

Playground Surfacing, Maintenance and Liability

At the end of March 1998, the latest version of the CSA Z614 National Standard for Playspaces was unveiled and the full ramifications are still being assessed. The incorporation of a performance requirement and maintenance of protective surfacing will affect the designers, purchasers, regulators, contractors and installers, owners, day care board members, employees and maintainers of the playspace. They will all have their part to play and carry associated liability. The requirement that all playground surfaces irrespective of date of installation be maintained to the performance standard of clause 10 is a potential concern to many. Those who now have specific responsibilities under the standard are those performing maintenance. For this group the definition of maintenance has changed and if they portray themselves as professionals such as landscape contractors or City maintenance personnel, they will be held to a higher level of care and therefore liability than most others involved in the playground industry.

The effect of the new standard will require that all playground protective surfacing be installed and maintained to the performance requirements of the ASTM F1292 test procedure for playground surfacing from the fall height specific to the particular piece of playground apparatus. The CSA Z614 stipulates the place to measure the fall height from, however the general rule is the highest accessible height except for a roof. Due diligence requires that the location for the fall height reflect what is found at the playground in reality.

Impact attenuation and measurement of forces at the time of impact are the only measures for playground protective surfacing. The pass/fail criteria (less than 200 g's and less than 1,000 HIC) are the levels at which one can expect a life threatening injury. The CSA standard recommends that all installed surfaces be tested at the site of installation to ensure that these force levels are not exceeded. Site tests can easily be performed with a free fall triaxial hemispherical headform or with some difficulty with a fixed uniaxial apparatus.

A detailed discussion of the selection of the 200 g's, the 1,000 HIC, negligence, and liability can be found in an article "Playground Surfacing, Injury Severity and Liability". This was published in the **January 1994 edition of Landscape Ontario, Landscape Trades**, and **March 1994 edition of the Ontario Parks Association, GreenSward**, and on the internet at <http://everplay.com/liability.htm>. This will inform the reader in detail of the history, both legal and technical, of playground surfacing.

Once it is understood that all playground surfaces must be installed to meet the performance of the ASTM F1292, the requirement that all playground surfaces should be maintained to this standard is obvious. This also means that all surface that currently do not meet the standard must be brought into compliance with the standard.

It is this capture of all playground surfaces that is cause for much concern and creates a potential problem for owners, play supervisors and maintainers.

The problem that quickly becomes evident to playground professionals has three aspects. First 70% of all playground injuries are the result of falls. Second, most playground surfaces (as high as 80%), especially in high traffic areas, will not meet the requirements of the standard. Third, the protective surface area has been increased for swings and these additional areas will in almost cases not meet the requirements of the standard. Section 10.5.7 of the CSA Z614 states "All protective surfacing shall be replaced or repositioned when it is worn or ceases to function as intended."

Recognition of the existence of a problem is a major step towards the solution. Depending upon the installed surface, the method of maintenance of the surface can be established. Generally loose fill materials (sand, pea gravel, wood fibers and chips) can be maintained as follows;

Sand is the most traditional playground surface, yet is the most difficult to maintain. Tests have shown that 12" of loose fine sand can only meet the requirements of the standard to a 9' fall, while the same sand 9" deep and compressed will only meet the standard at 5'. This means that the sand must be constantly topped up and loosened to its full depth. In many cases the infiltration of silt or contamination with the subsoil will not allow for the loosening to be effective. At this time the sand must be totally removed and replaced.

Pea gravel or metering stone is readily available and at a 12" loose depth will meet the performance of the standard to a height of 10'. At a 9" compressed depth this height reduces to 6'. This surface is easily disturbed, especially in high traffic areas such as climbers, slides, swings and sliding poles, where the impacts with the surface can be from significant heights. The pea gravel must be regularly redistributed and topped up. In addition contaminants of the subsoil can rise and cause the surface to become permanently reduced in depth and therefore reduce its ability to absorb impact. Once the peagravel is contaminated in this fashion, it must be replaced to its full depth. Avoidance of the contamination from subsoil can be accomplished with the installation of a geotextile between the subsoil and the peagravel. Other playground hazards such as peagravel being easily thrown or placed in bodily openings are outside the purview of this article.

There are many wood systems from mulch and chips to manufactured fibers. These are generally excellent energy absorbers that will at a 12" loose depth meet the standards at 11' and as low as 6' for a compressed depth of 9". Loosening or topping up can resolve compression from traffic and disruption. Decomposition that results in compression can only be resolved by total replacement. This can be prevented with the installation of a minimum 1" layer of gravel sandwiched between layers of geotextile

between the subsoil and wood system. This will provide for positive drainage as well as prevent capillary action of moisture from the subsoil to the wood.

Synthetic surfaces provide the greatest potential problem in that once they are installed there is very little that the owner can do to rejuvenate impact absorption. For water permeable systems, it is possible to use a gas power outdoor vacuum to remove dirt that is trapped in the surface. Mats or tiles generally have a leg formation as a part of the impact absorbing properties for the system. Where these have been installed on a granular base, the granular material can become lodged between the legs reducing the ability of the leg to move and thereby absorb impact. In this case the surface must be removed and totally reinstalled. Installation of a geotextile, use of a split granular only and selection of a mat with a flat rather than angled leg will prevent this problem. The most serious problem associated with synthetics is that the chemicals used in the bonding of the surface become rigid overtime and the surface no longer meets the standard. When a synthetic surface ceases to function as intended it will have to be replaced. In most cases this can be very expensive.

Given the significance of surfacing in the reduction of injuries and the potential cost and liability associated with installation and maintenance of surfacing it is important that the owners of play surfaces take steps to protect themselves. Here are a few steps that can be taken to avoid problems in the future;

1. At the time of installation make sure that the surface selected will provide of the impact absorbing properties required for the fall height of the play structure. For loose fill materials the CSA Z614 standard has a table that can provide assistance.
2. Require that a geotextile be installed between the subsoil and the protective surface material.
3. Perform a site test with a free fall triaxial headform or fixed uniaxial headform at the time of installation and have the results and drop heights documented.
4. Establish a maintenance program that will ensure that the protective surface will continue to meet the requirements of the standard.
5. For synthetic surfaces, ensure that the installed surface provide a Gmax less than 200 and HIC less than 1,000 from the maximum accessible height, tops of railings, pivot points of swings and the highest point of any climbing apparatus. It is recommended that the numbers be lower than the limit of the standard, to allow for changes over time. An industry practice is to have a Gmax less than 161 and HIC less than 950 at the time of installation.
6. For synthetic surfaces, require that a site test confirming that the surface continues to meet the requirements of the standards be performed as part of the warranty of the surface at the end of the warranty period.
7. For all playground surfaces perform site test periodically as recommended in the CSA Z614 standard.

It is a requirement of the CSA Z614 standard that all playground protective surfacing is dynamic and must be impact absorbing. Everyone associated with the playground and supervision of play should insist on the periodic site testing of the protective surface. This will assist in the development of the maintenance program and schedule for replacement of materials that no longer perform as required.

There are two videos available regarding safety, inspection and supervision of the playground. Each has a focus on a specific user group. Child's Play, produced by Safe Kids Canada and distributed by CSA is aimed at the parent and user of the playground. It's Time to Stop Playing Around is produced and distributed by the Ontario Parks Association has a technical orientation. These can provide tips on the maintenance and inspection of the entire playspace. In addition the Canadian Parks and Recreation Association is providing a program for the certification of inspectors of playgrounds to the requirements of the CSA standard.

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