PLAYGROUND ADVISORY

www.PlaygroundAdvisory.com

Canadian Playground Advisory Inc.

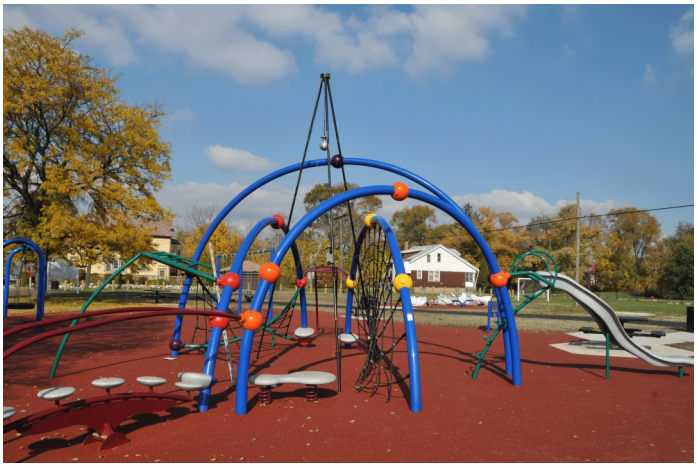
Volume 6 Issue 1

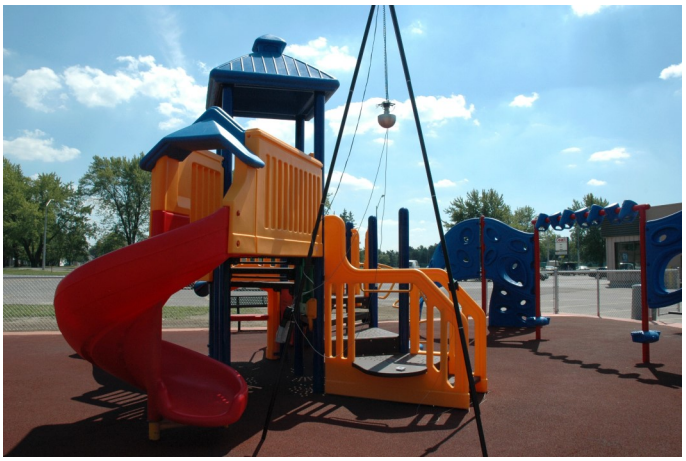
February 2014

Understanding Rubber Playground Surfaces

The key to playground protective surfacing is the "protective" aspect first with accessibility to persons with all abilities and functional longevity a close second and third. Other considerations are important, but only if the surface continues to perform. This is doubly important in Ontario, Canada for Child Care operators, who have a mandated and continued requirement to meet or exceed the requirements of the CSA Z614 Standard. In the United States the mandate for continued compliance with ASTM F1292 is through the DOJ 2010 ADA Standards for Accessible Design. For both of these, compliance in the field at any time that the playground is in operation is the requirement.

Playground surfacing has obviously been around as long as there have been playgrounds. Synthetic surfaces were developed first as mats or tiles in the 1960's and poured in place not until the late 1970's and 80's. Essentially these were a combination of recycled tire and post-industrial rubber and a polyurethane binder, with the technology developed for running tracks being applied. This is also when those looking for colour in the athletic surface turned to the rubber industry for a material to bring colours and meet or exceed the durability of tire rubber with the winner being EPDM. Initially the colours were all UV stable due to the limited number of colours available. With the proliferation of colours, some of the problems with fading and colourfastness began to be an issue.





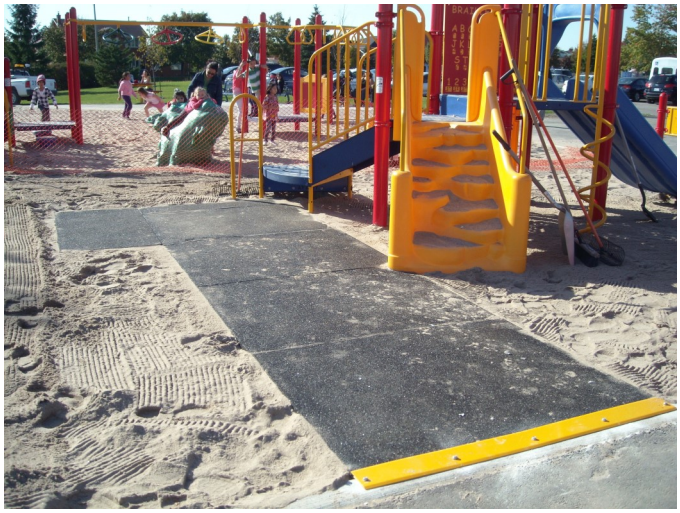
Injury prevention became important in the early 1980's with the publishing by the US CPSC of the Handbook for Public Playground Safety and the requirement that the protective surface must have a Gmax value less than 200 and that this would prevent a life-threatening skull fracture. With time and further research by the automotive injury and awareness of concussions the injury prevention moved from up to a 16% risk of fatality from head injury to prevention of the concussion and the long-bone injury requiring surgery. There has also been a move to distinguish between children under 5 and over 5 as they are more prone to head first falling along with a need to learn about their bodies and as their skulls are not as protective as older children. For this reason we see the need to change from the original life-threating 200 g to 100 g or under and for the Head Injury Criteria (HIC) from the 15% fatality risk of 1000 to under 700 for children over 5 and 500 for children under 5. As the play community speaks more and more of risky play and challenge, exposure to hazards and severe to critical injuries should exist.

Some of the distinguishing features between the

manufactured mats and tiles over the poured surfaces are obvious while others such as where each fails are less obvious. Since their development fabricated products have been plagued with a significant expansion and contraction problem that causes them to curl or gap causing problems with accessibility and compaction of dirt in seams. Manufactures have combatted this problem either through mechanical interlocks or adhesives, which depending upon their longevity only delay the failure of the product. Alternatively for the attenuation of impacts the mats function through the incorporation of legs that flex and create an air space. Some legs are better than others in their ability to flex and quite often the continued flexing caused the legs to break and the product fail. An additional problem with the leg relates to the installation techniques utilized. To ensure that the leg continues to function, mats must be installed on a hard surface such as asphalt of concrete. Compacted granular, which is stable at the time of installation will eventually with freeze/thaw and penetration of water begin to shift and allow the leg to become embedded in the granular base reducing the ability to attenuate impact. One major advantage of the manufactured tile is that they will be consistent as they are produced under controlled conditions. Users must remember that consistency means that bad mats will be consistently bad and generally good mats will be consistently good.

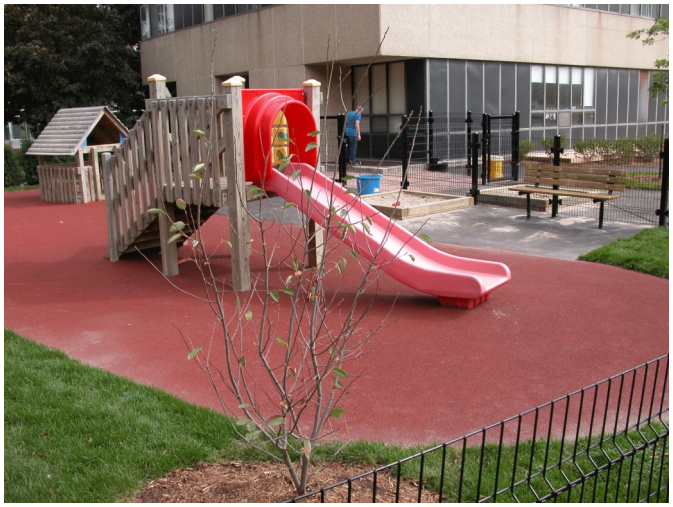
Over the past 10 years and as a response to the need

to meet accessibility requirements a trend in mats has been to the large format mat. These range from 3’ x 3’ to 4’ x 5’ and from 1” to 3” thick and generally used as wear mats or accessible routes in loose fill surfacing. Those with a 5' width are designed to meet the minimum width of an accessible route without seams that occur in smaller mats playing havoc with the cross-slope. Although there are lots of claims made by manufacturers, there are no ASTM standards and therefore purchasers must make sure that the claims are real. Remember there is no such thing as ADA "approved" & with a requirement for a vertical change of height not exceeding ½ " there are no mats installed singularly that meet the ADA. Accessibility standards to reference would be Annex H of the CSA Z614 and the DOJ 2010 ADA Standards for Accessible Design.



It is interesting with ASTM having written guides and performance standards for both Engineered Wood Fiber (EWF), ASTM F2075 and Poured-In-Place, ASTM F2479 to alleviate concerns and point out shortcomings, that the rubber mat industry is minimally active in ASTM F08.63 and has not yet proposed a performance standard or guide. The clear advantage of tiles is that they are modular, therefore easy to ship, install and replace individual pieces making failure isolated and piecemeal. Modular replacement might be hampered by the method of bonding or locking them to each other. A performance standard and therefore the questions prospective purchasers should address are; does the tile have different abrasion resistance to the surface above and to the side of legs; how many impacts with a missile simulating a child from the critical height are required to cause leg failure; what is the expected expansion and contraction through exposure to submersion or cold; what is the tensile strength of the sys-

tem to keep mats from separating; and obviously the compliance with ASTM F1292.



As to poured-in-place, this is a technology that is fraught with claims of science and precision in installation techniques that generally do not exist and lead to premature failure. To allow users to better understand the problems (sales personnel will tell you all the presumed advantages) ASTM has published the ASTM F2479 "Standard Guide for Specification, Purchase, Installation and Maintenance of Poured-In-Place Playground Surfacing". The principals of Canadian Playground Advisory Inc. have chaired the task group and made and continue to make major contributions to the guide. It is important to the reader to understand that this is just a guide and therefore does not have performance requirements. Therefore anyone claiming compliance to the F2479 indicates their lack of understanding. The guide points out that aromatic mdi polyurethane binders are not UV stable and generally cause a product to become more rigid over time and exposure therefore owners and specifiers should consider specifying polyurethanes that are UV stable and incorporating warranties into contracts that require ongoing compliance with standards like ASTM F1292.

Currently the ASTM F08.63 sub-committee on playground surfacing is balloting a poured-in-place performance standard to address the concerns of owners requiring manufacture/installer to perform warrantable repairs. These include the forming of cracks exceeding the thickness of a 25¢ coin, the occurrence of gaps exceeding ½" (12.7mm), changes in vertical height and slopes that exceed the requirements of the accessibility requirements, no exposed wire in the surface exposed to children, abrasion resistance due to poor materials, binder or installation technique and obviously compliance to ASTM F1292 for both the critical height test and in the field through testing at least every three years.

With regard to top colour of the rubber surface,

whether a mat or poured in place, the ASTM F2479 includes both the long standing EPDM and more recent TPV as options. Although the standard includes definitions for each product it is incumbent on the specifier to ensure selection of and warranties for colour fastness from the suppliers. This is to ensure that the delivered product meets aesthetic expectations. It is critically important that neither the substitution of the original recycled tire rubber with EPDM or TPV enhances or diminishes that functional properties of the final surface. This will be determined by the selection of the binder, the thickness of the surface and the installation techniques employed.

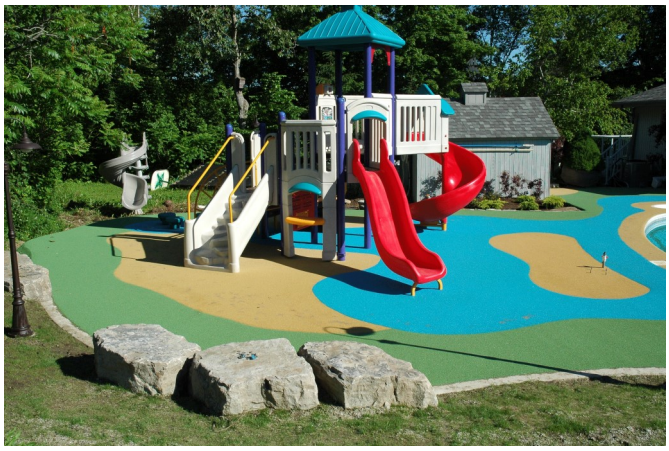
The provision of colour has become significant over the past 15 years as synthetic rubber surfaces have become more dominant and there has been a need to first provide a method to get away from the heat of black only rubber followed by theming and logos. Initially the poured-in-place industry took a leaf from the mat manufacturer's book by using pigmented binders to bond the black rubber and these, just as with the mats, tend to fade and darken down in high traffic areas. EPDM rubber has provided proven colour in sports surfaces and playgrounds since the late 1960s. Although proven to be highly durable and able to provide a wide range of colours, demands for greater creativity has brought some colours that are

better suited for indoors due to lack of UV resistance. It is important to remember that this problem only applies to a few fringe colours and specifiers are encouraged to ask their suppliers for statement on fading. Following EPDM and a relative newcomer to colour in playgrounds is TPV, which is not a rubber, but a thermoplastic. TPV, as EPDM, adds nothing to the crucial performance of the surface such as impact attenuation, abrasion resistance, functional longevity or most important playability to the playground surface. Both of these offer alternatives and generally are available to surface manufacturers around the world. It is important for architects and landscape architects to understand that they can provide exciting play environments that are both colourful and functional with options they want, but with this discussion on colour will need to ask questions for the project to be able to succeed.

Another rubber surface that has gained acceptance in some markets is the loose rubber. There are various configurations from crumb to nuggets to shred and carry a variety of names from suppliers. ASTM F08.63 currently has a standard for these products working through the standards publishing process. Even with a standard in place, specifiers and owners must ensure themselves the product meets compliance and does not have exposed wire, exposing children to a hazard.

With the focus on the budget, functional longevity becomes a consideration and ASTM standards

again provide guidance and assistance. The ASTM F2479 beyond the guidance on mechanisms of failure and how to work beyond them provides clarity on the content of a warranty document that would be developed by the specifier. This would include the number of years the warranty is for and the performance standards and requirements the surface must meet at the end of that period. Additionally the ASTM F1292 provides for testing in the field, as required by CSA Z614 and the ADA, and requires the owner to select the drop height for this test which can be higher than the equipment manufacturer suggested fall height and based on reasonable foreseeable misuse by the children. This Standard also allows for the selection of lower values for Gmax and HIC than the life-threatening minimums of the standards. The greater complication will be compliance to accessibility requirements including no gaps



greater than a ½" (12.7mm) or changes in vertical height greater than ½" (12.7mm) as well as conformance to running and cross slope requirements. Detailed and lengthy requirements for the ground level accessible route can be found at www.playgroundadvisory.com either as a step by step procedure or in newsletters.

Ultimately the synthetic rubber surface must meet performance requirements, enhance the play experience and prevent injuries. There are many providers of products as this is a business opportunity for many manufacturers and contractors. They are not always successful and many come and go to change the legal names to avoid liability and warranty. It is important for the owner to understand that product failure on behalf of their supplier has very little consequence to them, where as it could mean a program failure to the playground owner/operator for whom the surface is an integral part of a larger playground and community project.