

# EVERPLAY NEWS

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## Injury Opportunities and Protective Surfacing

Injuries as a result of falls still account for up to 70% of all injuries in the playspace and the total number of injuries is on the rise rather than diminishing. The question is whether the existing Standards are able to address the issue or is the lack of inspection to the Standards and follow-up repair and maintenance the culprit? Are the injury opportunities, a circumstance or set of circumstances that could result in an injury being created by designers, manufacturers, installers and owner/operators?

The latest statistics for Canada are available for the year 1996 and indicate that each year, "more than 10,000 Canadian children are injured on playgrounds". This study reported that what could be termed generally as falls (fell off equipment to bad landing) accounted for 72% of injuries. There is a tendency to understate the number of injuries as the collection of statistics in Canada, as prepared by Health Canada using the CHIRRP, are generated in only 15 hospital reporting centres across the country and then extrapolated. The injuries that are dealt with in family practices, walk in clinics and non CHIRRP hospitals are not specifically reported.

The National Electronic Injury Surveillance System (NEISS) of the U.S. Consumer Product Safety Commission considers injury data from hospitals, doctor's offices/clinics, ambulatory surgery centres and hospital emergency rooms. In 1998 the total number of injuries for individuals under 20 was 509,650 with a total cost of US\$9.8 billion. This cost includes medical, legal and liability, pain and suffering and

work loss expenses. The highest cause of the injuries is impact with the surface or another piece of equipment, 74% with falls to the "protective playground surface" being 58% of total injuries.

Consistently injury reports stipulate "inadequate surfacing" as the cause of an injury. If a determination is able to be made after the occurrence of an injury that the surface was inadequate, why can this determination not be made before and the problem responded to prior to the injury. Could it be that the surface in actual fact is adequate and the injury is not preventable, given that certain children will challenge themselves and the playspace as part of their normal activity.

The determination of the "adequacy" of a protective surface can only be through the application of established test methods and Standards. In Canada these Standards are the CSA Z614 and the test methods are those in ASTM F1292 and EN1177 for measuring the impact attenuation of the surface. In the United States the Standards are the ASTM F1487 and ASTM F1292. Additionally the U.S. Consumer Product Safety Commission has published a Handbook for Public Playground Safety. The goal of Standards is to eliminate the life-threatening and debilitating injury opportunity, and reduce the severity outcomes of the injury opportunities that are inherent in the activity.

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**Special points of interest:**

- The Ontario Parks Association is—50th Anniversary, Congratulations
- CAPP—Canadian Association of Playground Practitioners enhances networking amongst professions in all aspects of play.
- Dale Hughes retires - Congratulations and enjoy your golf game

## Health & Safety Issues in Water Play & Spray Pads

The Water Play feature or Spray Pad can present hidden hazards that the user, especially young children will not be aware of. These include slip-falls, impacts with the surface, ingestion of germs, exposure to air borne bacteria and bacteria by-products, *E. coli* and *Staphylococci* among others. Injuries can range from abrasions, concussions and contusions to diseases such as diarrhea and hypersensitivity to pneumonitis and endotoxins.

prevention of the above problems and steps should be taken at the design, installation and maintenance phases of the project to ensure the success.

Once the heat of summer hits thoughts turn to ways of cooling down. For many people with younger children, the Water Play or Spray Pad offers the relief they need. The typical public access Water Play does not have play structures and is intended for chil-

The surface of the Water Play is a key element in the

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What makes a surface “adequate or inadequate”? In the case of playground surfacing the measure for the Standards has been the life-threatening head injury as a result of the impact. This is measured using a scientific device (headform) that measures both the g-max (maximum deceleration experienced during impact) and the HIC (head injury criteria). Head impact injuries with a g-max not exceeding 200 or a HIC not exceeding 1000 are not believed to be life-threatening. For this reason no surface when tested while it is in service should exceed these values.

A key element for the measurement of the “adequacy” of the surface is the height from which the headform is dropped or the child could fall. The various Standards provide minimum “fall heights” for each piece of playground equipment. These are generally from the location where the manufacturer/designer of the structure have intended the children to play, commonly called the designated play surface. In some cases this does not take into consideration that children, as a part of normal play, will see challenges and take risks. The Standard for surfacing, ASTM F1292, requires that the test performed at the playspace be from the height established by the owner/operator prior to purchase. This is where the dilemma begins for the designer of the playspace.

The CSA Z614 Standard defines the fall height as “the vertical distance between a designated play surface or the top of a guardrail and the protective surfacing beneath it.” In Canada the fall height is taken from the tops of guardrails on the structure, while in the case where there are barrier panels, which are to “prevent inadvertent and deliberate attempts to pass through the device and discourage climbing”, the fall height is taken from the platform height. In the United States the fall height is the platform irrespective of whether there is a guardrail or a barrier. It is difficult to justify that when a child is on the protective surface outside a protective barrier that they travelled from the height of the platform and not the top of the barrier panel. As part of the due diligence, the owner/operator or the playspace designer must determine if there is an injury opportunity at a height greater than that stated as the minimum in the Standards. Liability could well extend to the installer of the playground protective surface as they would have specialized knowledge as to the properties of the surface being installed and would, by the nature of their industry, have an understanding of the “play” that could be expected.

In the case of the injury from a fall, the injury opportunity is a combination of:

- the height from which the child falls.
- the impact absorbing properties of the surface.
- the nature in which the child falls.

Horseplay or a child challenging their physical abilities beyond their capabilities is not material to the outcome if the surface upon which the child falls does not absorb the impact in the manner that has been stipulated.

When the drop height for the protective surface is stipulated as the platform, the stakeholders in the playspace may have created an injury opportunity. In the case of the fall from the top of a guardrail, the minimum additional height above the platform will be 740mm (29”), whereas for a fall from the top of a barrier panel, the minimum above the platform will be 740mm (29”) where intended for users 2-5 years and 970mm (38”) where intended for 5-12 years. If the surface has only been installed to the minimums of the Standards, that is platform height and g-max not to exceed 200 and HIC not to exceed 1000, the additional height above the platform would be expected to result in a potentially life-threatening head injury. This failure of the understanding of the anatomy of a fall presents a serious injury opportunity throughout the playspace.



The impact absorbing properties of the surface will be set at the time of installation. The manufacturer/supplier/installer will have been presented with specific requirements prior to installation from the owner/operator as to the drop height from which the surface will be tested and the maximum g-max and HIC to be allowed. Many warranty clauses will extend this requirement for the warranty period. The owner/operator will have made an assessment of the injury opportunities on the play structure and the anticipated use of the structure by the children. The surface manufacturer/supplier/installer delivers a protective surface system, whether it is a synthetic unitary material or loose fill to comply with the specifications. In the case of unitary surfaces, very little change can be made to the impact absorbing properties once it has been installed. In point of fact there is a tendency with these surfaces to become more rigid over time, thereby reducing the impact absorbency. Loose fill materials are more easily modified and generally the addition of more material and increasing the depth of the surface will increase the performance characteristics in relation to impact absorption.

All playground “protective surfaces” will have gone through a manufacturing process. In the case of loose fill surfaces, the material will have been selected (sand, pea gravel, wood, rubber chips) and the particle sizes selected through a mechanical process of crushing, cutting and/or screening. For unitary materials the selection of raw materials and the installation technique will also be developed prior to the delivery of the surface. As a result the manufacturer/supplier and in most cases the installer of the “protective surface” know the performance characteristics of the material in the playspace.

It is at the time of installation of the “protective surface” that there is a physical and visual understanding of the injury opportunities of the play structure and whether the properties specified for the “protective surface” will be appropriate for the fall potential of the structure. This is the last opportunity to exercise due diligence and therefore the liability for the “protective surface” and its properties will fall upon the owner/operator, the designer of the playspace, the manufacturer/supplier of the surface and the installer of the surface. Where the surface is installed

with significant injury opportunities, the rationale should be recorded for future reference.

Once the “protective surface” has been installed it must be tested at a minimum of 3 locations for each distinct play structure from the drop height specified by the owner/operator using the test method in ASTM F1292. The results are to be recorded and any areas failing the requirements of the specification are to be brought into compliance and the play structure not used until the surface complies.

What remains is the maintenance of the surface for the entire life of the playspace. This is the obligation of the owner/operator with the assistance of the surface manufacturer/supplier/installer. Maintenance instructions shall be provided to assist in this effort. In addition, it is a requirement of most surface materials and at best a good practice that any replacement, topping up or repairs to the surface be done using the same materials as originally installed.

Play must challenge a child’s mental, physical, social and emotional abilities to allow the child to learn about themselves, their peers and their environment. The playspace provides a controlled environment in which a child can develop. Because of the nature of the play participant(s) and the influences on them to challenge themselves and strive to greater achievements, there cannot be an elimination of injuries in the playspace. The best that can be done is for the providers of the playspace to understand the nature of the play that will occur and take the reasonable steps to remove the injury opportunities that could be present. The result and goal should be the elimination of the life-threatening and debilitating injury and the reduction of the severity of any other injury that might occur.



## Health and Safety in Water Play

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dren under 10 years of age. The play of the children ranges from running from spray feature to spray feature, tag with other children, sitting or standing on the surface and ground spray features. Some of these activities involve relatively fast and sudden movements. As a result good footing is a requirement.

In most cases the Water Play is unsupervised and there can be no expectation of enforcement of rules that govern swimming pools such as “no running” and “no horseplay”.

Strategies must be developed to provide for the following;

- impact absorption, where required
- slip resistance
- elimination of standing water
- avoidance of skin abrasions
- removal of germs and bacteria

Impact absorption for the surface should not be a consideration if there are no play structures or other features that could be climbed. Since the Water Play is always on a hard non-absorbing surface or base, features such as benches, picnic tables, retaining walls etc. should be located well outside the area of the water spray to avoid having a slip fall occur from one of these features to the surface. Where there is the installation of a play structure, then an impact absorbing surface must be installed that meets the requirements of Standards for playground “protective surfacing” (ASTM F1292). Provision of a splashdown pool of any depth less than that required for a diving board at the height of the playground is not only unacceptable, but could lead to drowning where a child is injured with a concussion as a result of a fall and could then lie under the

water either disoriented or unconscious.

Slip resistance is a significant problem given the intended activity and constant exposure of the surface of the lubricant effect of the water. An additional problem in areas with hard water the residual calcium can solidify on the surface and has been know to produce an almost glass like surface. As a result the surface should have texture that has demonstrated resistance to slip under dry and especially wet conditions. Since footwear cannot be stipulated the consideration should be given to the slip resistant properties being performed on the equivalent of a bare foot. Most commercial surfaces will have been tested in conjunction with footwear and in many cases athletic footwear that might contribute to a better than reproducible result in the Water Play. The slope of the Water Play should be a minimum of 2% to ensure that water does not accumulate on the surface and create the potential for the foot to hydroplane on the surface, reducing the value of any slip resistant feature of the surface materials. The surface should also not trap water within pores thereby holding water and contributing to slip even when the water spray is not present.

There are a few strategies that can be used to provide slip resistance. For a hard surface such as concrete texture can be added during the finishing and drying process with the addition of a broom finish. A broom finished surface will have a tendency to be worn smooth as a result of the rubbing action of the foot against the hard surface. The water will accelerate this wear. Another strategy is the installation of a synthetic surface on top of a hard base. The choices here are plaster-like trowel on, industrial epoxy and grit and rubberized surfaces. Plaster surfaces tend to have the same problem as broom finished concrete, whereas industrial grit tends to cut in to the child’s bare foot. The rubberized surfaces are

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## CSA Z614 Available for Public Review

The CSA Z614 Standard for Playspaces is to be revised and the document is available on the internet for public review. Procedure is go to [www.csa.ca](http://www.csa.ca) – select English – click on Standards on the left side – click on info update on the left side (a new page will open) – across the top click on public review – go to the bottom and you will find the Z614.

## ASTM F2157 Running Track Standard

After many years of hard work a new consensus Standard for the athletic running track has been published. This Standard provides test procedures and pass fail/criteria to determine if a running track system will be a classification A, B, C or not classified, with an A classification meeting all of the requirements of the IAAF. Field compliance testing includes planarity, drainage and thickness measurements.

This a major breakthrough for Track and Field and should be a benefit to owners, specifiers and athletes.

## Test Impact Absorbing Properties of Football Fields

EVERY year there are injuries of football players impacting with a hard surface. New technologies in both natural and artificial turf have been developed to absorb impacts. The testing of the football field surface is the subject of the ASTM F1936 Standard. This test procedure should be performed at the time the turf has been installed to ensure that the specification and contract requirements have been met and again prior to the start of each season to determine warranty compliance or confirm that maintenance procedures are correct.

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the combination of a rubber granule and binder that is applied to the surface. Those systems that are applied by trowel typically smoothes the rubber down as part of the installation process, thereby leaving only the slip resistance of the rubber to interact with the child. Other systems apply the binder to the surface and the rubber granule is cast into the binder allowing the exposure of the angular nature of the rubber, thereby providing the slip resistance inherent in the rubber and providing a texture to the foot.

Standing water can be a drowning hazard, accumulate germs or bacteria and cause deterioration of the surface. The drowning hazard will be related to the depth of the water; however it must be recognized that vandals may block a drain and cause the water to rise to a level that was not anticipated. For this reason there should be more than one drain or the size of the drain should be such as to discourage blocking. Where the water is not chlorinated and water is allowed to stand, bacteria that is the result of a fecal accident, contamination by birds or other animals, could be a hazard to the user through the introduction of *E. coli* and *Staphylococci*. The nature of the Water Play or Splash Pad make bird and animal contamination a likelihood. In an article on pool water, Micheal Beach, Ph.D. of the CDC, National Center for Infectious Diseases concludes "therefore the best way to avoid getting sick from swimming is to keep germs out of the pool in the first place and to remember not to swallow swimming water.

Certain surfaces will be detrimentally affected by long submersions in water. This can be further complicated in where the water is treated with chlorine. In addition certain disinfectants that could be used to eliminate germs and bacteria may do damage to the surface. The owner/operator and the installation designer should determine if these factors are a problem for any surfaces that are being contemplated.

Since there is the expectation that children will run and abruptly change directions as part of the Water Play activity, it is extremely important that the surface does not cut the skin of the foot or in the case of a slip-fall, the abrasion will be limited. This will affect the choice of the surface and generally eliminates the industrial types.

Germs, bacteria and bacteria by-products can be in the spray nozzles, on

or in the surface. The removal of these can only be achieved with regular maintenance that will involve flushing of the surface. Where the surface is impermeable to water, normal hose pressure or a pressure washer should allow contaminants to be flushed to the drain. A problem can occur where the surface is porous and water is allowed to sit within the system during the normal activity of the Water Play. In this case the contaminants could have had an opportunity to become trapped within the system and this will require that system to have a disinfectant applied on a regular basis to penetrate the pores and kill whatever germs or bacteria that might be trapped within the surface.

The surface is a significant contributor to the success or problems that can occur in a Water Play. Although it is outside the discussion here, the owner/operator must also give consideration to other potential problems that relate to suction entrapment issues, water purification, the volume and pressure of the water among others. Many of these issues can be discussed with your local public health professional.



**Water Play with water impermeable and textured rubber surface**