EVERPLAY News

Everplay International Inc.

Volume 15, Issue 1

January 2008

The Perfect Playground Surface Does Not Exist

The perfect playground surface must have excellent impact attenuating properties to protect from injuries, while providing access to all of the play components for persons of all abilities. This surface requires little or no maintenance at the time of installation and throughout the functional life of the playground. It would also be ideal if the costs associated with the surface were minimal.

Unfortunately the perfect surface does not exist.

With some thought, understanding of needs for the playground and the performance properties of surfacing materials, an owner/operator and their consultants can select surface materials that can provide the perfect compromise.

Surface Performance Properties

Reduction of Injuries with Impact Attenuation

Standards for playgrounds have set minimum requirements for the prevention of the life-threatening head injury. Values greater than 200 Gmax or 1000 HIC are these limits for the head injury, but lower values can also cause serious injuries.

Studies from Australia have indicated that Gmax values greater than 100 provide a significant risk of an arm fracture and this risk is 3 times greater when the Gmax is greater than 200 as opposed to being under 150.

Studies of HIC (head injury criteria) indicate that at a value of 500 can result in a 79% chance of a minor head injury (broken nose or teeth) and a 38% risk of a moderate head injury (skull fracture with a brief loss of consciousness). A moderate head injury that can include permanent head injury can occur with as little as 850 HIC. The conclusion for this section is that playground surface should provide the lowest possible Gmax and HIC values from the tops of barriers and guardrails or any other location from which children might fall.

News from ASTM F08

Various sub-committees have been working in the development of new standard for use in playgrounds and athletic surfaces.

The F08.63 sub-committee published a Standard Guide for Poured-In-Place Surfaces under ASTM F2157. This guide is a must read for anyone planning on investing in this type of surfaces. Learn the pitfalls and problems.

As an expansion to the PIP Guide, the sub-committee is working on a performance standard that will provide performance based tests that can be used in the laboratory and the field.

The test method for the Rotational Penetrometer is also expected to be concluded this year, providing a field test method for firmness and stability of accessible surfaces.

For those with artificial turf fields, there are new standards in the works to take into consideration all of the sports that take place on the field.

The Perfect Playground Surface - Does Not Exist

Impact attenuation can be affected by the design of the surface system, the depth of the components, the compaction of the surface or contamination with other materials. Some materials such as scrap polyethylene foam have excellent impact absorbing properties at room temperature, but get very firm at low temperatures. Other systems are easily disturbed, exposing an unyielding sub-base to the falling child. These are considerations for initial installation and as part of a maintenance and operations program.

Accessible Surfacing Requirements

A playground needs to provide challenges for physical, mental and social aspects of the child's life, but access to the community of play should be available to everyone. The ability of a child to participate in the play of their peers is a human right and therefore the surfaces to accessible play components are a requirement of the playground. This is a requirement at the time of first installation and will remain so throughout the life of the playground. This may well require little to no maintenance to significant and ongoing maintenance.

The accessible route shall be firm, stable and slip resistant. To measure the firmness and stability, a device known as a Rotational Penetrometer is used. ASTM is working on a Standard Test Method for the use of the device, however until this Standard has been published there is a method available from Beneficial Designs, the developer of the device. The method can be found at www.beneficialdesigns.com and can be used in the field to test surfaces in the field.

This route can be either an elevated ramp or ground surface that also doubles as the protective surface for the playground. In most cases the ramp is manufactured steel with a coating and fixed into position. The surface of most significant concern is the ground surface that must be maintained for firmness and stability as well as meeting the requirements for minimum width of the route, maximum slope and changes in vertical level.

The clear width of the accessible route must generally be 1524mm (60") and must have a vertical clearance of 2032mm (80") with no protrusions. The specific exceptions to the general rule can be found in Annex H of the CSA Z61407 Standard for Canada or the Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines, July 23, 2004. Although there are exceptions to limit the width of the accessible route, there is always a requirement for a periodic turning area of at least 1524mm (60") x 1524mm (60").

The maximum running slope for the accessible ground level route is 1:16 if considered to be a ramp and 1:20 when connecting ground level play components, while the cross slope shall not be greater than 1:50. Any clear ground space at a play component must have a slope not exceeding 1:50 in all directions. These are measured in the field with a minimum 1524mm (60") straightedge.

The tolerance for changes in vertical level along the accessible route either at any point, a transition from one surface to another or within a surface are prescribed. There shall not be vertical changes greater than 12.7mm (0.5"), with an allowance for change of up to 25.4mm (1"), provided the upper 12.7mm (0.5") is on a 1:2 in Canada and one half those dimensions for the United States.

The impact of this measurements for the accessible route slope and level also means that when a straightedge is laid across the surface the distance under the straightedge shall not be greater than 12.7mm (0.5") for Canada and 0.25" (6mm) for the United States.

Additionally, the requirements for the accessible route are that the impact attenuation of the surface within the use zone must also meet section 10.1 of the CSA Z614 or ASTM F1292.

Lastly there shall be no horizontal gaps that are greater than 12.7mm (0.5") in width.

An accessible route will require a surface that is rigid in its ability to retain level, yet provide long-term impact attenuation properties.

Resistance to Vandalism

Vandalism fortunately is not a regular occurrence in playground, but it is a consideration when considering a protective surface as well as the other components of the playground. Should vandalism occur, the problems of repair by specially trained technicians or collateral damage to components not initially targeted are the concern of every playground owner.

Graffiti is an inconvenience on play structures and synthetic surface; however fire is the most devastating and the burial of broken glass and other sharps can cause the most damage to the user.

The standard tools for a vandal intent on setting fire in the playground are lighter fluid and a match. Typically a volume that can be sprayed in less than 60 seconds is used. Once the match ignites the accelerant, the surface should either not sustain the fire once the accelerant burns off or the surface should self extinguish and not allow the fire to spread significantly.

The risk of minor or major loss of the playground surfacing or the play structure as a result of fire are considerations for the time of purchase of the surface system.

Capital Cost of the Surface System

Unfortunately, nothing is free and surfacing systems will have an initial capital cost that varies with the type of surface selected. Typically the surfaces that are considered to be the lowest maintenance are also the highest in initial cost, whereas loose fill natural systems that require significant maintenance and replacement are very low in initial cost. These latter systems also tend not to be accessible. Other systems such as loose rubber, engineered wood fibre and woodchips offer a mid-range cost that has made them very popular.

Cost or budget tend to dictate the initial selection of the surface type and in the case of some systems such as Poured-In-Place, the potential for failure of the impact attenuation requirement prior to the expected functional life of the playground can make the cost of the playground extreme to say the least.

Combining surface systems such as a synthetic and loose fill can lower the total average capital cost of the playground surfaces, but considerations should be given to the transitions from one system to the other for both those is special needs and the able bodied. Some of the mechanical features that must be added to increase the functionality of the systems carry a cost that is not anticipated. This could include surface systems that take into consideration the transitions from the surface to a ramp, the playground to the exterior walkways or the area around a transfer system.

Maintenance Requirements of Surfacing Systems

Maintenance will form a critical component to the long-term success of the playground It does not matter whether maintenance is considered the cleaning, regrading, recompacting, topping up, replacing of materials or the downtime of a playground that does not meet the originally designed purpose, all come down to a monetary value. Maintenance will require the expenditure of money by the owner/operator to keep the playground meeting minimum safety standards and increasingly the requirements for accessibility.

The CSA Z614, section 11.1.1, requires that a budget for maintenance be developed and set aside at the time of design, purchase of equipment and installation. Although this is not always the case, a little more attention to this requirement might result in better decision making and a saving of money in the long-run.

What Does Each Surface System Offer and Not Provide?

Loose Fill Natural Surfaces

Surfaces such as sand and pea gravel, unless specifically engineered for the purpose of a playground surface, generally offer a low cost, poor impact attenuation properties and a need to maintain and replace on a regular basis.

Natural surfaces that are engineered to be used in the playground are generally highly processed, which adds to their cost, and improves impact attenuation properties. This is often a benefit to the owner of the large playspace.

In any event the loose fill natural materials are not functional as an accessible route and will require another surface system in this area. This will require support and sub-base engineering that will also add cost to the final surfacing choice.

Loose Fill Woodchips

This is generally the by-product of chipping or grinding when pruning and tree removal takes place in the urban forest. When care is taken in the selection of the materials, with the removal of bark, twigs and leaves, the material can have excellent impact attenuating properties. If properly installed and maintained, woodchips can be used as an accessible route in the playspace. A pleasant side benefit of woodchips is a low initial cost depending upon the methods taken to process that original wood.

Engineered Wood Fibre

This is a wood system from the grinding of wood to the requirements of ASTM F2075 Standard and is generally only available from commercial suppliers. These systems, when properly installed, provide excellent impact attenuating properties and with appropriate maintenance can provide the accessible route. In most cases the suppliers of engineered wood fibre also provide rubber mats that are to installed in high traffic areas to provide a higher degree of accessibility and lower cost of maintenance.

Loose Rubber Systems

When tires are crushed and ground, the result is rubber crumb and granule of a number of sizes. Typically granules in the 1-4mm range and the crumb in the 6-12mm range are supplied to the playground in the raw black or coloured. These products provide excellent impact attenuating properties when installed and maintained to a continuous depth of 300mm. As they are easily disrupted with active play, the maintenance can be considerable to keep them in the same place. This same problem makes them very difficult if not impossible to use on an accessible route as they rarely will meet the planarity requirements, let alone be firm and stable. A safety concern is the possibility of wire being exposed in the crumb and causing an injury to a child.

Poured-In-Place Synthetic Systems

These are the bonding of rubber granules in multiple layers to provide a surface around the play structure. ASTM has published a Standard Guide F2157 to discuss the aspects of this type of surface, the problems that can occur at the time of installation and over time. The biggest perceived problem with this surface is its high initial cost. This is a problem when the surface fails to meet impact attenuation prior to the end of its expected life or if the surface cracks or shrinks over time. Surfaces such as EVERPLAY offer more than a 15 year history of successful installations and warranties ranging from 5 to 8 years to provide assurances to the owner/operator that the surfaces will continue to meet expectations. Suppliers such as EVERPLAY also provide for lower impact attenuation values at the time of installation such as Gmax <150 and HIC <800 to allow for additional injury prevention. These surfaces also tend self-extinguish shortly after an accelerant is consumed by fire or not ignite at all. Additionally, these surfaces can be designed to meet all of the requirements of an accessible route.

To page 4

We're on the web www.everplay.com

Everplay International Inc.

18 Automatic Rd., Unit 12
Brampton, Ontario
L6S 5N5
Canada

Phone: 416-410-3056
Fax: 905-494-1136
E-mail: rolf@everplay.com
henry@everplay.com
adam@everplay.com

State of the art is not a limit, it is a point of departure

From page 3

Synthetic Tiles or Mats

These systems offer the advantage of being modular, allowing for entire playspace to be covered or provide an accessible route through an otherwise non-accessible surfacing system. These systems have been known to "dish or curl", open at the seams and can lose their impact attenuating properties. They do allow for ease of maintenance and replacement should damage or vandalism occurs.

Synthetic Turf

Although artificial grass has been with us for decades, it is a recent arrival in the playground. There are questions as to seams, impact attenuation properties and compliance with the requirements for accessibility. Should these be adequately resolved, there could be a place for this type of system.

Hybrid Systems

There are a number of new systems that are base on the creation of a continuous sheet of a synthetic material over an impact attenuating underlay. A system such as SMARTE has excellent impact attenuating properties with HIC values under 700 at heights exceeding 4 meters(13 feet). An additional advantage is the ability for local workers to provide quick and effective maintenance should vandalism occurs.

Where to Now?

We have attempted to highlight the properties you should be looking for in a playground protective surface and the list some of the features of some of the more popular playground surface systems.
The owner/operator and their consultant should engage expertise in the selection process as well as the specification and compliance testing process to ensure that they have the playground surface that meets their needs at the time of installation and throughout the life of the playground.

For further information go to www.everplay.com or www.playgroundadvisory.com