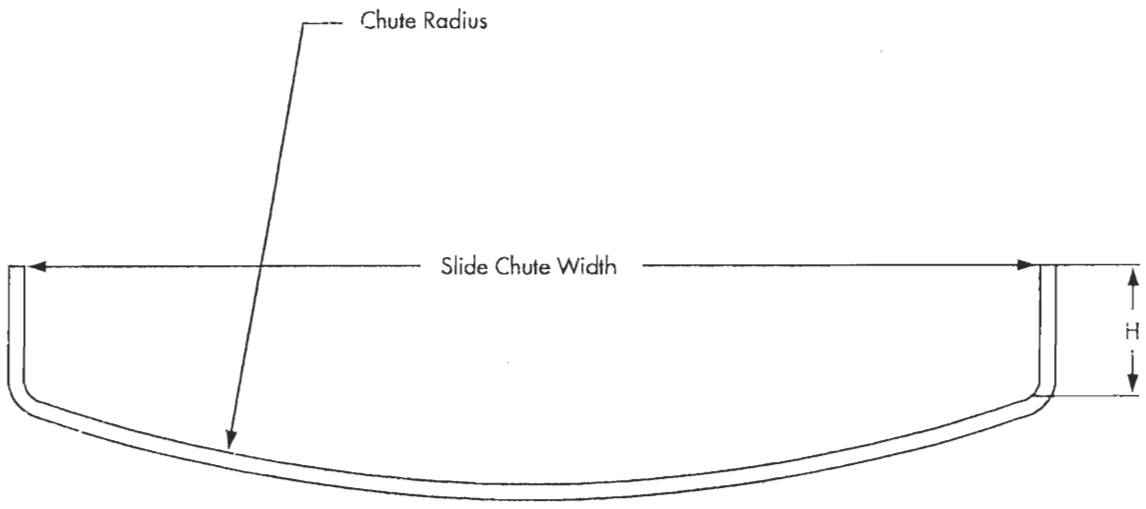


Figure 19. Minimum Side Height for Slide with Circular Cross Section



$$H = 4 - \frac{2 \times \text{Slide Chute Width}}{\text{Slide Chute Radius}}$$

Figure 20. Formula for Minimum Vertical Side Height for Slide with Curved Chute

For slides that are no more than 4 feet in height, the height of the exit region should be no more than 11 inches from the protective surfacing.

For slides that are over 4 feet in height, the exit region should be at least 7 inches but not more than 15 inches above the protective surfacing.

Slide exit edges should be rounded or curved, to prevent lacerations or other injuries which could result from impact with a sharp or straight edge.

All slide exits should be located in uncongested areas of the playground.

12.4.6 Embankment Slides

The slide chute of an embankment slide should have a maximum height of 12 inches above the underlying ground surface. Such a design basically eliminates the hazard of falls from height. Embankment slides should follow all of the recommendations given for straight slides, where applicable, e.g., side height, slope, use zone at exit, etc. It is important that some means be provided at the slide chute entrance to minimize the use of these slides by children on skates, skateboards or bicycles.

12.4.7 Spiral Slides

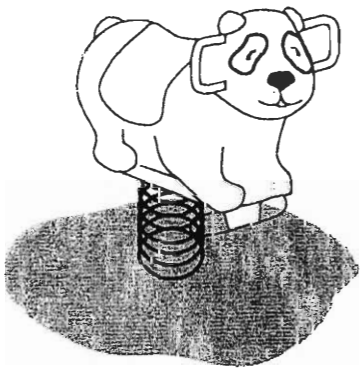
It is recommended that spiral slides follow the recommendations for straight slides (where applicable), with special attention given to design features which may present problems unique to spiral slides, such as lateral discharge of the user.

Preschool-Age Children: Because these children have less ability to maintain balance and postural control, only short spiral slides, one turn (360°) or less, are recommended for this age group.

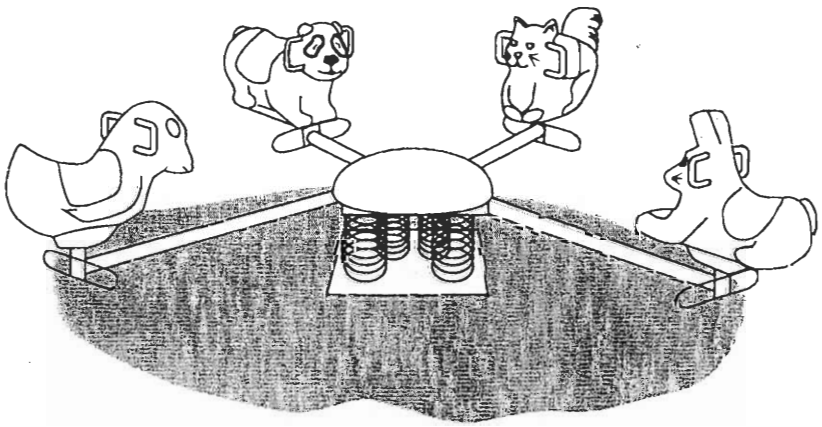
12.4.8 Tube Slides

Tube slides should meet all the applicable recommendations for other slides.

Barriers should be provided or surfaces textured to prevent sliding on the top (outside) of the tube.



Animal Spring Rocker



4-Way Spring-Centered Seesaw

Figure 21. Examples of Spring Rockers

The minimum internal diameter of the tube should be no less than 23 inches.

It should be noted that children using tube slides may not be visible to a supervisor. Consideration should be given to extra supervision on playgrounds having tube slides or to having transparent tube sections for observation and supervision.

12.4.9 Roller Slides

Roller slides should meet applicable recommendations for slides in Section 12.4.

The space between adjacent rollers and between the ends of the rollers and the stationary structure should be less than 3/16 inch.

Frequent inspections are recommended to insure that there are no missing rollers or broken bearings.

12.5 Spring Rockers

Preschool-age children enjoy the bouncing and rocking activities presented by this equipment, but older children may not find it challenging enough.

Examples of spring rockers are shown in Figure 21. Preschoolers are the primary users of such rocking equipment. Therefore, the recommendations in this section address only preschool-age children.

Seat design should not allow the rocker to be used by more than the intended number of users.

Each seating position should be equipped with handgrips and footrests. The diameter of handgrips should follow the recommendations for handgripping components in Section 10.

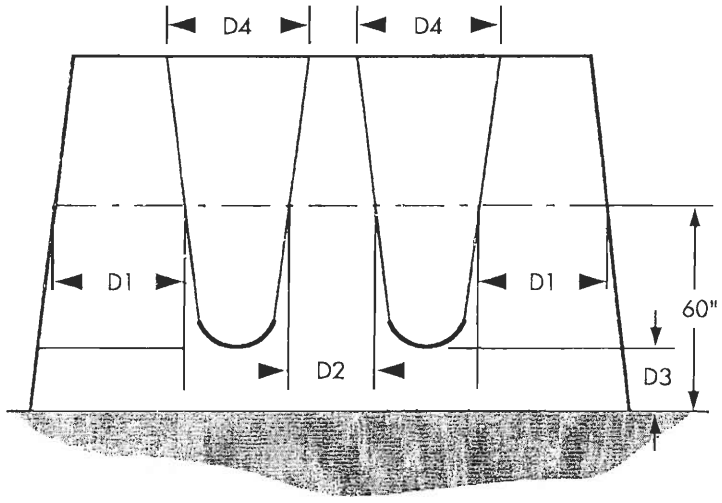
The springs of rocking equipment should minimize the possibility of children pinching their hands or their feet between coils or between the spring and a part of the rocker.

12.6 Swings

12.6.1 General

Children of all ages generally enjoy the sensations created while swinging. Most often, they sit on the swings, and it is common to see children jumping off swings. Younger children tend to also swing on their stomachs, and older children may stand on the seats.

Swings may be divided into two distinct types: single-axis of motion and multiple-axes of motion. A single-axis swing is intended to swing back-and-forth in a single



D1 = 30" Min.

D2 = 24" Min.

D3 = 12" Min. for Preschool-Age Children
16" Min. for School-Age Children
24" Min. for Tot Swings

D4 = 20" Min.

Figure 22. Minimum Clearances for Single-Axis Swings

plane and generally consists of a seat supported by at least two suspending members each of which is connected to a separate pivot on an overhead structure. A multiple-axis swing consists of a seat (generally a tire) suspended from a single pivot that permits it to swing in any direction. Hardware used to secure the suspending elements to the swing seat and to the supporting structure should not be removable without the use of tools. S-hooks are often part of a swing's suspension system, either attaching the suspending elements to the overhead support bar or to the swing seat. Open S-hooks can catch a child's clothing and present a strangulation hazard. S-hooks should be pinched closed. An S-hook is considered closed if there is no gap or space greater than 0.04 inches. It is appropriate to measure this gap with a feeler gauge but, in the absence of such a gauge, the gap should not admit a dime.

Swings should be suspended from support structures that discourage climbing. A-frame support structures should not have horizontal cross-bars.

Fiber ropes are not recommended as a means to suspend swings.

12.6.2 Single-Axis (To-Fro) Swings

To help prevent young children from inadvertently running into the path of moving swings, swing structures should be located away from other equipment or activities. Additional protection can be provided by means of a low barrier, such as a fence or hedge. Such barriers should not be an obstacle within the use zone of a swing structure or hamper supervision by blocking visibility.

The use zone to the front and rear of single-axis swings should never overlap the use zone of another piece of equipment.

To minimize the likelihood of children being struck by a moving swing, it is recommended that no more than two single-axis swings be hung in each bay of the supporting structure.

Attaching single-axis swings to composite structures is not recommended.

Swing seats should be designed to accommodate no more than one user at any time. To help reduce the severity of impact injuries, wood or metal swing seats are not recommended. Lightweight rubber or plastic swing seats are preferred. Edges of seats should have smoothly finished or rounded edges and should conform to the protrusion recommendations in Section 9.3.

The vertical distance from the underside of an occupied swing seat to the protective surfacing should be no less than 12 inches for swings intended for preschool-age children and no less than 16 inches for swings intended for school-age children. NOTE: If loose-fill material is used as a protective surfacing, the seat height recommendations should be determined after the material has been leveled.

To minimize collisions between swings or between a swing and the supporting structure, the clearances shown in Figure 22 are recommended. In addition, to reduce side-to-side motion, swing hangers should be spaced no less than 20 inches apart.

It is recommended that single-axis swings intended for preschool-age children have the pivot points no greater than 8 feet above the protective surfacing.

12.6.3 Tot Swings

These are single-axis swings intended for children under 4 years of age to use with adult assistance. The seats and suspension systems of these swings, including the related hardware, should follow all of the other criteria for conventional single axis swings.

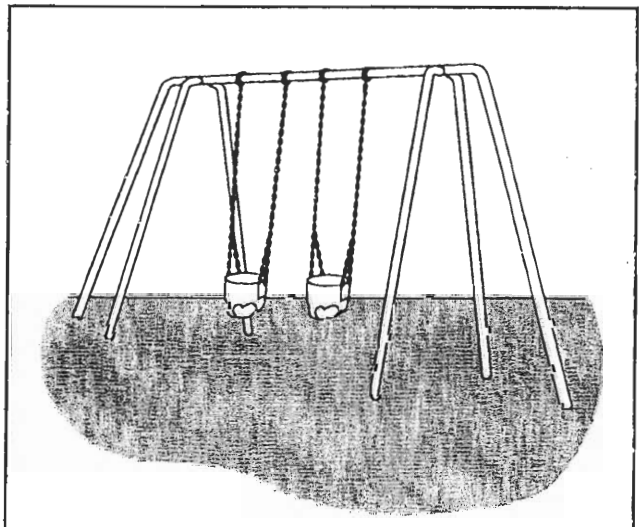


Figure 23. Example of Tot Swings

Full-bucket tot swing seats are recommended to provide support on all sides of a child (see Figure 23). It is important that such supports do not present a strangulation hazard. Openings in tot swing seats should conform to the entrapment criteria in Section 9.6. It is recommended that tot swings be suspended from structures which are separate from those for other swings, or at least suspended from a separate bay of the same structure.

The vertical distance from the underside of an occupied tot swing seat to the protective surfacing should be no less than 24 inches to minimize the likelihood that it will be used by unsupervised young children who may become stuck in the seat.

12.6.4 Multi-Axis Tire Swings

Tire swings are usually suspended in a horizontal orientation using three suspension chains or cables connected to a single swivel mechanism that permits both rotation and a swinging motion in any axis.

A multi-axis tire swing should not be suspended from a structure having other swings in the same bay. Attaching multi-axis swings to composite structures is not recommended.

To minimize the hazard of impact, heavy truck tires should be avoided. Further, if steel-belted radials are used, they should be closely examined to ensure that there are no exposed steel belts that could be a potential protrusion or laceration hazard. Plastic materials can be used as an alternative to simulate actual automobile tires. Drainage holes should be provided in the underside of the tire.

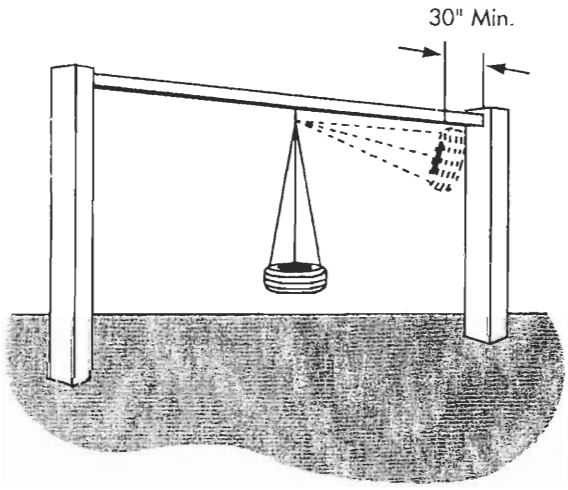


Figure 24. Multi-Axis Tire Swing Clearance

The likelihood of hanger mechanism failure is increased for tire swings, due to the added stress of rotational movement and multiple occupancy. Special attention to maintenance is warranted. The hanger mechanisms for multi-axis tire swings should not have any accessible pinch points.

The minimum clearance between the seating surface of a tire swing and the uprights of the supporting structure should be 30 inches when the tire is in a position closest to the support structure (see Figure 24).

12.6.5 Swings Not Recommended for Public Playgrounds

The following types of swings are not recommended for use in public playgrounds:

Animal Figure Swings -- These are not recommended because their rigid metal framework is heavy presenting a risk of impact injury.

Multiple Occupancy Swings – With the exception of tire swings, swings that are intended for more than one user are not recommended because their greater mass, as compared to single occupancy swings, presents a risk of impact injury.

Rope Swings – Free swinging ropes that may fray or otherwise form a loop are not recommended because they present a potential strangulation hazard.

Swinging Dual Exercise Rings and Trapeze Bars – These are rings and trapeze bars on long chains that are generally considered to be items of athletic equipment and are not recommended for public playgrounds. NOTE: The recommendation against the use of exercise rings does not apply to overhead hanging rings such as those used in a ring trek or ring ladder (see Figure 14).

12.7 Trampolines

Trampolines are not recommended for use on public playgrounds.

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7. Title 16, Code of Federal Regulations, Part 1303; *Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint*; Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

8. CPSC *Staff Recommendations for Identifying and Controlling Lead Paint on Public Playground Equipment*; U.S. Consumer Product Safety Commission, Washington, D.C., 20207, October 1996. Copies also available by calling 1-800-638-CPSC or visiting the CPSC's Internet Web site at http://www.cpsc.gov (go to "What's Happening").

9. Lee, Brian C., *Estimate of Risk of Skin Cancer from Dislodgeable Arsenic on Pressure Treated Wood Playground Equipment*; U.S. Consumer Product Safety Commission, Washington, D.C. 20207, January 1990.

10. *Consumer Information Sheet: Inorganic Arsenical Pressure-Treated Wood*; American Wood Preservers Institute, 1945 Gallows Road, Suite 550, Vienna, Virginia 22182.7.

11. U.S. Architectural and Transportation Barriers Compliance Board, 1331 F Street, NW, Washington, DC 20001-1111.

12. *Entrapment Probes and Protrusion Gauges Kit*; Safety Products Dept., National Recreation and Park Association, 22377 Belmont Ridge Road, Ashburn, VA 20148-4501.

APPENDIX B
Entrapment Recommendations and Test Methods

B1. GENERAL — Any completely-bounded opening (see Figure B-1) may be a potential head entrapment hazard and should conform to the recommendations in this appendix. One exception to these recommendations is an opening where the ground serves as the lower boundary. Openings in both horizontal and vertical planes present a risk of entrapment. Even those openings which are low enough to permit a child's feet to touch the ground present a risk of strangulation to an entrapped child, because younger children may not have the necessary cognitive ability and motor skills to withdraw their heads, especially if scared or panicked.

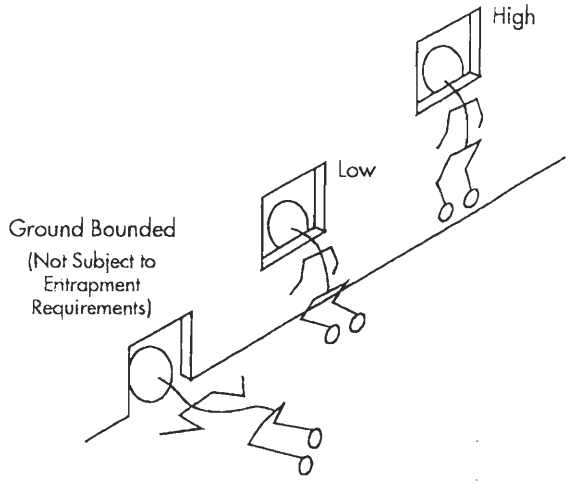


Figure B-1. Examples of Completely Bounded Openings

An opening may present an entrapment hazard if the distance between any interior opposing surfaces is greater than 3.5 inches or less than 9 inches; when one dimension of an opening is within this potentially hazardous range, all dimensions of the opening should be considered together to fully evaluate the possibility of entrapment. The most appropriate method to determine whether an opening is hazardous is to test it using the following fixtures, methods, and performance criteria.

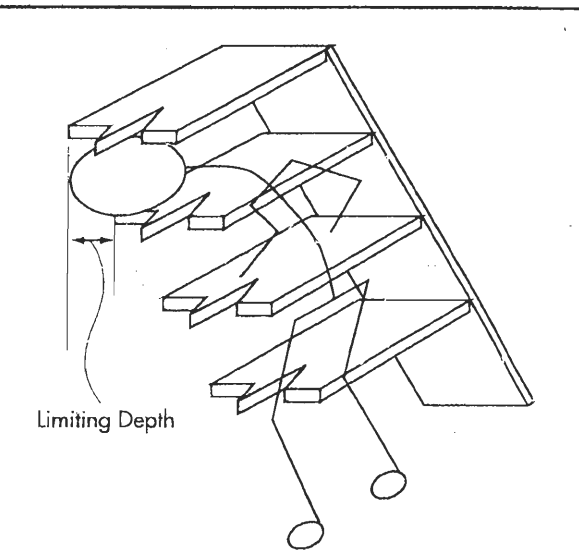


Figure B-2. Completely Bounded Openings with Limited Depth

These recommendations apply to all playground equipment, both for preschool-age and school-age children; fixed equipment as well as moving equipment (in its stationary position) should be tested for entrapment hazards. There are two special cases for which separate procedures are given: completely-bounded openings where depth of penetration is a critical issue (see Figure B-2); and openings formed by non-rigid climbing components.

B2. TEST FIXTURES — Two templates are required to determine if completely bounded openings in rigid structures present an entrapment hazard.

B2.1 Small Torso Template — The dimensions (see Figure B-3) of this template are based on the size of the torso of the smallest user at risk, (5th percentile 2-year-old child). If an opening is too small to admit the template, it is also too small to permit feet first entry by a child. Because children's heads are larger than their torsos, an opening that does not admit the small torso probe will also prevent head first entry into an opening by a child.

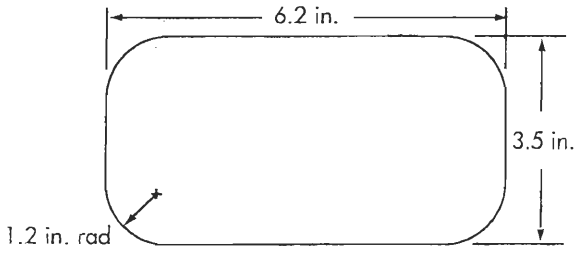


Figure B-3. Small Torso Template

B2.2 Large Head Template — The dimensions (see Figure B-4) of this template are based on the largest dimension on the head of the largest child at risk (95th percentile 5-year-old child). If an opening is large enough to permit free passage of the template, it is large enough to permit free passage of the head of the largest child at risk in any orientation. In addition, openings large enough to permit free passage of the Large Head Template also will not entrap the chest of the largest child at risk.

These templates can easily be fabricated from cardboard, plywood or sheet metal.

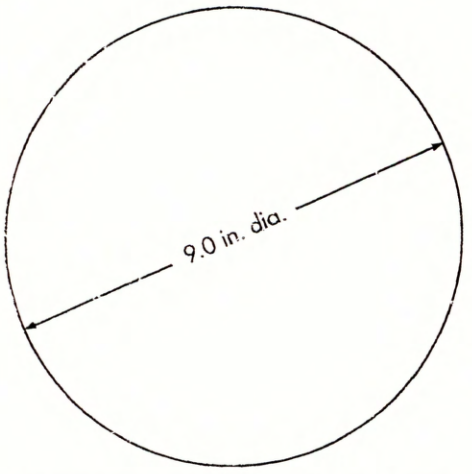


Figure B-4. Large Head Template

B3. RECOMMENDATION — When tested in accordance with the procedure in B4. below, an opening meets the recommendation if:

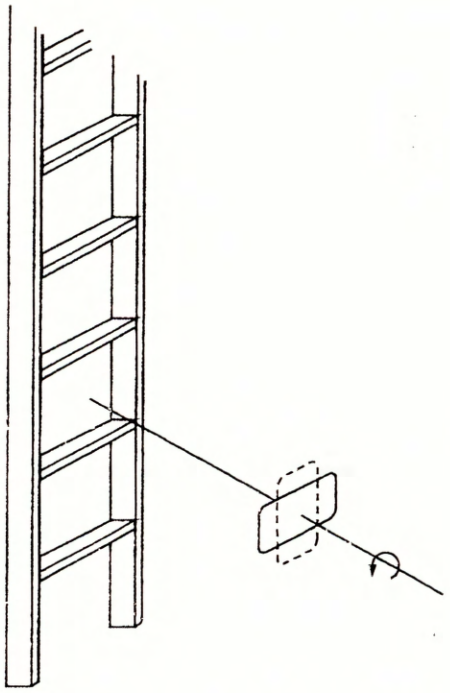
(1) the opening does not admit the Small Torso Template,

or

(2) the opening admits the Small Torso Template and also admits the Large Head Template.

An opening fails to meet the recommendation if it admits the Small Torso Template but does not admit the Large Head Template.

B4. TEST PROCEDURE — Attempt to place the Small Torso Template in the opening with the plane of the template parallel to the plane of the opening. While keeping it parallel to the plane of the opening, the template should be rotated to its most adverse orientation i.e., major axis of template oriented parallel to the major axis of the opening. If the Small Torso Template can be freely inserted through the opening, place the Large Head Template in the opening, again with the plane of the template parallel to the plane of the opening, and attempt to freely insert it through the opening. The test procedure is illustrated in Figure B-5.



Test procedures and performance criteria for completely-bounded openings.

Place the Small Torso Template in the opening with the plane of the template parallel to the plane of the opening. Rotate the template while keeping it parallel to the opening.

If the Small Torso Template can be inserted into the opening, place the Large Head Template into the opening so its plane is parallel to the plane of the opening.

An opening can pass this test when tested in accordance with the above procedures in one of two ways: 1) the opening does not admit the Small Torso Template when it is rotated to any orientation about its own axis, or 2) the opening admits the Small Torso Template and also admits the Large Head Template. An opening fails the test under the following conditions: the opening admits the Small Torso Template but does not admit the Large Head Template.

Figure B-5. Entrapment Test for Completely-Bounded Openings

B5. COMPLETELY-BOUNDED OPENINGS WHERE DEPTH OF PENETRATION IS A CRITICAL ISSUE — The configuration of some openings may be such that the depth of penetration is a critical issue for determining the entrapment potential. This is a special case for which separate test procedures are necessary.

For example, consider a vertical wall or some other barrier behind a stepladder. The entrapment potential depends not only on the dimensions of the opening between adjacent steps but also on the horizontal space between the lower boundary of the opening and the barrier. A child may enter the opening between adjacent steps feet first and may proceed to pass through the space between the rear of the lower step and the barrier and become entrapped when the child's head is unable to pass through either of these two openings. In effect, there are openings in two different planes each of which has the potential for head entrapment and should, therefore, be tested.

Figure B-6 illustrates these two planes for a stepladder as well as for a generic opening. Plane A is the plane of the completely bounded opening in question and Plane B is the plane of the opening encompassing the horizontal space between the lower boundary of the opening in Plane A and the barrier that should also be tested against the entrapment recommendations.

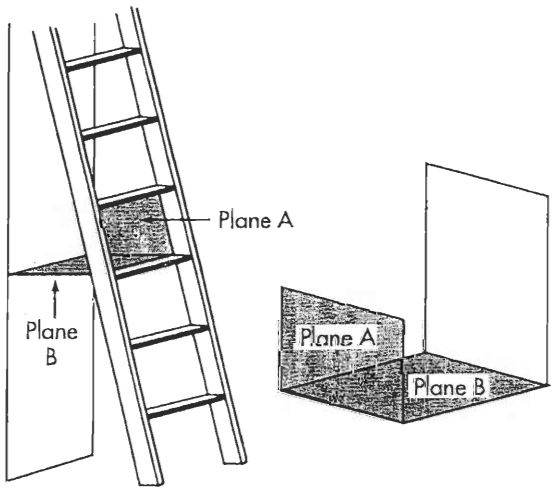


Figure B-6. Examples of Completely-Bounded Openings Where Depth of Penetration is a Critical Issue

The procedures and performance criteria for testing openings where the depth of penetration is a critical issue depend on a series of questions, as described below.

The first step is to determine whether or not the smallest user at risk can enter the opening in Plane A. The Small Torso Template is used to test this opening as follows:

Place the Small Torso Template in the opening in Plane A with its plane parallel to Plane A; rotate the template to its most adverse orientation with respect to the opening while keeping it parallel to Plane A. Does the opening in Plane A admit the Small Torso Template in any orientation when rotated about its own axis?

NO — If the opening in Plane A does not admit the Small Torso Template in any orientation, then the opening is small enough to prevent either head first or feet first entry by the smallest user at risk and is not an entrapment hazard. The opening meets the recommendations.

YES — If the opening in Plane A admits the Small Torso Template, then the smallest user at risk can enter the opening in Plane A. The entrapment potential depends on whether or not the smallest user at risk can also enter the opening in Plane B. The Small Torso Template is again used to test this opening as follows: With the plane of the Small Torso Template parallel to the opening in Plane B and with the template's major axis (i.e., the 6.2-inch dimension) parallel to Plane A, does the opening in Plane B admit the Small Torso Template?

NO — If the opening in Plane B does not admit the Small Torso Template, then it is small enough to prevent head or feet first entry by the smallest user at risk. Therefore the depth of penetration into the opening in plane A is insufficient to result in entrapment of the smallest user at risk. The opening meets the recommendations.

YES — If the opening in Plane B admits the Small Torso Template, then the smallest user at risk can enter the opening in Plane B feet first. The entrapment potential depends on whether or not the Large Head Template can exit the opening in Plane A when tested as follows:

Place the Large Head Template in the opening in Plane A with its plane parallel to Plane A. Does the opening in Plane A admit the Large Head Template?

NO — If the opening in Plane A does not admit the Large Head Template, then a child whose torso can enter the opening in Plane A as well as the opening in Plane B, may become entrapped by the head in the opening in Plane A. The opening does not meet the recommendations.

YES — If the opening in Plane A admits the Large Head Template, then the largest user at risk can exit the opening in Plane A. The entrapment potential depends on whether or not the largest user at risk can also exit the opening in Plane B. The Large Head Template is used to test this as follows:

With the plane of the Large Head Template parallel to the opening in Plane B, does the opening in Plane B admit the Large Head Template?

NO — If the opening in Plane B does not admit the Large Head Template, then the largest user at risk cannot exit the opening in Plane B. This presents an entrapment hazard because a child's torso may enter the openings in Plane A and Plane B, and a child's head may pass through the opening in Plane A but become entrapped in the opening in Plane B. The opening does not meet the recommendations.

YES — If the opening in Plane B admits the Large Head Template, then the largest user at risk can exit the opening in Plane B so there is no entrapment hazard. The openings in Plane A and Plane B meet the recommendations.

B6. Non-Rigid Openings — Climbing components such as flexible nets are also a special case for the entrapment tests because the size and shape of openings on this equipment can be altered when force is applied, either intentionally or simply when a child climbs on or falls through the openings. Children are then potentially at risk of entrapment in these distorted openings.

B6.1 Test Fixtures — The procedure for determining conformance to the entrapment recommendations for non-rigid openings requires two three-dimensional test probes which are illustrated in Figures B-7 and B-8 and are applied to an opening in a non-rigid component with

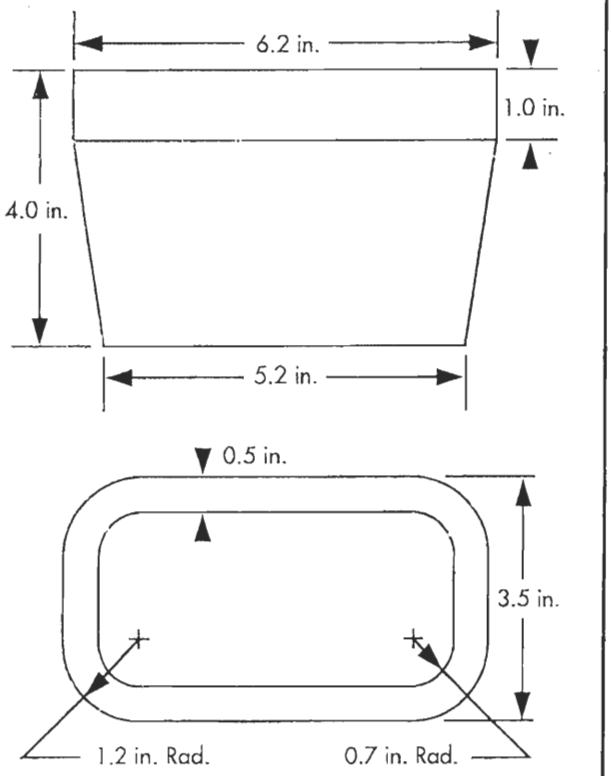


Figure B-7. Small Torso Probe

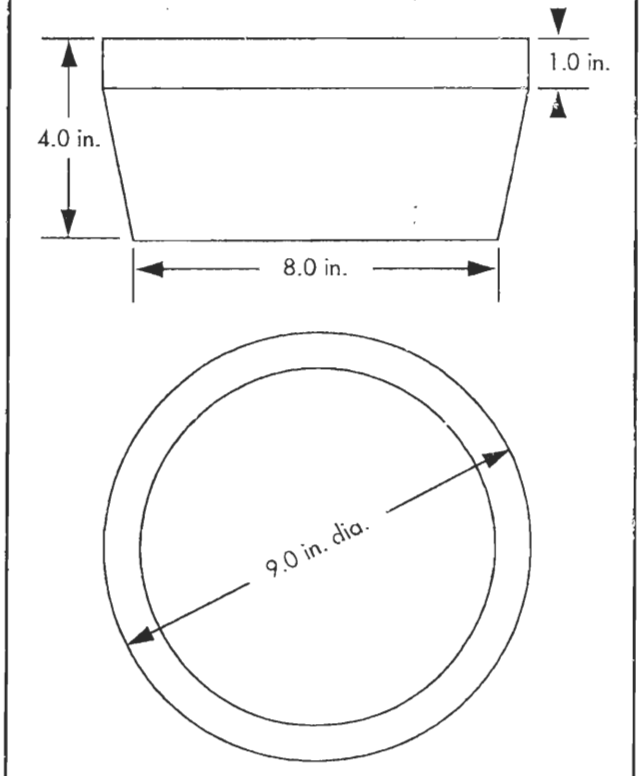


Figure B-8. Large Head Probe

a force of up to 50 pounds. These test probes may be purchased from NRPA [12].

B6.2 Recommendations — When tested in accordance with the procedure in B6.3 below, a non-rigid opening may meet the recommendations in one of two ways:

(1) The opening does not permit complete passage of the Small Torso Probe when tested in accordance with the procedure in B6.3 below.

(2) The opening allows complete passage of the Small Torso Probe and the Large Head Probe when tested in accordance with the procedure in B6.3 below.

A non-rigid opening does not meet the entrapment recommendations if it allows complete passage of the Small Torso Probe but does not allow complete passage of the Large Head Probe.

B6.3 Test Procedure — Place the Small Torso Probe in the opening, tapered end first, with the plane of its base parallel to the plane of the opening. While keeping its base parallel to the plane of the opening, rotate the probe to its most adverse orientation (major axis of probe parallel to major axis of opening). Determine whether the probe can be pushed or pulled through the opening by a force no greater than 50 pounds. If the Small Torso Probe cannot pass completely through the opening, it meets the recommendations.

If the Small Torso Probe passes completely through the opening, place the Large Head Probe in the opening with the plane of its base parallel to the plane of the opening. Again attempt to push or pull the probe through the opening with a force no greater than 50 pounds. If the Large Head Probe can pass completely through the opening, it meets the recommendations.

APPENDIX C
Summary Characteristics of Organic and Inorganic Loose-Fill Materials, and Unitary Synthetic Materials

ORGANIC LOOSE MATERIAL
wood chips, bark mulch, engineered wood fibers, etc.

Fall Absorbing Characteristics
- Cushioning effect depends on air trapped within and between individual particles, and pre-supposes an adequate depth of material. See Table 1 for performance data.

Installation/Maintenance
- Should not be installed over existing hard surfaces (e.g., asphalt, concrete).
- Requires a method of containment (e.g., retaining barrier, excavated pit).
- Requires good drainage underneath material.
- Requires periodic renewal or replacement and continuous maintenance (e.g., leveling, grading, sifting, raking) to maintain appropriate depth and remove foreign matter.

Advantages
- Low initial cost.
- Ease of installation.
- Good drainage.
- Less abrasive than sand.
- Less attractive to cats and dogs (compared to sand).
- Attractive appearance.
- Readily available.

Disadvantages
The following conditions may reduce cushioning potential:
- Rainy weather, high humidity, freezing temperatures.
- With normal use over time, combines with dirt and other foreign materials.
- Over time, decomposes, is pulverized, and compacts requiring replenishment.
- Depth may be reduced by displacement due to children's activities or by material being blown by wind.
- Can be blown or thrown into children's eyes.
- Subject to microbial growth when wet.
- Conceals animal excrement and trash (e.g., broken glass, nails, pencils, and other sharp objects that can cause cut and puncture wounds).
- Spreads easily outside of containment area.
- Can be flammable.
- Subject to theft by neighborhood residents for use as mulch.

INORGANIC LOOSE MATERIAL
sand and gravel

Fall Absorbing Characteristics
- See Table 1 for performance data.

Installation/Maintenance
- Should not be installed over existing hard surfaces (e.g., asphalt, concrete).
- Method of containment needed (e.g., retaining barrier, excavated pit).
- Good drainage required underneath material.
- Requires periodic renewal or replacement and continuous maintenance (e.g., leveling, grading, sifting, raking) to maintain appropriate depth and remove foreign matter.
- Compacted sand should periodically be turned over, loosened, and cleaned.
- Gravel may require periodic break up and removal of hard pan.

Advantages
- Low initial cost.
- Ease of installation.
- Does not pulverize.
- Not ideal for microbial growth.
- Nonflammable.
- Materials are readily available.
- Not susceptible to vandalism except by contamination.
- Gravel is less attractive to animals than sand.

Disadvantages
The following conditions may reduce cushioning potential:
- Rainy weather, high humidity, freezing temperatures.
- With normal use, combines with dirt and other foreign materials.
- Depth may be reduced due to displacement by children's activities and sand may be blown by wind.
- May be blown or thrown into children's eyes.
- May be swallowed.
- Conceals animal excrement and trash (e.g., broken glass, nails, pencils, and other sharp objects that can cause cut and puncture wounds).

Sand
- Spreads easily outside of containment area.
- Small particles bind together and become less cushioning when wet; when thoroughly wet, sand reacts as a rigid material.
- May be tracked out of play area on shoes; abrasive to floor surfaces when tracked indoors; abrasive to plastic materials.
- Adheres to clothing.
- Susceptible to fouling by animals.

Gravel

- Difficult to walk on.
- If displaced onto nearby hard surface pathways, could present a fall hazard.
- Hard pan may form under heavily traveled areas.

INORGANIC LOOSE MATERIAL
shredded tires

Fall Absorbing Characteristics

- See Table 1 for performance data. Manufacturer should be contacted for information on Critical Height of materials when tested according to ASTM F1292.

Installation/Maintenance

- Should not be installed over existing hard surfaces (e.g., asphalt, concrete).
- Method of containment needed (e.g., retaining barrier, excavated pit).
- Good drainage required underneath material.
- Requires continuous maintenance (e.g., leveling, grading, sifting, raking) to maintain appropriate depth and remove foreign matter.

Advantages

- Ease of installation.
- Has superior shock absorbing capability.
- Is not abrasive.
- Less likely to compact than other loose-fill materials.
- Not ideal for microbial growth.
- Does not deteriorate over time.

Disadvantages

- Is flammable.
- Unless treated, may cause soiling of clothing.
- May contain steel wires from steel belted tires.
  Note: *Some manufacturers provide a wire-free guarantee.*
- Depth may be reduced due to displacement by children's activities.
- May be swallowed.

UNITARY SYNTHETIC MATERIALS
rubber or rubber over foam mats or tiles, poured in place urethane and rubber compositions

Fall Absorbing Characteristics

- Manufacturer should be contacted for information on Critical Height of materials when tested according to ASTM F1292.

Installation/Maintenance

- Some unitary materials can be laid directly on hard surfaces such as asphalt or concrete. Others may require expert under-surface preparation and installation by the manufacturer or a local contractor. Materials generally require no additional means of containment. Once installed, the materials require minimal maintenance.

Advantages

- Low maintenance.
- Easy to clean.
- Consistent shock absorbency.
- Material not displaced by children during play activities.
- Generally low life cycle costs.
- Good footing (depends on surface texture).
- Harbor few foreign objects.
- Generally no retaining edges needed.
- Is accessible to the handicapped.

Disadvantages

- Initial cost relatively high.
- Undersurfacing may be critical for thinner materials.
- Often must be used on almost level uniform surfaces.
- May be flammable.
- Subject to vandalism (e.g., ignited, defaced, cut).
- Full rubber tiles may curl up and cause tripping.
- Some designs susceptible to frost damage.

APPENDIX D
Description of Loose-Fill Surfacing Materials in Table 1

1. Wood Chips — Random sized wood chips, twigs, and leaves collected from a wood chipper being fed tree limbs, branches, and brush.

2. Double Shredded Bark Mulch — Similar to shredded mulch commonly used by homeowners to mulch shrubs and flower beds.

3. Engineered Wood Fibers — Relatively uniform sized shredded wood fibers from recognized hardwoods. Sample contained no bark or leaves.

4. Fine Sand — Particles of white sand purchased in bags marked "play sand." The material was passed through wire-cloth screens of different sizes in accordance with ASTM Standard Method C136-84a and yielded the following results:

Screen Size	*Percent Passing Through Screen*
#16	100
#30	98
#50	62
#100	17
#200	0–1

5. Coarse Sand — Sample was obtained from a supplier to the landscaping and construction trades. ASTM C136-84a test results were:

Screen Size	*Percent Passing Through Screen*
#4	98
#8	73
#16	4
#30	1
#50	0–1

6. Fine Gravel — Sample was obtained from a supplier to the residential landscaping market. Gravel particles were rounded and were generally less than 3/8 inch in diameter. ASTM C136-84a test results were:

Screen Size	*Percent Passing Through Screen*
3/8 inch	100
#3 1/2	93
#4	65
#8	8
#16	5
#30	4

7. Medium Gravel — Particles were rounded as found in river washed or tumbled stone. ASTM C136-84a test results were:

Screen Size	*Percent Passing Through Screen*
1/2 inch	100
3/8 inch	80
5/16 inch	58
#3 1/2	20
#4	8
#8	7
#16	3

8. Shredded Tires — No impact attenuation tests have been conducted by CPSC on these materials. The size of the particles and the method by which they are produced may vary from one manufacturer to another. Therefore, consumers seeking to install such materials as a protective surfacing should request test data from the supplier showing the critical height of the material when tested in accordance with ASTM F1292. In addition, a guarantee should be obtained from the supplier that the material is free from steel wires or other contaminants.

APPENDIX E
Noteworthy Changes to the 1997 Handbook

Maximum Equipment Height

- Added maximum height recommendations for horizontal ladders for both preschool-age and school-age children (12.1.5) and a maximum height recommendation for swings for preschool-age children (12.6.2). These recommendations were added to minimize fall injuries.

Surfacing

- Added information on the use of shredded tires as a protective surfacing material (Table 1 and Appendices C and D). CPSC has received many questions on the shock absorbing properties of shredded tires. While CPSC has not conducted tests on these materials, test data obtained from manufacturers indicates they have superior shock absorbing properties and should be considered as a possible protective surfacing material.

Maintenance

- Revised the maintenance checklist at Appendix A to make it easier to keep public playgrounds maintained for greater safety.

Lead Paint

- Added information on how to address playground equipment with leaded paint (8.1). During 1996, it was discovered that a number of older playgrounds had equipment with paint containing a high level of lead. This new information regarding lead in paint was added to draw attention to this problem and provide information on how to eliminate it.

Use Zones

- Revised recommendations on use (fall) zones to permit use (fall) zones of certain equipment to overlap (5.1.1). Requiring a 12 foot separation between individual pieces of stationary equipment is believed to be excessive and has been burdensome to some child care facilities with limited space for a playground. CPSC does not believe that the reduction in use zones will increase the likelihood of injuries resulting from falls.

- Added use zone recommendations for tot swings (5.1.3). The use zone to the front and rear of single-axis swings is based on the maximum trajectory of a child deliberately jumping from a swing. The CPSC recognizes that children using tot swings are unlikely to engage in this behavior and therefore recommends use zones less than those for conventional single-axis swings.

Protrusions

- Added recommendations addressing clothing entanglement hazard of protrusions on slides and protrusions that point upwards (9.4) and a warning concerning drawstring entanglement (9.2). Incidents of clothing and drawstring entanglement on certain protrusions and other configurations were not adequately addressed by the previous general protrusion recommendations in Section 9.2.

Climbing Ropes

- Added recommendation for acceptable climbing ropes (12.1.7). The addition provides a means to determine when a rope that is secured at both ends does not present a strangulation hazard. The previous edition of the handbook did not provide a means to determine when the rope was secured.

Slides

- Changed recommendations for slides with curved chute cross sections (12.4.4). This change harmonizes the recommendations for these slides with the requirements in the ASTM F1487 voluntary standard.

- Added definition for embankment slides and added an exit use zone recommendation (12.4.6). These were added to clarify what is an embankment slide and what use zone is recommended at the exit.

- Added recommendations for roller slides (12.4.9). These were added to harmonize the CPSC recommendations with the ASTM F1487 voluntary standard.

- Added new figure to clarify how to measure slide slope (Fig. 18). This was added to clarify the intent of the previous recommendation.

Swings

- Added recommendation that fiber ropes not be used to suspend swings (12.6.1). Fiber ropes that unraveled during use have been involved in strangulation incidents.

- Added swing seat height recommendations for all swings (12.6.2 & 12.6.3). These recommendations are intended to minimize cratering of loose-fill protective surfacing under the swings.

Seesaws

- Added a recommendation for maximum angle of fulcrum seesaws (12.3). The addition is intended to minimize the likelihood that a child will be propelled forward when the seesaw reaches its maximum height.

Other Noteworthy Changes

- Revised the introduction to state that the guidelines in the handbook do not apply to adult fitness trail equipment, soft contained play equipment, or water play facilities (1). The maximum user of playground equipment covered by the recommendations in this handbook is a 95th percentile 12 year old. Therefore, certain dimensions on adult fitness trail equipment may not apply. Soft contained play equipment is generally designed to prevent falls, therefore, the surfacing and use zone recommendations may not apply. Water play facilities are relatively new and were not considered when the recommendations in the handbook were being drafted.

- Added list of equipment not recommended for preschool-age children and provided a list identifying where to find specific recommendations for preschool-age equipment (6.3). These additions are for the convenience of persons seeking information on playground equipment for preschool-age children.

- Changed the recommendations for the diameter of handgripping components (10.2.1). At the time the recommendations for the 1991 handbook were being drafted ladder rungs were commonly fabricated from 1¼ inch steel pipe having an outside diameter (O.D.) of 1.66 inches. Since that time, steel pipe with an O.D. of 1.5 inches has become readily available and is closer to the optimum size recommended for components that will be grasped by a child to support full body weight.

- Changed the recommendation for handrail height on stairways (10.3.1). Handrail height more appropriate for preschool-age children has been added.

Public Playground Safety Checklist

Here are 10 important tips for parents and community groups to keep in mind to help ensure playground safety.

1 Make sure ***surfaces*** around playground equipment have at least 12 inches of wood chips, mulch, sand, or pea gravel, or are mats made of safety-tested rubber or rubber-like materials.

2 Check that protective ***surfacing extends*** at least 6 feet in all directions from play equipment. For swings, be sure surfacing extends, in back and front, twice the height of the suspending bar.

3 Make sure play structures more than 30 inches high are ***spaced*** at least 9 feet apart.

4 Check for ***dangerous hardware,*** like open "S" hooks or protruding bolt ends.

5 Make sure ***spaces*** that could trap children, such as openings in guardrails or between ladder rungs, measure less than 3.5 inches or more than 9 inches.

6 Check for ***sharp points or edges*** in equipment.

7 Look out for ***tripping hazards,*** like exposed concrete footings, tree stumps, and rocks.

8 Make sure elevated surfaces, like platforms and ramps, have ***guardrails*** to prevent falls.

9 Check ***playgrounds regularly*** to see that equipment and surfacing are in good condition.

10 ***Carefully supervise children*** on playgrounds to make sure they're safe.

For additional copies, write: Playground Checklist, CPSC, Washington, DC 20207; call CPSC's toll-free hotline at 1-800-638-2772; or visit CPSC's web site at www.cpsc.gov.

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Appendix B

Audit Forms

Playground Safety Audit
Child Composite

Playground_____ Date of Audit_____

Address_____ Weather Conditions_____

Inspector_____ Equipment Used_____

Age of Intended User_____

Surfacing (Check all that Apply)

Acceptable

__Wood Mulch

__ Double Shredded Bark Mulch

__ Uniform Wood Chips

__ Fine Sand

__ Coarse Sand

__ Fine Gravel

__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt

__ Concrete

__ Soil and/or Packed Dirt

__ Grass and/or Turf

__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

On the following pages, each violation of safety standards must be assigned a priority rating dependent upon its potential for injury. The following priority values will be used

Priority 1 – Risk of life threatening and/or permanent injuries resulting in permanent disability

Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Child Composite Structure

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Stability	Are footings stable and buried below ground level or covered by protective surfacing anywhere the structure enters the ground?	Yes No		1	4	1 4	
	Is equipment unable to be tipped over?	Yes No		1	4	1 4	
	Is the composite structure located in an uncongested area?	Yes No		3	12	1 2 3 4	
	Do handholds stay in place when grasped?	Yes No		1	4	1 4	
Corrosion	Is there any corrosion or visible rotting?	Yes No		4	16	1 2 3 4	
Hardware	Are any components missing? Make sure all parts of the structure are present and in good working order with no loose play or excessive wear in moving parts.	Yes No		1	4	1 4	
	Are fasteners, connecting or covering devices non-removable without the use of tools? -Bolts, nuts, washers and any other fastening device which can be located anywhere on structure(s), especially at the posts	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Entrapment Angles	Are all angles greater than 55 degrees, exception is a lower leg that is horizontal or projects downward?	Yes No		3	12	1 2 3 4	
Entrapment, Head and Body	Are all opposing surfaces less than 3.5 or greater than 9 inches in distance from each other? -The only exception is the space between the protective surface and the first step	Yes No		3	12	1 2 3 4	
	Do all openings pass entrapment tests using provided probes? -The same exception applies as mentioned above -Be sure to check all openings: between rungs, handrails, stairs....	Yes No		3	12	1 2 3 4	
Protrusions	Are nuts, bolts, and screws recessed, covered or sanded smooth and level?	Yes No		3	12	1 2 3 4	
	Are there any components that fail the protrusions test performed with provided probes? -Protrusions can exist anywhere on the equipment, thoroughly check equipment to insure no protrusions are present	Yes No		3	12	1 2 3 4	
Surfacing	Is there adequate drainage of surfacing material? -I.E. No pooling or clogged drains	Yes No		1	4	1 4	
	Does the depth of the surface material agree with the critical height of the equipment (see pg. 5, table 1 of *The Handbook for Public Playground Safety*)?	Yes No		1	4	1 4	

Child Composite Structure

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Pinch, Crush and Shear Points	Are there any pinch, crush or shearing points? -To determine a pinch, crush or shearing point consider the likelihood of entrapping a body part, and the configuration and closing force of the components.	Yes No		3	12	1 2 3 4	
Sharp Points, Corners, and Edges	Are there any sharp points, corners or edges; check throughout the structure(s)? -Metal edges are rounded. -There are no sharp, rough or raw edges.	Yes No		3	12	1 2 3 4	
	Is the wood smooth and contains no splinters?	Yes No		3	12	1 2 3 4	
Fall Zone	Do all fall zones extend a minimum of 6 feet from all directions from the perimeter of the equipment?	Yes No		1	4	1 4	
	Do the fall zones from the exit region extend a minimum of 6 feet from the end of a slide, or the height of the slide plus 4 feet, whichever is greater?	Yes No		1	4	1 4	
	Do the users have free movement around the equipment beyond the fall zone?	Yes No		1	4	1 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Guardrail An enclosing device around an elevated platform that is intended to prevent inadvertent falls from the platform	5-12 years – do all elevated surfaces greater than 30 inches have a guardrail?	Yes No		3	12	1 2 3 4	
	Is the top surface of a guardrail designed for 5-12 year olds 38 inches high and is the bottom less than or equal to 26 inches above the platform?	Yes No		3	12	1 2 3 4	
Protective Barrier An enclosing device around an platform that is intended to prevent both inadvertent and deliberate attempts to pass through the barrier	5-12 years – do all elevated surfaces of greater than 48 inches have a protective barrier?	Yes No		3	12	1 2 3 4	
	Is the top surface of the barrier designed for 5-12 year olds, 38 inches high and non-climbable?	Yes No		3	12	1 2 3 4	
Stepped Platforms	Is the difference in height between stepped platforms less than or equal to 18 inches?	Yes No		3	12	1 2 3 4	
	If space does not exceed 9 inches, is infill used to reduce the space to less than 3.5 inches?	Yes No		3	12	1 2 3 4	
Rungs and Hand-gripping Components	Do all rungs have a diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Handrails	Are handrails on stairways and step ladders continuous; extending the full length of the access and provided for both sides?	Yes No		2	8	1 2 4	
	Are handrails present regardless of the height of the access? -They are required regardless of height.	Yes No		1	4	1 4	
Handrail Height	Is the vertical distance between the top front edge of a step and a top surface of the handrail between 22 and 38 inches?	Yes No		3	12	1 2 3 4	
	Is the handrail diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Does every transition from an access to a platform have handrails or hand holds?	Yes No		1	4	1 4	
Climbing Ropes	Are vertically suspended climbing ropes securely anchored to a footing which is firmly embedded into ground and covered?	Yes No		1	4	1 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Design	Do accesses which do not have handrails, such as rung ladders, arch or flexible climbers have alternate hand-gripping support at transition?	Yes No		1	4	1 4	
	Do climbers have climbing bars or structural components in the interior of the structure on to which a child may fall more than 18 inches?	Yes No		1	4	1 4	
	Are steps or rungs evenly spaced, including the space between the step or rung and the surface of the platform?	Yes No		3	12	1 2 3 4	
	Do openings between steps or rungs and the underside of the platform present an entrapment hazard? -Test using probes provided	Yes No		1	4	1 2 3 4	
	When risers are closed, do the treads of stairways and step ladders prevent the accumulation of water and debris?	Yes No		4	16	1 4	
	Rung Ladder – Is the slope between 75 and 90 degrees?	Yes No		3	12	1 2 3 4	
	Step Ladder – Is the slope between 50 and 75 degrees?	Yes No		3	12	1 2 3 4	
	Stairway – Is the slope less than 35 degrees?	Yes No		4	16	1 2 3 4	
	Are all platforms within 2 degrees of a horizontal plane?	Yes No		4	16	1 2 3 4	
	Are openings provided that allow for drainage which will prevent rotting from standing water?	Yes No		2	8	1 2 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Give # of Points
Tunnels	Are all components of crawl through tunnels secure and firmly fixed?	Yes No		1	4	1 4	
	Does the tunnel have two safe clear exits?	Yes No		1	4	1 4	
	Is the tunnel is designed to drain properly? -No puddles form within the tunnels	Yes No		3	12	1 2 3 4	
Climbers With Non-Rigid Components	Are connections between ropes, cables, or chains within a climbing grid securely fixed?	Yes No		1	4	1 4	
	Does spacing between the horizontal and vertical climbing grid satisfy all entrapment criteria? -Use provided probes	Yes No		3	12	1 2 3 4	
	Are all flexible climbing devices securely anchored at both ends?	Yes No		1	4	1 4	
	Are all bottom anchoring devices below the level of the playing surface?	Yes No		1	4	1 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Track Riders	Are the lowest portions of the hand grip components between 64- 78 inches above the surface?	Yes No		1	4	1 4	
	Does the underside of the track beam have a minimum clearance of 78 inches above protective surface?	Yes No		1	4	1 4	
Arch Climbers	Is the hand or foot rung diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Does the spacing of rungs on arch climbers follow the guidelines specified by the CPSC? -See page 21 of *The Handbook for Public Playground Safety*	Yes No		3	12	1 2 3 4	
	Does the spacing between the horizontal and vertical components satisfy all entrapment criteria?	Yes No		3	12	1 2 3 4	
	Are arch climbers the sole means of access of the equipment?	Yes No		1	4	1 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Horizontal Ladder and Overhead Rings	Do horizontal overhead ladders and overhead rings exceed the maximum height of 84 inches?	Yes No		3	12	1 2 3 4	
	Is the height of takeoff landing no greater than 36 inches?	Yes No		3	12	1 2 3 4	
	Is the space between adjacent rungs of overhead ladders greater than 9 inches?	Yes No		3	12	1 2 3 4	
	Does the center to center spacing of overhead rungs exceed no more than 15 inches?	Yes No		3	12	1 2 3 4	
	Do overhead rings pass entrapment tests and does chain length exceed no more than 12 inches?	Yes No		3	12	1 2 3 4	
	Are there any cables, ropes or wires, that could cause strangulation which are suspended lower than 7 feet?	Yes No		3	12	1 2 3 4	
	Is the horizontal distance between the landing structure and the first handhold greater than or equal to 10 inches?	Yes No		3	12	1 2 3 4	
	Is the first handhold placed directly above the platform or climbing rungs?	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Sliding Poles	Is the sliding pole continuous with no protruding welds or seams along the sliding surface?	Yes No		3	12	1 2 3 4	
	Does the sliding pole change direction along the sliding portion?	Yes No		3	12	1 2 3 4	
	Is the horizontal distance between the sliding pole and the edge of the platform or other structure used for access between 18 and 20 inches?	Yes No		3	12	1 2 3 4	
	Does the sliding pole extend at least 38 inches above the level of the platform?	Yes No		3	12	1 2 3 4	
	Is the diameter of the sliding pole greater than 1.9 inches?	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Slide Platform	Are there gaps between the platform and the start of the sliding surface?	Yes No		3	12	1 2 3 4	
	Is the width of a slide platform equal to or greater than the width of the slide itself?	Yes No		3	12	1 2 3 4	
	Do guardrails or protective barriers surround the platform on all open sides?	Yes No		2	8	1 2 4	
	Do the guardrails around the slide platform have a minimum height of 4 feet?	Yes No		2	8	1 2 4	
	With the exception of tube slides, are handholds present at the entrance of a slide to help facilitate the transition from sitting to standing?	Yes No		3	12	1 2 3 4	
	Do the slide platform have a minimum length (going back from the slide) of 22 inches?	Yes No		3	12	1 2 3 4	
	Is there some means to promote sitting on the sliding surface (i.e. guardrail or hood that does not encourage climbing)?	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Sliding Surface	Are there gaps between side and sliding surface?	Yes No		3	12	1 2 3 4	
	Do flat open chutes have side barriers of a minimum of 4 inches or greater?	Yes No		3	12	1 2 3 4	
	Is there an average incline of no greater than 30 degrees along the slide?	Yes No		3	12	1 2 3 4	
	If the platform is constructed of metal, is the slide located in the shade or facing away from the sun?	Yes No		3	12	1 2 3 4	
Tube Slides	Is the minimum internal diameter of a tube slide greater than or equal to 23 inches?	Yes No		4	16	1 2 3 4	
	Are the sides of half tube slides no less than one half the width of the slide?	Yes No		3	12	1 2 3 4	
	Are barriers provided or surfaces textured to prevent sliding on top (outside) of tube slides?	Yes No		3	12	1 2 3 4	
Roller Slides	Do the ends of rollers and the structure, or adjacent rollers have a distance no greater than 3/16 of an inch between them?	Yes No		3	12	1 2 3 4	
Slide Exit Region	Do all slides have an exit region that is essential horizontal and has a length greater than or equal to 11 inches?	Yes No		3	12	1 2 3 4	
	Are exit edges rounded or curved; squared, blunt edges are not acceptable?	Yes No		3	12	1 2 3 4	

Playground Score Sheet

Total Points Given _____

Total Possible Points_____

Percent Safe_____

Percent Safe is

Given Points / Possible points X 100

Playground Safety Audit
Tot Composite

Playground_____ Date of Audit_____

Address_____ Weather Conditions_____

Inspector_____ Equipment Used_____

Age of Intended User_____

Surfacing (Check all that Apply)

Acceptable

__Wood Mulch

__ Double Shredded Bark Mulch

__ Uniform Wood Chips

__ Fine Sand

__ Coarse Sand

__ Fine Gravel

__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt

__ Concrete

__ Soil and/or Packed Dirt

__ Grass and/or Turf

__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

On the following pages, each violation of safety standards must be assigned a priority rating dependent upon its potential for injury. The following priority values will be used

Priority 1 – Risk of li-fe threatening and/or permanent injuries resulting in permanent disability

Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Tot Composite Structure

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Stability	Are footings stable and buried below ground level or covered by protective surfacing anywhere the structure enters the ground?	Yes No		1	4	1 4	
	Is equipment unable to be tipped over?	Yes No		1	4	1 4	
	Is the composite structure located in an uncongested area?	Yes No		3	12	1 2 3 4	
	Do handholds stay in place when grasped?	Yes No		1	4	1 4	
Corrosion	Is there any corrosion or visible rotting?	Yes No		4	16	1 2 3 4	
Hardware	Are any components missing? Make sure all parts of the structure present and in good working order with no loose play or excessive wear in moving parts.	Yes No		1	4	1 4	
	Are fasteners, connecting or covering devices non-removable without the use of tools? -Bolts, nuts, washers and any other fastening device, which can be located anywhere on structure(s), especially at the posts.	Yes No		3	12	1 2 3 4	

Tot Composite Structure

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Entrapment Angles	Are all angles greater 55 degrees? The only exception is a lower leg that is horizontal or projects downward?	Yes No		3	12	1 2 3 4	
Entrapment, Head and Body	Are all opposing surfaces less than 3.5 or greater than 9 inches in distance from each other? -The only exception is the space between the protective surface and the first step	Yes No		3	12	1 2 3 4	
	Do all openings pass entrapment tests, using provided probes? -The same exception applies as mentioned above. -Be sure to check all openings: between rungs, handrails, stairs....	Yes No		3	12	1 2 3 4	
Protrusions	Are nuts, bolts, and screws recessed, covered or sanded smooth and level?	Yes No		3	12	1 2 3 4	
	Are there any components that fail the protrusions test, performed with provided probes? -Protrusions can exist anywhere on the equipment, thoroughly check to ensure there are no protrusions.	Yes No		3	12	1 2 3 4	
Surfacing	Is there adequate drainage of surfacing material? -I.E. No pooling or clogged drains	Yes No		1	4	1 4	
	Does the depth of the surface material agree with the critical height of the equipment (see pg. 5, table 1 of *The Handbook for Public Playground Safety*)?	Yes No		1	4	1 4	

Tot Composite Structure

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Pinch, Crush and Shear Points	Are there any pinch, crush or shearing points? -To determine a pinch, crush or shearing point consider the likelihood of entrapping a body part, and the configuration and closing force of the components.	Yes No		3	12	1 2 3 4	
Sharp Points, Corners, and Edges	Are there any sharp points, corners or edges; check throughout the structure(s)? -Metal edges are rounded -There are no sharp, rough or raw edges	Yes No		3	12	1 2 3 4	
	Is the wood smooth and has no splinters?	Yes No		3	12	1 2 3 4	
Fall Zone	Do all fall zones extend a minimum of 6 feet from all directions from the perimeter of the equipment?	Yes No		1	4	1 4	
	Do the fall zones from the exit region extend a minimum of 6 feet from the end of a slide, or the height of the slide plus 4 feet, whichever is greater?	Yes No		1	4	1 4	
	Do the users have free movement around the equipment beyond the fall zone?	Yes No		1	4	1 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Guardrail An enclosing device around an elevated platform that is intended to prevent inadvertent falls from the platform	2-5 years – do all elevated surfaces greater than 20 inches have a guardrail?	Yes No		3	12	1 2 3 4	
	Is the top surface of a guardrail designed for 2-5 year olds 29 inches high and is the bottom less than or equal to 23 inches above the platform?	Yes No		3	12	1 2 3 4	
Protective Barrier An enclosing device around an platform that is intended to prevent both inadvertent and deliberate attempts to pass through the barrier	2-5 years – do all elevated surface of greater than 30 inches have a protective barrier?	Yes No		3	12	1 2 3 4	
	Is the top surface of the barrier designed for 2-5 year olds 29 inches high and non-climbable?	Yes No		3	12	1 2 3 4	
Stepped Platforms	Is the maximum difference in height between stepped platforms 12 inches?	Yes No		3	12	1 2 3 4	
	If space exceeds 9 inches, is infill used to reduce the space to less than 3.5 inches?	Yes No		3	12	1 2 3 4	
Rungs and Hand-gripping Components	Do the rungs have a diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	

Tot Composite Structure

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Handrails	Are handrails on stairways and step ladders continuous, extending the full length of the access and provided for both sides?	Yes No		2	8	1 2 4	
	Are handrails present, regardless of the height of the access? -They are required regardless of height.	Yes No		1	4	1 4	
Handrail Height	Is the vertical distance between the top front edge of a step and a top surface of the handrail between 22 and 38 inches?	Yes No		3	12	1 2 3 4	
	Is the handrail diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Does every transition from an access to a platform have handrails or hand holds?	Yes No		1	4	1 4	
Climbing Ropes	Are vertically suspended climbing ropes securely anchored to a footing, which is firmly embedded into ground and covered?	Yes No		1	4	1 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Design	Do accesses which do not have handrails, such as rung ladders, arch or flexible climbers have alternate hand-gripping support at transition?	Yes No		1	4	1 4	
	Do climbers have climbing bars or structural components in the interior of the structure on to which a child may fall more than 18 inches?	Yes No		1	4	1 4	
	Are steps or rungs evenly spaced, including the space between the step or rung and the surface of the platform?	Yes No		3	12	1 2 3 4	
	Do openings between steps or rungs and the underside of the platform present an entrapment hazard? -Test using probes provided.	Yes No		1	4	1 4	
	When risers are closed, do the treads of stairways and step ladders prevent the accumulation of water and debris?	Yes No		4	16	1 2 3 4	
	Rung Ladder – Is the slope between 75 and 90 degrees?	Yes No		3	12	1 2 3 4	
	Step Ladder – Is the slope between 50 and 75 degrees?	Yes No		3	12	1 2 3 4	
	Stairway – Is the slope less than 35 degrees?	Yes No		4	16	1 2 3 4	
	Are all platforms within 2 degrees of a horizontal plane?	Yes No		4	16	1 2 3 4	
	Are openings provided that allow for drainage which will prevent rotting from standing water?	Yes No		2	8	1 2 4	

Tot Composite Structure

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Give # of Points
Tunnels	Are all components of crawl through tunnels secure and firmly fixed?	Yes No		1	4	1 4	
	Does the tunnel have two safe clear exits?	Yes No		1	4	1 4	
	Is the tunnel designed to drain properly? -No puddles form within the tunnels.	Yes No		3	12	1 2 3 4	
Track Riders	Not recommended for 2-5 years of age.	Yes No		1	4	1 4	
Arch Climbers	Free-standing arch climbers are not recommended for 2 - 5 year olds.	Yes No		1	4	1 4	
Horizontal Ladder and Overhead Rings	Horizontal ladders and overhead rings are not recommended for 2-5 year olds.	Yes No		3	12	1 2 3 4	
Sliding Poles	Not recommended for 2 - 5 year olds.	Yes No		3	12	1 2 3 4	
Climbers With Non-Rigid Components	Flexible climbing grid devices are not recommended as sole access to equipment for children of 2 - 5 years of age.	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Slide Platform	Are there gaps between the platform and the start of the sliding surface?	Yes No		3	12	1 2 3 4	
	Is the width of a slide platform equal to or greater than the width of the slide itself?	Yes No		3	12	1 2 3 4	
	Do the guardrails around the slide platform have a minimum height of 4 feet?	Yes No		2	8	1 2 4	
	With the exception of tube slides, are handholds present at the entrance of a slide to help facilitate the transition from sitting to standing?	Yes No		3	12	1 2 3 4	
	Do the slide platforms have a minimum length (going back from the slide) of 22 inches?	Yes No		3	12	1 2 3 4	
	Is there some means to promote sitting on the sliding surface (i.e. guardrail or hood that does not encourage climbing)?	Yes No		3	12	1 2 3 4	

Tot Composite Structure

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Sliding Surface	Are there gaps between side and sliding surface?	Yes No		3	12	1 2 3 4	
	Do flat open chutes have side barriers of a minimum of 4 inches or greater?	Yes No		3	12	1 2 3 4	
	Is there an average incline of no greater than 30 degrees along the slide?	Yes No		3	12	1 2 3 4	
	If the platform is constructed of metal, is the slide located in the shade or facing away from the sun?	Yes No		3	12	1 2 3 4	
Tube Slides	Is the minimum internal diameter of a tube slide equal to or greater than 23 inches?	Yes No		4	16	1 2 3 4	
	Are the sides of half tube slides no less than one half the width of the slide?	Yes No		3	12	1 2 3 4	
	Are barriers provided or surfaces textured to prevent sliding on top (outside) of tube slides?	Yes No		3	12	1 2 3 4	
Roller Slides	Do the ends of rollers and the structure, or adjacent rollers have a distance no greater than 3/16 of an inch between them?	Yes No		3	12	1 2 3 4	
Slide Exit Region	Do all slides have an exit region that is essential horizontal and has a length greater than or equal to 11 inches?	Yes No		3	12	1 2 3 4	
	Are exit edges rounded or curved; squared, blunt edges are not acceptable?	Yes No		3	12	1 2 3 4	

Playground Score Sheet

Total Points Given _____

Total Possible Points_____

Percent Safe_____

Percent Safe is

Given Points / Possible points X 100

Playground Safety Audit
Swings

Playground_____ Date of Audit_____

Address_____ Weather Conditions_____

Inspector_____ Equipment Used_____

Age of Intended User_____

Surfacing (Check all that Apply)

Acceptable

__Wood Mulch

__ Double Shredded Bark Mulch

__ Uniform Wood Chips

__ Fine Sand

__ Coarse Sand

__ Fine Gravel

__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt

__ Concrete

__ Soil and/or Packed Dirt

__ Grass and/or Turf

__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

On the following pages, each violation of safety standards must be assigned a priority rating dependent upon its potential for injury. The following priority values will be used

Priority 1 – Risk of life threatening and/or permanent injuries resulting in permanent disability

Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Stability	Has the equipment shifted or become bent?	Yes No		3	12	1 2 3 4	
	Is it possible to tip or push over equipment?	Yes No		1	4	1 4	
	Are the footings stable and buried below ground level and covered by protective surfacing?	Yes No		1	4	1 4	
Corrosion and Wear	Is there rotting, corrosion, or visible wear on equipment? -S-hooks, chains, poles.....	Yes No		3	12	1 2 3 4	
Hardware	Are any components missing; all parts of the structure should be present and in good working order	Yes No		1	4	1 4	
	Are pipes and tubing capped or plugged?	Yes No		3	12	1 2 3 4	
	Are fasteners, connecting or covering devices able to be removed without the use of tools?	Yes No		3	12	1 2 3 4	

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Sharp Points, Corners, and Edges	Are there any sharp points, corners or edges? -Metal edges should be rolled back or capped -Seat edges should be smoothly finished or rounded -No other sharp, rough or raw edges present	Yes No		3	12	1 2 3 4	
	Is the wood smooth and has no splinters?	Yes No		4	16	1 2 3 4	
Protrusions	Are there more that 2 threads exposed on any bolt?	Yes No		3	12	1 2 3 4	
	Are all nuts, bolts, and screws recessed, covered or sanded smooth and level?	Yes No		3	12	1 2 3 4	
	Are there components that fail the protrusion tests on any accessible part of the structure? -Protrusions can exist anywhere on the equipment; thoroughly check the equipment to ensure no protrusions are present.	Yes No		3	12	1 2 3 4	
Surfacing	Is there adequate drainage of surfacing material? -No pooling present -Slopes away from equipment -No clogged drains	Yes No		1	4	1 4	
	Does the depth of the surface material agree with the critical height of the equipment?	Yes No		1	4	1 4	

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Minimum Clearance	Is the minimum clearance between the seating surface of the tire and the uprights of the supporting structure 30 inches when the tire is in a position closest to the support structure?	Yes No		3	12	1 2 3 4	
Entrapment Angles	Are all angles greater 55 than degrees unless the lower leg is horizontal or projects downward?	Yes No		3	12	1 2 3 4	
Entrapment, Head and Body	Are all opposing surfaces less than 3.5 or greater than 9 inches in distance from each other? -The only exception is the distance between the protective surface and first step	Yes No		3	12	1 2 3 4	
	Do all openings pass the entrapment tests using the provided probes? -Same exception applies as mentioned above -Check all possible openings in structure	Yes No		3	12	1 2 3 4	
Fall Zones	Do the fall zones must extend a minimum of 6 feet from all directions from the perimeter of the equipment?	Yes No		1	4	1 4	
	Single-axis swings – Is there a minimum distance of two times the pivot point in front and behind the swing?	Yes No		1	4	1 4	
	Multi-axis tire swing – Is there a minimum distance in all directions of 6 feet + the length of the supporting member?	Yes No		1	4	1 4	
	Do users have free movement around the equipment beyond the fall zone?	Yes No		1	4	1 4	

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Location	Are swings located away from other equipment and activities, and are not overlapping any other fall zones?	Yes No		3	12	1 2 3 4	
	Are all swings located away from circular paths and near the periphery of the playground?	Yes No		3	12	1 2 3 4	
Structure Design	Do all single access swings have no more than two swings per bay?	Yes No		1	4	1 4	
	Are single access swings attached to a composite structure?	Yes No		1	4	1 4	
	Do A-frame support structures have horizontal crossbars?	Yes No		3	12	1 2 3 4	
	Are tot swings suspended from structures separate from other swings or suspended in a different bay of the same structure?	Yes No		1	4	1 4	

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Seat Design and Placement	Are all S-hooks completely closed?	Yes No		3	12	1 2 3 4	
	Do tot seats have support on all sides that do not present a strangulation hazard?	Yes No		1	4	1 4	
	Are all seats of the same type level to prevent collisions?	Yes No		4	16	1 2 3 4	
	Is there a minimum of 24 inches of clearance between seats?	Yes No		1	4	1 4	
	Is there a minimum of 30 inches clearance between the seat and structure?	Yes No		1	4	1 2 3 4	
	Is the vertical distance from underside of occupancy seat and protective surface at least 12 inches?	Yes No		4	16	1 2 3 4	
	Are wood or metal seats used?	Yes No		1	4	1 4	
	Are the seats designed for only one user at a time?	Yes No		3	12	1 2 3 4	
	Flying animal, multiple occupancy, rope swings, and trapeze bars should not be present.	Yes No		1	4	1 4	

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Multi Axis Tire Swings	Are there steel belted radials exposed; closely examine to make sure there are none?	Yes No		3	12	1 2 3 4	
	Are all S-hooks completely closed?	Yes No		3	12	1 2 3 4	
	Are there any accessible pinch, crush or shear points?	Yes No		3	12	1 2 3 4	
	Due to added stress of rotation, inspect all hanger mechanisms; Are they worn?	Yes No		3	12	1 2 3 4	
	Are drain holes provided to prevent pooling and excessive water?	Yes No		4	16	1 2 3 4	
	Are heavy truck tires used (they should not be)?	Yes No		1	4	1 4	
	Are tire swings suspended solely in the structure; no other swings should be present?	Yes No		1	4	1 4	

Playground Score Sheet

Total Points Given _____

Total Possible Points_____

Percent Safe_____

Percent Safe is

Given Points / Possible points X 100

Playground Safety Audit
Slides

Playground_____ Date of Audit_____

Address_____ Weather Conditions_____

Inspector_____ Equipment Used_____

Age of Intended User_____

Surfacing (Check all that Apply)

Acceptable

__Wood Mulch

__ Double Shredded Bark Mulch

__ Uniform Wood Chips

__ Fine Sand

__ Coarse Sand

__ Fine Gravel

__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt

__ Concrete

__ Soil and/or Packed Dirt

__ Grass and/or Turf

__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

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Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Slides

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Stability	Are the slides located in an uncongested area, away from other equipment?	Yes No		3	12	1 2 3 4	
	Has the equipment shifted of become bent?	Yes No		3	12	1 2 3 4	
	Is the equipment sturdy and cannot be pushed over?	Yes No		1	4	1 4	
	Are the footings stable and buried below ground level or covered by protective surfacing?	Yes No		1	4	1 4	
Slide Access	Does the step ladder have a slope between 50 and 75 degrees?	Yes No		3	12	1 2 3 4	
	Do the stairways have a slope of less than 35 degrees?	Yes No		3	12	1 2 3 4	
	Are the ladder rung diameters between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Are the hand rail diameters between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Are the handrails continuous and have a height between 22 and 38 inches?	Yes No		3	12	1 2 3 4	

Slides

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Slide Platform	Are there gaps between the platform and the start of the sliding surface?	Yes No		3	12	1 2 3 4	
	Is the platform horizontal?	Yes No		3	12	1 2 3 4	
	Is the width of a slide platform equal to or greater than the width of the slide itself?	Yes No		3	12	1 2 3 4	
	Do guardrails or protective barriers surround the platform on all open sides?	Yes No		2	8	1 2 4	
	Do the guardrails around the slide platform have a minimum height of 4 feet?	Yes No		2	8	1 2 4	
	With the exception of tube slides, are handholds present at the entrance of a slide to help facilitate the transition from sitting to standing?	Yes No		3	12	1 2 3 4	
	Does the slide platform have a minimum length (going back from the slide) of 22 inches?	Yes No		3	12	1 2 3 4	
	Is there some means to promote sitting on the sliding surface (i.e. guardrail or hood that does not encourage climbing)?	Yes No		3	12	1 2 3 4	

Slides

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Sliding Surface	Are there gaps between side and sliding surface?	Yes No		3	12	1 2 3 4	
	Do flat open chutes have side barriers of a minimum of 4 inches or greater?	Yes No		3	12	1 2 3 4	
	Is there an average incline of no greater than 30 degrees along the slide?	Yes No		3	12	1 2 3 4	
	If the surface is constructed of metal is the slide located in the shade or facing away from the sun?	Yes No		3	12	1 2 3 4	
Tube Slides	Is the minimum internal diameter of a tube slide equal to or greater than 23 inches?	Yes No		4	16	1 2 3 4	
	Are the sides of half tube slides no less than one half the width of the slide?	Yes No		3	12	1 2 3 4	
	Are barriers provided or surfaces textured to prevent sliding on top (outside) of tube slides?	Yes No		3	12	1 2 3 4	
Roller Slides	Do the ends of rollers and the structure, or adjacent rollers have a distance no greater than 3/16 of an inch between them?	Yes No		3	12	1 2 3 4	
Exit Region	Do all slides have an exit region that is essential horizontal and has a length greater than or equal to 11 inches?	Yes No		3	12	1 2 3 4	
	Are exit edges rounded or curved; squared, blunt edges are not acceptable?	Yes No		3	12	1 2 3 4	

Slides

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Guardrail An enclosing device around an elevated platform that is intended to prevent inadvertent falls from the platform	2-5 years – Do elevated surfaces greater than 20 inches have a guardrail?	Yes No		1	4	1 4	
	Is the top surface of a guardrail designed for 2-5 years, 29 inches high and the bottom no more that 23 inches above the platform?	Yes No		1	4	1 4	
	5-12 years -Do elevated surfaces greater than 30 inches have a guardrail?	Yes No		1	4	1 4	
	Is the top surface of a guardrail designed for 5-12 years, 38 inches high and the bottom no more than 26 inches above the platform?	Yes No		1	4	1 4	
Protective Barrier An enclosing device around an elevated platform that is intended to prevent both inadvertent and deliberate attempts to pass through the barrier	2-5 years – Do elevated surface of greater than 30 inches have a protective barrier?	Yes No		1	4	1 4	
	Is the top surface of a barrier, designed for 2-5 years, 29 inches high and non-climbable?	Yes No		1	4	1 4	
	5-12 years – Do elevated surface of greater than 48 inches have a protective barrier?	Yes No		1	4	1 4	
	Is the top surface of a barrier, designed for 5-12 years, 38 inches high and non-climbable?	Yes No		1	4	1 4	

Slides

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Pinch, Crush and Shearing Points	Is all equipment is free of sharp points? - There are no sharp points, rough or raw edges at the ends of the slide - The slide end is either rolled back, rounded or capped - There no other sharp points located on the structure	Yes No		3	12	1 2 3 4	
	Are there any pinch, crush or shearing points? -To determine a pinch, crush or shearing point consider the likelihood of entrapping a body part, and the configuration and closing force of the components	Yes No		3	12	1 2 3 4	
	Is all wood smooth and have no splinters?	Yes No		3	12	1 2 3 4	
Protrusions Protrusions are a critical issue when inspecting slides, because they can cause strangulation.	Are all nuts, bolts and screws recessed, covered or sanded smooth and level?	Yes No		3	12	1 2 3 4	
	There must be no protrusions - No components fail the protrusion test	Yes No		3	12	1 2 3 4	
Hardware	Are all fasteners tight and not able to be loosened without the use of tools?	Yes No		3	12	1 2 3 4	
	Are there any components are missing? Be sure all parts of the structure are present and in good working order with no loose play or excessive wear in moving parts	Yes No		1	4	1 4	

Slides

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Corrosion	Is there corrosion or visible rotting present?	Yes No		4	16	1 2 3 4	
Surfacing	Is there adequate drainage of surfacing material? -No pools present -No clogged drains -Surface slopes away from equipment	Yes No		1	4	1 4	
	Does the depth of the surface material agree with the critical height of the equipment (see pg. 5, table 1 of *The Handbook for Public Playground Safety*)?	Yes No		1	4	1 4	
Entrapment Angles	Are all angles greater than 55 degrees unless lower leg is horizontal or projects downward?	Yes No		3	12	1 2 3 4	
Entrapment, Head and Body	There are no partially bound openings?	Yes No		3	12	1 2 3 4	
	Do all openings pass entrapment tests, regardless of distance from protective surface? -The only exception is the space between the protective surface and the first step -Check all openings: steps, handrails, rungs.....	Yes No		3	12	1 2 3 4	

Slides

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Fall Zone	Do all fall zones extend a minimum of 6 feet from all directions from the perimeter of the equipment?	Yes No		1	4	1 4	
	Do the fall zones from the exit region extend a minimum of 6 feet from the end of a slide, or the height of the slide plus 4 feet, whichever is greater?	Yes No		1	4	1 4	
	Do the users have free movement around the equipment beyond the fall zone?	Yes No		1	4	1 4	

Playground Score Sheet

Total Points Given _____

Total Possible Points_____

Percent Safe_____

Percent Safe is

Given Points / Possible points X 100

Playground Safety Audit
Climbing Equipment

Playground_____ Date of Audit_____

Address_____ Weather Conditions_____

Inspector_____ Equipment Used_____

Age of Intended User_____

Surfacing (Check all that Apply)

Acceptable

__Wood Mulch

__ Double Shredded Bark Mulch

__ Uniform Wood Chips

__ Fine Sand

__ Coarse Sand

__ Fine Gravel

__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt

__ Concrete

__ Soil and/or Packed Dirt

__ Grass and/or Turf

__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

On the following pages, each violation of safety standards must be assigned a priority rating dependent upon its potential for injury. The following priority values will be used

Priority 1 – Risk of li-fe threatening and/or permanent injuries resulting in permanent disability

Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Climbing Equipment

Standards		Compliance	Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Stability	Are footings stable and buried below ground level or covered by protective surfacing anywhere the structure enters the ground?	Yes No		1	4	1 4	
	Is equipment unable to be tipped over?	Yes No		1	4	1 4	
	Do handholds stay in place when grasped?	Yes No		1	4	1 4	
Corrosion	Is there any corrosion or visible rotting?	Yes No		4	16	1 2 3 4	
Hardware	Are any components missing? Be sure all parts of the structure present and in good working order and with no loose play or excessive wear in moving parts	Yes No		1	4	1 4	
	Are fasteners, connecting or covering devices non-removable without the use of tools? -Bolts, nuts, washers and any other fastening device, which can be located anywhere on structure(s), especially at the posts	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Surfacing	Is there adequate drainage of surfacing material? -I.E. No pooling or clogged drains	Yes No		1	4	1 4	
	Does the depth of the surface material agree with the critical height of the equipment (see pg. 5, table 1 of the *Handbook for Public Playground Safety*)?	Yes No		1	4	1 4	
Tunnels	Are all components of crawl through tunnels secure and firmly fixed?	Yes No		1	4	1 4	
	Does the tunnel have two safe clear exits?	Yes No		1	4	1 4	
	Is the tunnel is designed to drain properly? -No puddles form within the tunnels	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Climbers With Non-Rigid Components	Are connections between ropes, cables, or chains within the climbing grid securely fixed?	Yes No		1	4	1 4	
	Does spacing between the horizontal and vertical climbing grid satisfy all entrapment criteria? -Use provided probes	Yes No		3	12	1 2 3 4	
	Flexible climbing grid devices are not recommended as sole access to equipment for children of 2 - 5 years of age.	Yes No		3	12	1 2 3 4	
	Are all flexible climbing devices securely anchored at both ends?	Yes No		1	4	1 4	
	Are bottom anchoring devices below the level of the playing surface?	Yes No		1	4	1 4	
Track Riders	Not recommended for 2-5 years of age.	Yes No		1	4	1 4	
	Are the lowest portions of the hand grip components between 64- 78 inches above the surface?	Yes No		1	4	1 4	
	Does the underside of the track beam have a minimum clearance of 78 inches above protective surface?	Yes No		1	4	1 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Arch Climbers	Free-standing arch climbers are not recommended for 2 - 5 year olds.	Yes No		1	4	1 4	
	Is the hand or foot rung diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Does the spacing of rungs on arch climbers follow the guidelines specified by the CPSC? -See page 21 of *The Handbook for Public Playground Safety*	Yes No		3	12	1 2 3 4	
	Does the spacing between the horizontal and vertical components satisfy all entrapment criteria?	Yes No		3	12	1 2 3 4	
	Are arch climbers the sole means to access of the equipment?	Yes No		1	4	1 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Horizontal Ladder and Overhead Rings	Must be used only by 5 - 12 year olds.	Yes No		3	12	1 2 3 4	
	Do horizontal overhead ladders and overhead rings exceed a height of 84 inches?	Yes No		3	12	1 2 3 4	
	Is the maximum height of takeoff landing no greater than 36 inches?	Yes No		3	12	1 2 3 4	
	Is the space between adjacent rungs of overhead ladders no greater than 9 inches?	Yes No		3	12	1 2 3 4	
	Does the center to center spacing of overhead rungs exceed 15 inches?	Yes No		3	12	1 2 3 4	
	Do overhead rings pass entrapment tests and does chain length exceed 12 inches?	Yes No		3	12	1 2 3 4	
	Are there any cables, ropes or wires, that could cause strangulation suspended lower than 7 feet?	Yes No		3	12	1 2 3 4	
	Does the horizontal distance between landing structure to first handhold exceed the minimum of 10 inches?	Yes No		3	12	1 2 3 4	
	Is the first handhold placed directly above the platform or climbing rungs?	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Give # of Points
Sliding Poles	Not recommended for 2 - 5 year olds.	Yes No		3	12	1 2 3 4	
	Is the sliding pole continuous with no protruding welds or seams along the sliding surface?	Yes No		3	12	1 2 3 4	
	Does the sliding pole change direction along the sliding portion?	Yes No		3	12	1 2 3 4	
	Is the horizontal distance between the sliding pole and the edge of the platform or other structure used for access between 18 and 20 inches?	Yes No		3	12	1 2 3 4	
	Does the sliding pole extend at least 38 inches above the level of the platform?	Yes No		3	12	1 2 3 4	
	Is the diameter of the sliding pole greater than 1.9 inches?	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Climbing Ropes	Are vertically suspended climbing ropes securely anchored to a footing, which is firmly embedded into ground and covered?	Yes No		1	4	1 4	
Sharp Points, Corners, and Edges	Are there any sharp points, corners or edges, check throughout the structure(s)? -Metal edges are rounded -There are no sharp, rough or raw edges	Yes No		3	12	1 2 3 4	
	Is the wood smooth and has no splinters?	Yes No		3	12	1 2 3 4	
Protrusions	Are nuts, bolts, and screws recessed, covered or sanded smooth and level?	Yes No		3	12	1 2 3 4	
	Are there any components that fail the protrusions test, performed with provided probes? -Protrusions can exist anywhere on the equipment, thoroughly check equipment to insure no protrusions are present.	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Entrapment, Head and Body	Are all opposing surfaces less than 3.5 or greater than 9 inches in distance from each other? -The only exception is the space between the protective surface and the first step	Yes No		3	12	1 2 3 4	
	Do all openings pass entrapment tests, using provided probes? -The same exception applies as mentioned above -Be sure to check all openings: between rungs, handrails, stairs....	Yes No		3	12	1 2 3 4	
Entrapment Angles	Are all angles greater 55 degrees unless lower leg is horizontal or projects downward?	Yes No		3	12	1 2 3 4	
Design	Do accesses which do not have handrails, such as rung ladders, arch or flexible climbers have alternate hand-gripping support at transition?	Yes No		1	4	1 4	
	Do climbers have climbing bars or structural components in the interior of the structure on to which a child may fall more than 18 inches?	Yes No		1	4	1 4	
	Do climbing devices intended for 2 - 5 year olds must offer a non-challenging exit?	Yes No		3	12	1 2 3 4	
Fall Zones	Do Fall zones extend a minimum of 6 feet in all directions from the perimeter of the equipment?	Yes No		1	4	1 4	

Playground Score Sheet

Total Points Given _____

Total Possible Points_____

Percent Safe_____

Percent Safe is

Given Points / Possible points X 100

Playground Safety Audit
Platforms

Playground_____ Date of Audit_____

Address_____ Weather Conditions_____

Inspector_____ Equipment Used_____

Age of Intended User_____

Surfacing (Check all that Apply)

Acceptable

__Wood Mulch

__ Double Shredded Bark Mulch

__ Uniform Wood Chips

__ Fine Sand

__ Coarse Sand

__ Fine Gravel

__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt

__ Concrete

__ Soil and/or Packed Dirt

__ Grass and/or Turf

__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

On the following pages, each violation of safety standards must be assigned a priority rating dependent upon its potential for injury. The following priority values will be used

Priority 1 – Risk of life threatening and/or permanent injuries resulting in permanent disability

Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Platforms

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Design	Are all platforms within 2 degrees of a horizontal plane?	Yes No		4	16	1 2 3 4	
	Are openings provided that allow for drainage which will prevent rotting from standing water?	Yes No		2	8	1 2 4	
Guardrail An enclosing device around an elevated platform that is intended to prevent inadvertent falls from the platform	2-5 years – do all elevated surfaces greater than 20 inches have a guardrail?	Yes No		3	12	1 2 3 4	
	Is the top surface of a guardrail designed for 2-5 year olds 29 inches high and is the bottom less than or equal to 23 inches above the platform?	Yes No		3	12	1 2 3 4	
	5-12 years – do all elevated surfaces greater than 30 inches have a guardrail?	Yes No		3	12	1 2 3 4	
	Is the top surface of a guardrail designed for 5-12 year olds 38 inches high and is the bottom less than or equal to 26 inches above the platform?	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Protective Barrier An enclosing device around an platform that is intended to prevent both inadvertent and deliberate attempts to pass through the barrier	2-5 years – do all elevated surface of greater than 30 inches have a protective barrier?	Yes No		3	12	1 2 3 4	
	Is the top surface of the barrier designed for 2-5 year olds 29 inches high and non-climbable?	Yes No		3	12	1 2 3 4	
	5-12 years – do all elevated surface of greater than 48 inches have a protective barrier?	Yes No		3	12	1 2 3 4	
	Is the top surface of the barrier designed for 5-12 year olds 38 inches high and non-climbable?	Yes No		3	12	1 2 3 4	
Stepped Platforms	Is the maximum difference in height between stepped platforms 12 inches for 2 - 5 year olds and 18 inches for 5 - 12 year olds?	Yes No		3	12	1 2 3 4	
	If space exceeds 9 inches, is infill used to reduce the space to less than 3.5 inches?	Yes No		3	12	1 2 3 4	
Entrapment, Head and Body	Are all opposing surfaces less than 3.5 or greater than 9 inches in distance from each other? -The only exception to this is the distance between the protective barrier and the first step	Yes No		1	4	1 4	
	Do all openings pass the entrapment tests performed using the provided probes? -Be sure to check any and all openings: between handrails, steps....	Yes No		1	4	1 4	

Platforms

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Entrapment Angles	Are all angles greater 55 degrees unless lower leg is horizontal or projects downward?	Yes No		3	12	1 2 3 4	
Protrusions	Are all nuts, bolts and screws sanded, recessed, covered or smoothed and level?	Yes No		3	12	1 2 3 4	
	Are there any components that fail the protrusion tests on any accessible part of the equipment? -Protrusions can exist anywhere on equipment, thoroughly check the equipment to insure that there are no protrusions present	Yes No		3	12	1 2 3 4	
Sharp Points, Corners, and Edges	Are there any sharp points, corners or edges anywhere on the equipment?	Yes No		1	4	1 4	
	Are there any open holes in the equipment forming traps?	Yes No		1	4	1 4	
	Is all wood smoothed and has no splinters?	Yes No		3	12	1 2 3 4	
Hardware	Are any components missing? Make sure all parts of the structure are present and in good working order with no loose play or excessive wear in moving parts.	Yes No		1	4	1 4	
	Check all fasteners, connecting or covering devices to assure that they can not be removed without the use of tools.	Yes No		2	8	1 2 4	

Playground Score Sheet

Total Points Given _____

Total Possible Points_____

Percent Safe_____

Percent Safe is

Given Points / Possible points X 100

Playground Safety Audit
Rotating and Rocking Equipment

Playground_____ Date of Audit_____

Address_____ Weather Conditions_____

Inspector_____ Equipment Used_____

Age of Intended User_____

Surfacing (Check all that Apply)

Acceptable

__Wood Mulch

__ Double Shredded Bark Mulch

__ Uniform Wood Chips

__ Fine Sand

__ Coarse Sand

__ Fine Gravel

__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt

__ Concrete

__ Soil and/or Packed Dirt

__ Grass and/or Turf

__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

On the following pages, each violation of safety standards must be assigned a priority rating dependent upon its potential for injury. The following priority values will be used

Priority 1 – Risk of life threatening and/or permanent injuries resulting in permanent disability

Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Rotating and Rocking

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Stability	Has any equipment shifted or become bent?	Yes No		3	12	1 2 3 4	
	Can the equipment be tipped or knocked over?	Yes No		1	4	1 4	
	Are footings stable and buried below ground level or covered by protective surfacing?	Yes No		1	4	1 4	
Hardware	Are there any components of the structure that are missing? Make sure all parts are present and in good working order, with no loose play or excessive wear in moving parts	Yes No		1	4	1 4	
	Are all fasteners, connecting or covering devices not removable without the use of tools?	Yes No		3	12	1 2 3 4	
Corrosion	Is there any corrosion or visible rotting?	Yes No		4	16	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Merry Go Rounds	Is the rotating platform continuous and approximately circular with openings that will allow no greater than a 5/16 inch rod to fit through?	Yes No		3	12	1 2 3 4	
	Is the difference between the minimum and maximum radii of a non circular platform greater than two inches? (see *Handbook for Public Playground Safety*, pg 23, figure 15)	Yes No		3	12	1 2 3 4	
	Are any components of the apparatus, including the handgrips, extending beyond the perimeter of the platform?	Yes No		3	12	1 2 3 4	
	Are there handgrips provided possessing a diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Are there any accessible shearing or crushing mechanisms present in the undercarriage? Also make sure the rotating platform has no sharp edges	Yes No		3	12	1 2 3 4	
	Is the underside of the merry-go-round no more than 14 inches from the protective surface? Also make sure there is no less than 9 inches between the underside of merry-go-round and protective surface.	Yes No		3	12	1 2 3 4	
	Is there a means to limit the peripheral speed of rotation to a maximum speed of 13 ft/sec?	Yes No		3	12	1 2 3 4	
	Is there any oscillatory (up and down) motion when rotating?	Yes No		2	8	1 2 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
See Saws	Not recommended for 2-5 year olds unless equipped with a spring centering device	Yes No		3	12	1 2 3 4	
	Are partial car tires or some other shock absorbing material embedded in the ground underneath the seat of the fulcrum see saw, or secured on the underside of the seats?	Yes No		3	12	1 2 3 4	
	Are handholds provided at each seating position for gripping with both hands? Also make sure they do not turn when grasped.	Yes No		3	12	1 2 3 4	
	Are the diameters of handgrips between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Is the seesaw seat surface able to reach no greater than 5 feet above the protective surface?	Yes No		3	12	1 2 3 4	
	Is the fulcrum fixed and enclosed or otherwise designed to prevent pinching?	Yes No		3	12	1 2 3 4	
	Do any handholds protrude beyond the side of the seat? Make sure that they are a minimum of 3 inches for 1 hand grip and a minimum of 6 inches for 2 hand grips.	Yes No		3	12	1 2 3 4	
	Is the maximum angle between the horizontal protective surface and see-saw 25 degrees?	Yes No		4	16	1 2 3 4	
	Are there any footrests on the fulcrum see-saws? Not permitted unless the see-saw is equipped with a spring centering device.	Yes No		4	16	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Spring Rocking Equipment	Does the seat design minimize the likely hood of the rocker being used by more than the intended number of users?	Yes No		4	16	1 2 3 4	
	Is the seat height of spring rocker equipment between 14 – 28 inches?	Yes No		4	16	1 2 3 4	
	Is each seating position equipped with handgrips and foot rests?	Yes No		3	12	1 2 3 4	
	Do all hand holds and foot rests stay in place when grasped?	Yes No		3	12	1 2 3 4	
	Are the diameters of the handgrips between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Does the spring pinch the child's hands or feet between coiled or between the spring and any part of the rocker?	Yes No		2	8	1 2 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Pinch Crush and Shearing Points	Are there any sharp points, corners or edges on the equipment?	Yes No		3	12	1 2 3 4	
	Are there any holes present in the equipment that could cause an entrapment hazard?	Yes No		1	4	1 4	
	Is all wood smooth and free of splinters?	Yes No		4	16	1 2 3 4	
Protrusions	Are all nuts, bolts and screws recessed, covered or sanded smooth and level?	Yes No		3	12	1 2 3 4	
	Are there any protrusions that fail the protrusion test? Look For: Foot Rests Handholds Underside of Merry-Go-Round	Yes No		3	12	1 2 3 4	

Rotating and Rocking

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Surfacing	Is there adequate drainage of surfacing material?	Yes No		1	4	1 4	
	Does the depth of the surface material agree with the critical height of the equipment? (see pg.5, table 1 of *The Handbook for Public Playground Safety*)	Yes No		1	4	1 4	
Entrapment Angles	Are there any "V" entrapment angles present?	Yes No		3	12	1 2 3 4	
	Are all angles greater than 55 degrees unless the lower leg is horizontal or projects downward?	Yes No		3	12	1 2 3 4	
Entrapment, Head and Body	Are all opposing surfaces less than 3.5 or greater than 9 inches in distance from each other?	Yes No		3	12	1 2 3 4	
	Are there any partially bound openings present?	Yes No		3	12	1 2 3 4	
	Make sure to test all openings using the provided probes.	Yes No		3	12	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Fall Zones	Merry-go-rounds – Does the fall zone extend 6 feet beyond perimeter of the platform?	Yes No		1	4	1 4	
	See-saws – Does the fall zone extend 6 feet from beyond the perimeter of the equipment?	Yes No		1	4	1 4	
	Spring rocker equipment – Does the fall zone extend a minimum of 6 feet from the "at rest" perimeter of the equipment?	Yes No		1	4	1 4	
	It is acceptable for adjacent spring rockers with a maximum seat height of 24 inches to share the same fall zone.	Yes No		3	12	1 2 3 4	
	Is there space provided to allow for the free movement of non users?	Yes No		3	12	1 2 3 4	

Playground Score Sheet

Total Points Given _____

Total Possible Points_____

Percent Safe_____

Percent Safe is

Given Points / Possible points X 100

Playground Safety Audit
Stairways and Ladders

Playground_____ Date of Audit_____

Address_____ Weather Conditions_____

Inspector_____ Equipment Used_____

Age of Intended User_____

Surfacing (Check all that Apply)

Acceptable

__Wood Mulch

__ Double Shredded Bark Mulch

__ Uniform Wood Chips

__ Fine Sand

__ Coarse Sand

__ Fine Gravel

__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt

__ Concrete

__ Soil and/or Packed Dirt

__ Grass and/or Turf

__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

On the following pages, each violation of safety standards must be assigned a priority rating dependent upon its potential for injury. The following priority values will be used

Priority 1 – Risk of life threatening and/or permanent injuries resulting in permanent disability

Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Stairs and Ladders

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Stability	Has the equipment become shifted or bent?	Yes No		3	12	1 2 3 4	
	Can the equipment be tipped or pushed over?	Yes No		1	4	1 4	
	Are footings stable and buried below ground level or covered by a protective surfacing?	Yes No		1	4	1 4	
Protrusions	Are all nuts, bolts and screws recessed, covered or sanded smooth and level?	Yes No		3	12	1 2 3 4	
	Are there any components that fail the protrusion test on the structure? Look For: Handholds Stairs Both Sides of Equipment	Yes No		3	12	1 2 3 4	
Pinch, Crush and Shearing Points	Are there any sharp points, corners or edges?	Yes No		3	12	1 2 3 4	
	Are there any open holes in the equipment forming traps (e.g. at the ends of tubes)?	Yes No		3	12	1 2 3 4	
	Is the wood smooth and has no splinters?	Yes No		3	12	1 2 3 4	

Standards		Compliance	Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Corrosion	Are there any visible signs of corrosion or rotting on either side of equipment?	Yes No		3	12	1 2 3 4	
Hardware	Are any components missing? Be sure all parts of the structure are present and in good working order with no loose play or excessive wear in moving parts	Yes No		1	4	1 4	
	Are fasteners, connecting or covering devices removable without the use of tools?	Yes No		1	4	1 4	
Surfacing	Is there adequate drainage of surfacing material?	Yes No		1	4	1 4	
	Does the depth of the surface material agree with the critical height of the equipment (see pg. 5, table 1 of the *Handbook for Public Playground Safety*)?	Yes No		1	4	1 4	
Design	Are steps or rungs evenly spaced, including the space between the step or rung and the surface of the platform?	Yes No		3	12	1 2 3 4	
	Do openings between steps or rungs and the underside of the platform present an entrapment hazard? -Test using probes provided.	Yes No		1	4	1 4	
	When risers are closed, do the treads of stairways and step ladders prevent the accumulation of water and debris?	Yes No		4	16	1 2 3 4	

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Give # of Points
Rungs and Hand-gripping Components	Do the rungs must have a diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
Handrails	Are handrails on stairways and step ladders continuous; extending the full length of the access and provided for both sides?	Yes No		2	8	1 2 4	
	Handrails are required regardless of the height of the access.	Yes No		1	4	1 4	
Handrail Height	Is the vertical distance between the top front edge of a step and a top surface of the handrail between 22 and 38 inches?	Yes No		3	12	1 2 3 4	
	Is the handrail diameter between 1 and 1.67 inches?	Yes No		3	12	1 2 3 4	
	Does every transition from an access to a platform have handrails or hand holds?	Yes No		1	4	1 4	
Slope Requirements	Rung Ladder – Is the slope between 75 and 90 degrees?	Yes No		3	12	1 2 3 4	
	Step Ladder – Is the slope between 50 and 75 degrees?	Yes No		3	12	1 2 3 4	
	Stairway – Is the slope less than 35 degrees?	Yes No		4	16	1 2 3 4	

Stairs and Ladders

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Entrapment Angles	Are all angles greater than 55 degrees unless the lower leg is horizontal or projects downward?	Yes No		3	12	1 2 3 4	
Entrapment, Head and Body	Are all opposing surfaces less than 3.5 or greater than 9 inches in distance from each other? -The only exception is the space between the protective surface and the first step.	Yes No		3	12	1 2 3 4	
	Do all openings pass probe tests?	Yes No		3	12	1 2 3 4	
Fall Zone	Do all fall zones extend a minimum of 6 feet in all directions from the perimeter of the equipment?	Yes No		1	4	1 4	
	Is there space for all users to have free movement around the equipment beyond the fall zone (also encroachment zone)?	Yes No		1	4	1 4	

Playground Score Sheet

Total Points Given _____

Total Possible Points_____

Percent Safe_____

Percent Safe is

Given Points / Possible points X 100

Appendix C

Filled-out Example Audit Form

Playground Safety Audit
Swings

Playground Davis
Address Houghton St.
Inspector Bob Antonelli
Age of Intended User 5-12

Date of Audit 2/21/02
Weather Conditions Nice
Equipment Used Probes

Surfacing (Check all that Apply)

Acceptable

√ Wood Mulch
__ Double Shredded Bark Mulch
__ Uniform Wood Chips
__ Fine Sand
__ Coarse Sand
__ Fine Gravel
__ Medium Gravel

Unacceptable (Priority 1 Hazard)

__ Asphalt
__ Concrete
__ Soil and/or Packed Dirt
__ Grass and/or Turf
__ Asphalt covered in sand

Depth of Surfacing Material_____

Depth of Loose Fill Material must comply with Critical Height Values as set forth by the Consumer Safety Product Commission.

On the following pages, each violation of safety standards must be assigned a priority rating dependent upon its potential for injury. The following priority values will be used

Priority 1 – Risk of life threatening and/or permanent injuries resulting in permanent disability

Priority 2 – Severe injury not resulting in permanent disability

Priority 3 – Risk of slight or no injury or is not specifically addressed by the most recent guidelines set forth by the CPSC

Priority 4 – No risk, acceptable condition

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Stability	Has the equipment shifted or become bent?	Yes (No)		3	12	1 2 3 (4)	12
	Is it possible to tip or push over equipment?	Yes (No)		1	4	1 (4)	4
	Are the footings stable and buried below ground level and covered by protective surfacing?	(Yes) No		1	4	1 (4)	4
Corrosion and Wear	Is there rotting, corrosion, or visible wear on equipment? -S-hooks, chains, poles...	Yes (No)		3	12	1 2 3 (4)	12
Hardware	No components are missing, all parts of the structure are present and in good working order	Yes (No)	(SWING)	1	4	(1) 4	1
	Are pipes and tubing capped or plugged?	Yes No	N/A	3	12	1 2 3 4	/
	Are fasteners, connecting or covering devices not able to be removed without the use of tools?	(Yes) No		3	12	1 2 3 (4)	12
					48		45

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Sharp Points, Corners, and Edges	Are there any sharp points, corners or edges? -Metal edges should be rolled back or capped -Seat edges should be smoothly finished or rounded -No other sharp, rough or raw edges present	Yes (No)		3	12	1 2 3 (4)	12
	Is the wood smooth and has no splinters?	Yes No	N/A	4	~~16~~	1 2 3 4	/
Protrusions	Are there more that 2 threads exposed on any bolt?	Yes (No)		3	12	1 2 3 (4)	12
	Are all nuts, bolts, and screws recessed, covered or sanded smooth and level?	(Yes) ~~No~~		3	12	1 2 3 (4)	12
	Is there components that fail the protrusion tests present on any accessible part of the structure? -Protrusions can exist anywhere on the equipment, thoroughly check the equipment to insure that no protrusions are present.	Yes (No)		3	12	1 2 3 (4)	12
Surfacing	Is there adequate drainage of surfacing material? -No pooling present -Slopes away from equipment -No clogged drains	(Yes) No		1	4	1 (4)	4
	Is the depth of the surface material agree with the critical height of the equipment?	Yes (No)	resetche	1	4	(1) 4	1

56

53

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Minimum Clearance	Is the minimum clearance between the seating surface of the tire and the uprights of the supporting structure 30 inches when the tire is in a position closest to the support structure?	Yes No	N/A	3	~~12~~	1 2 3 4	/
Entrapment Angles	Are all angles greater 55 than degrees unless lower leg is horizontal or projects downward?	(Yes) No		3	12	1 2 3 (4)	12
Entrapment, Head and Body	Are all openings pass the entrapment tests using the provided probes? -Same exception applies as mentioned above -Check all possible openings in structure	(Yes) No		3	12	1 2 3 (4)	12
	Are all opposing surfaces less than 3.5 or greater than 9 inches in distance from each other? -The only exception is the distance between the protective surface and first step	(Yes) No		3	12	1 2 3 (4)	12
Fall Zones	Do the fall zones must extend a minimum of 6 feet from all directions from the perimeter of the equipment?	(Yes) No		1	4	1 (4)	~~4~~ 4
	Single-axis swings – Is there a minimum distance of two times the pivot point in front and behind the swing?	(Yes) No		1	4	1 (4)	4
	Multi-axis tire swing – Is there a minimum distance in all directions of 6 feet + the length of the supporting member?	Yes No	N/A	1	~~4~~	1 4	/
	Do users have free movement around the equipment beyond the fall zone?	(Yes) No		1	4	1 (4)	4

48

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Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Location	Are swings located away from other equipment and activities, and are not overlapping any other fall zones?	(Yes) No		3	12	1 2 3 (4)	12
	Are all swings located away from circular paths and near the periphery of the playground?	(Yes) No		3	12	1 2 3 (4)	12
Structure Design	Do all single access swings have no more than two swings per bay?	(Yes) No		1	4	1 (4)	4
	Are single access swings attached to a composite structure?	Yes (No)		1	4	1 (4)	4
	Do A-frame support structures have horizontal crossbars?	(Yes) No		3	12	1 2 3 (4)	12
	Are tot swings suspended from structures separate from other swings or suspended in a different bay of the same structure?	(Yes) No		1	4	1 (4)	4
					48		48

Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Seat Design and Placement	Are all S-hooks completely closed?	Yes (No)	Need to be changed	3	12	1 (2) 3 4	6
	Do tot seats have support on all sides and do not present a strangulation hazard?	(Yes) No		1	4	1 (4)	4
	Are all seats of the same type level to prevent collisions?	(Yes) No		4	16	1 2 3 (4)	16
	Is there a minimum of 24 inches of clearance between seats?	(Yes) No		1	4	1 (4)	4
	Is there a minimum of 30 inches clearance between the seat and structure?	(Yes) No		1	4	1 2 3 (4)	4
	Is the vertical distance from underside of occupancy seat and protective surface at least 12 inches?	(Yes) No		4	16	1 2 3 (4)	16
	Are wood or metal seats used?	Yes (No)		1	4	1 (4)	4
	Are the seats designed for only one user at a time?	(Yes) No		3	12	1 2 3 (4)	12
	Flying animal, multiple occupancy, rope swings, and trapeze bars should not be present.	Yes (No)		1	4	1 (4)	4

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Swings

Standards			Additional Comments	Multiplier	Possible # of Points	Repair Priority	Given # of Points
Multi Axis Tire Swings	Are there steel belted radials exposed, closely examine to make sure there are none?	Yes No	N/A	3	12	1 2 3 4	
	Are all S-Hooks completely closed?	Yes No		3	12	1 2 3 4	
	Are there no accessible pinch, crush or shear points?	Yes No		3	12	1 2 3 4	
	Due to added stress of rotation, inspect all hanger mechanisms, are they worn?	Yes No		3	12	1 2 3 4	
	Are drain holes provided, to prevent pooling and excessive water?	Yes No		4	16	1 2 3 4	
	Are heavy truck tires used (they should not be)?	Yes No		1	4	1 4	
	Are tire swings suspended solely in the structure, no other swings should be present?	Yes No		1	4	1 4	

Playground Score Sheet

Total Points Given 264

Total Possible Points 276

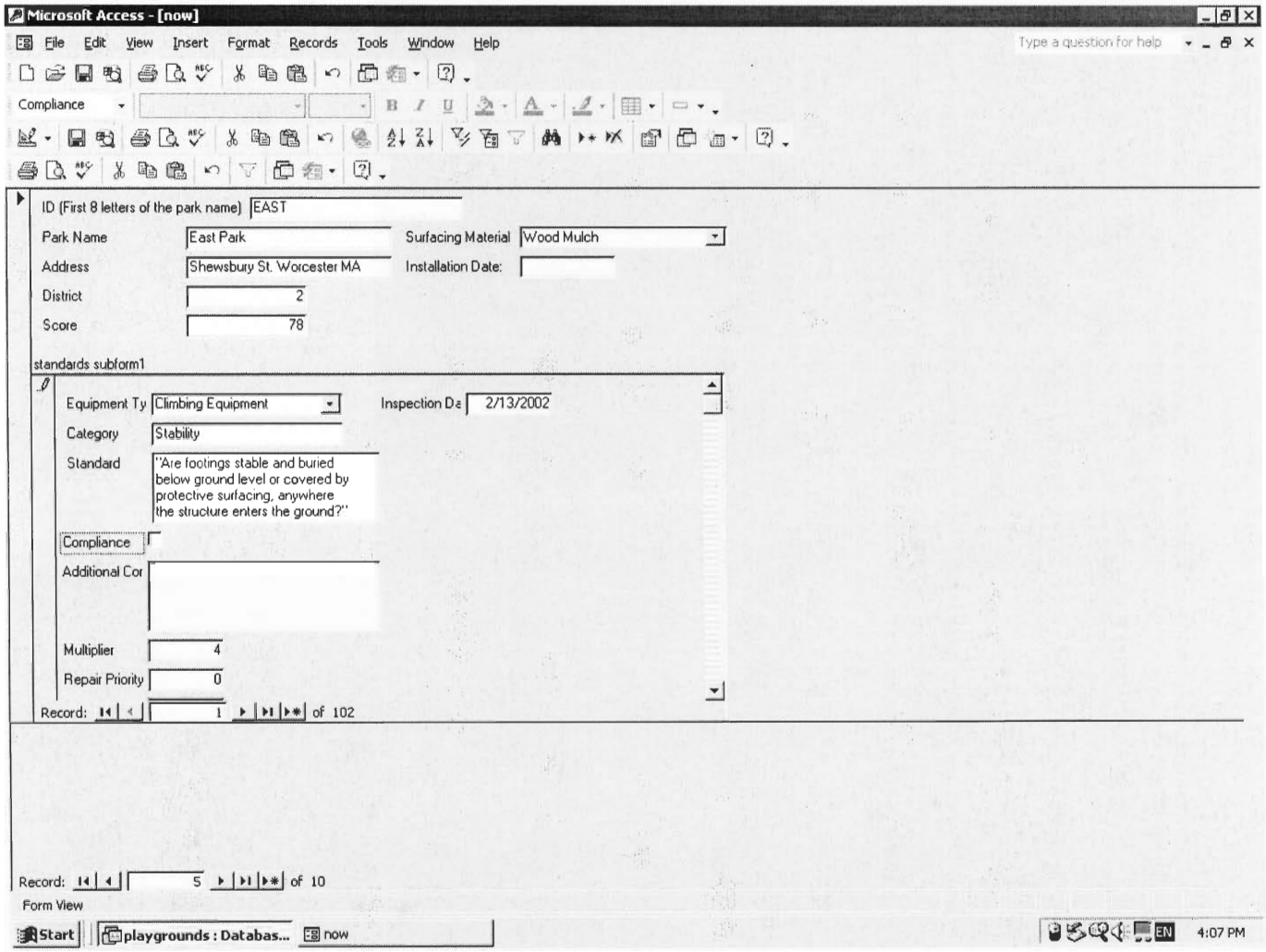
Percent Safe 95.6%

Percent Safe is

Given Points / Possible points X 100

Appendix D

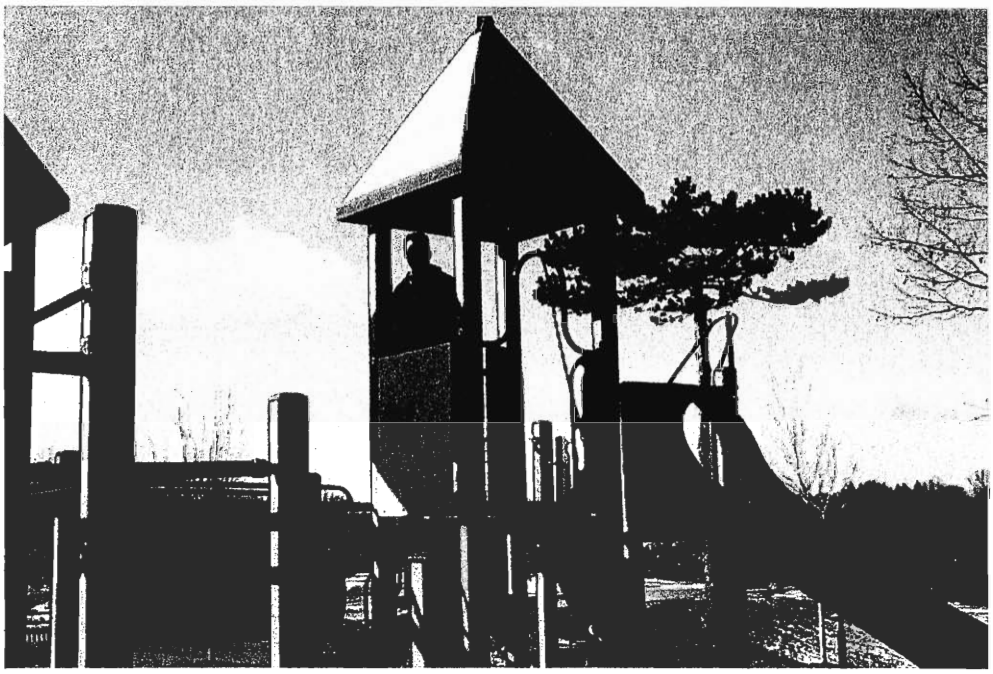
Database Screen Shot


Microsoft Access - [now]
File Edit View Insert Format Records Tools Window Help
Type a question for help
Compliance
ID (First 8 letters of the park name) EAST
Park Name East Park
Surfacing Material Wood Mulch
Address Shewsbury St. Worcester MA
Installation Date:
District 2
Score 78
standards subform1
Equipment Ty Climbing Equipment
Inspection Da 2/13/2002
Category Stability
Standard "Are footings stable and buried below ground level or covered by protective surfacing, anywhere the structure enters the ground?"
Compliance
Additional Cor
Multiplier 4
Repair Priority 0
Record: 1 of 102
Record: 5 of 10
Form View
Start
playgrounds : Databas...
now
EN
4:07 PM

Appendix E

User's Manual

Worcester Playground Safety System



Audit and Database User's Manual

Audit Forms

These forms will be used to assess the condition of each playground in the city of Worcester. The forms have already been customized to each park. Using the standard probes, protrusion rings, and dowels, you will be on your way to making your playground a safer place.

Using the cover page, check the appropriate surfacing material. On the next few pages, there are various standards listed that deal with the safety and usability of each piece of equipment.

Sample Line from Audit (size not to scale)

Standards			Additional Comments	Multiplier	Possible # of Points	Priority Ranking	Given # of Points
Corrosion	Is there any visible corrosion or rotting?	Yes No		4	16	1 2 3 4	

Check to see if each standard is compliant and if it is, circle YES, if it is not, circle NO. Be sure to add any additional comments if you feel they are necessary. The next step is to circle what priority the standard is. By looking on the front page, you will see priority rankings. Choose the most appropriate one based on your assessment of how severe the hazard is. If there is no risk of an injury, priority 4 should be circled. You must then multiply the number you circled by the multiplier in the adjacent column to give the standard the appropriate weight. Place this final number in the furthest column to the right of the form. You will need all of those numbers later on after the inspection is complete to calculate a final score of how safe the playground is. After the standards are all completed and each one has been given a final score, turn to the back page. Add up

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all the given points and divide by the total number of points that would be possible if the playground was in ideal condition. Multiply by 100 to get a percentage for each piece of equipment. Once all forms for a playground have been completed, average the score from each form together to get an overall score for the playground. If any piece of a equipment is supposed to be present, but it is missing due to vandalism, or other reasons, the overall score given to that piece is a 0. This enables the playground's overall score to accurately reflect the true condition of the playground. This percentage will enable you to compare each playground to one another and in doing so, will easily show your department which playgrounds are in need of the most repair.

Database

Once you have completed the field audit, the best way to ensure the preservation of the results as well as have easy access and updatability is via an electronic database.

The database you will be using to store this data was designed using Microsoft Access. The purpose was to mimic the very audit forms used in the field. Because certain aspects of the information contained in the database may be available for public viewing, a security log on is required in order to make changes to the content of the database. Contact the system administrator in order to obtain the needed permissions and a logon/password.

Once this is completed, open the playgrounds database, and enter the requested security information. Once open, in order to input the results of your inspections, select the Forms option, and open the form entitled "Data Entry" .

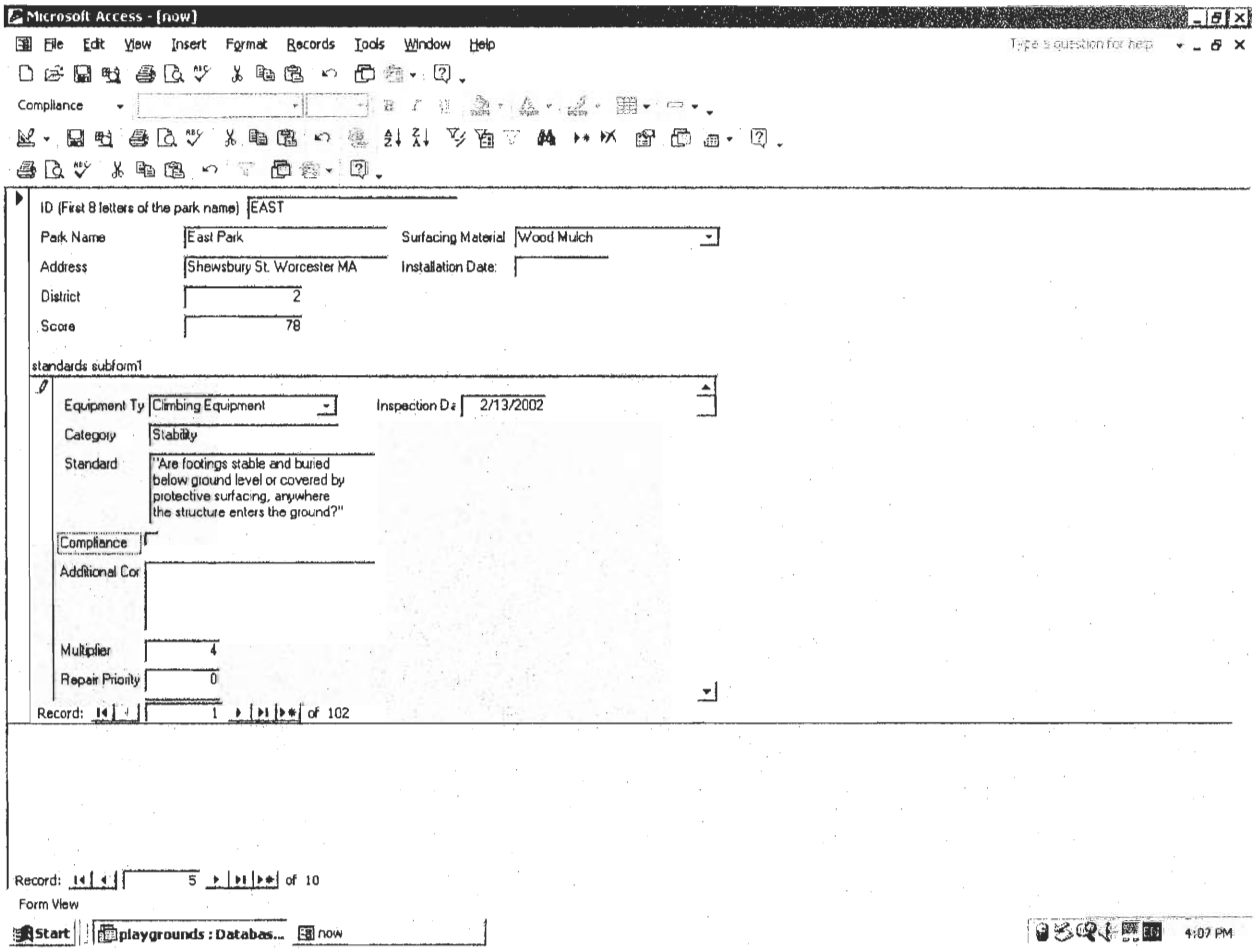
As you can see, this form is a close, though not perfect representation of the audit forms. There are some additional fields, and some fields have been removed, but the overall usage is the same. The first piece of important information is the park ID. This tells the computer what park you want to enter data on. The park ID for each playground is simple, it is the name of the park, up to the first eight letters. However, due to limitations with the software, typing the ID will not bring up the information for the needed park on this form, so you will have to scroll through the list of parks by clicking on the button on the bottom of the form. Once you have reached the park you want, enter all the pertinent information at the top of the screen. This includes, the location of the park, date of inspection, surfacing material of the playground and other general information. (see attached screen shot)

Once this information has been completed, it is time to enter the results of each audit. As shown by the screen shot the first field for each standard is the equipment type. While this is a pull down menu, due to programming limitations, selecting a new equipment will not pull up the standards for that piece, rather it will change the designation of that standard. As a result the only way to get to a specific piece of equipment is to scroll through all the standards using the button on the bottom. To make this process as user friendly as possible, the equipments have been ordered from most commonly used to least, starting with child composite structure, which is the most common playground structure.

As you will then see, the standards for each equipment follow the same order as those from the paper audit, so finalizing the data entry is merely a matter of transcribing your results from the audit to the database. The only major change is that a check box

replaces the yes/no selection on the form, but a checked box equals yes, and unchecked box equals no. For any standard that received an N/A, simply leave the box unchecked and enter N/A in the Additional Comments section

Database Screen Shot



Summary of Use for Audit forms and Database

- Fill out information on the audit cover page for each playground
- Check appropriate surfacing
- On the audit form, answer each question by circling yes or no
- Assign a priority value to each infraction
- Once completed, assign the playground a score, using the formula on the back page. DO NOT assign a numerical value to any standard marked N/A
- To enter the data in the database, open the database, and enter your username and password
- Click on the form tab, and open the form DATA ENTRY
- Fill out the form as you would the audit, entering pertinent playground information, and then each applicable standard. For every standard not use, enter NA into the ADDITIONAL COMMENTS field.
- To obtain a ranking of all playgrounds as compared to each other, open the REPORTS tab, and open the report called, RANKINGS
- Once data entered, close the database.

Appendix F

Inventory Pictures