

Poured in Place Playground Surfacing Standards and Requirements, Myths and Realities

There is little doubt that the *Poured in Place* playground surface is the most expensive and least understood choice that an owner/operator can make in the specification and installation of a playground. Failure to make the appropriate choice could pose negative consequences to the future of the playground, the children using the playground and the budgets available for new playgrounds.

A good *poured in place* surface can provide the owner/operator with many years of service and enhance the performance of the playground from the point of view of performance for impact attenuation, cleanliness, minimal maintenance, accessibility and durability.

Essentially a *poured in place* surface consists of dry components (rubber crumb and/or fibres) bonded with a wet component (polymer binder). These are mixed together in exacting proportions and poured in the playground over an appropriate base in one or more layers, by skilled technicians. The inter-relationship between the components and the way they are installed will have a major bearing on the short and long term performance of the surface.

It is important that the owner/operator and their specifier understand;

- what they are required to do with regard to standards and due dili-

gence

- what *poured in place* surfaces are and how they work
- what can go wrong and why
- how to determine or measure compliance with contract specifications and standards
- how to protect the owner/operator from liability in the future
- what are value-added tests and what do they mean

There is currently no specific standard anywhere in the world that relates specifically to *poured in place* surfacing. As a result, many manufacturers, installers and suppliers of components have developed their own specifications, descriptions and performance criteria. In many cases these are credible; however trade literature reflects that there are certain gaps and omissions in information, erroneous claims, unspecified shortcomings and outright false statements about specific products.

Standards and Due Diligence

There are eight standards in the

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world that relate to playground protective surfacing. They are the CSA Z614, the ASTM F1487, ASTM F1292, ASTM F2075, ASTM F1951, ASTM F2223, En1177, and AS/NZS 4422.

The CSA Z614 is the Canadian standard (www.CSAInternational.org) for playspaces and includes technical and performance specifications and information for both play structures and protective surfacing. Although the CSA Z614 contains a pass/fail value for protective surfacing, it refers to the tests in ASTM F1292 or En1177 as acceptable in measuring the performance of the surface.

There are a number of standards relating to playgrounds and playground surfaces from ASTM International (www.ASTM.org). The ASTM F1487 primarily provides the technical requirements for play structures, however it does require that protective surfacing be installed and maintained to the requirements of ASTM F1292. The ASTM F1292 stipulates that methods, instrumentation and pass/fail for impact attenuation of a protective surface. Since this procedure reports Gmax, HIC (head injury criteria) and velocity at the point of impact, it can be used directly within the CSA Z614 and ASTM F1487. The ASTM F1951 provides a performance test procedure and pass/fail requirements for a surface to be considered to be accessible. The ASTM F2075 describes the makeup and components required for a loose fill wood product to be defined as Engineered Wood Fibre. Interestingly both the ASTM F1951 and the ASTM F2075 require that the surface prior to being tested for performance to these standards, must demonstrate the ability to perform as an impact absorbing surface as stipulated in ASTM F1292.

The ASTM F2223 is a Standard Guide for playground surfacing and provides assistance to the non-technical person with an overview of the issues addressed in the technical standards. Interestingly this Standard in describing the importance of a surface being impact absorbing, (injuries from falls are greater than 60% of all playground injuries) outlines that even though a

surface meets the impact requirements of the Standard that serious injuries such as long bone injuries could still occur. It is important to note that the surfaces with lower Gmax and HIC values do provide better impact absorbing properties.

The En1177 is the European Community standard (www.cenorm.be/cenorm/index.htm) for testing and measuring performance of an impact attenuating surface. This Standard only reports the HIC value and if used in the conjunction with the CSA Z614, the test instrument must also provide a method of measuring and reporting the Gmax.

The AS/NZS 4422, the Australian/New Zealand Standard (www.standards.com.au/catalogue/script/Search.asp) provides a specification and test procedure for playground surfacing and specifically measures both the Gmax and HIC. This Standard requires that drop tests be performed from the point on a play structure from where the child has reasonable foreseeable access. This would place the testing from tops of guardrails and barriers as a minimum.

Due diligence requires that the owner/operator acquires or purchases and applies the knowledge that would ensure compliance with the standards and as well as meet whatever other performance requirements that would protect the interests of the owner/operator during the life of the playground. In many cases, this would include a detailed maintenance procedure that includes seasonal considerations. Small particles, such as sand that penetrate the ***poured in place*** surface will have the potential to cause failure of the surface and result in a serious injury. Methods of cleaning the surface and materials that should not be placed in conjunction with the surface should be requested and received from the supplier.

What goes wrong with *Poured in Place*?

The technology of every ***Poured in Place*** surface will have components or techniques that are proprietary to the manufacturer/installer/supplier. Should a supplier no longer be in business, it is not very likely that another supplier would be able to find an effective of



lasting repair solution short of a total replacement of the surface. All of the surfaces are made of polymer binders and depending upon the quality of these binders they will be detrimentally affected by exposure to ultraviolet light and/or water. Generally this exposure causes the surface to lose impact absorbing properties. In some cases the surfaces become more durable as they get harder – this is not a good thing since there is no fairy dust that can be magically spread across the surface to restore resilience. Once the surface fails the impact attenuating requirements of any of the standards, the surface must be made to comply and this generally means replacement.

What to do?

All of the standards and literature worldwide indicate the importance of impact attenuation of the playground surface. The Gmax and HIC values must be below those that are considered to contribute to life-threatening head injuries. Lower values of Gmax and HIC do indicate a better surface for impact absorption.

Another important aspect of all of these standards is that the performance of the surface must be below the values stated at the time of installation and at all times that the play structure is in use. It is suggested to that suppliers provide a warranty that reflects this.

The best practice would be to install a surface that provides as low a Gmax and HIC value as possible when tested from the highest accessible points of the play structure. Contractually specified performance must be field tested to confirm compliance. All of the standards have field testing procedures. Use them! It is the responsibility of the owner/operator to stipulate the height from which the test is to be performed and what the allowable results will be, provided they are lower than the minimums of the Standard.

An acceptable warranty should stipulate impact performance requirements, drop heights and a term longer than the typical 1 year. Apply your knowledge to ensure you're your concerns are addressed, rather than only those the manufacturer is prepared to cover.

It is important to check references. Call clients of older sites and ask if they have recently had their surfaces tested and enquire about any specific problems that have emerged over time.

Other Tests and Standards

Quite often surfacing suppliers have performed tests on their products that may or may not relate to the application for which you are purchasing that product. **Poured in Place** surfaces are used in many applications and unusual tests can be performed. Since these tests have been paid for and they carry a certain element of credibility, they are included in corporate literature and surface specifications. Whenever you are presented with tests, go to the websites above and search for the standard to check for validity and relevance to your specific application. There are numerous examples of irrelevant tests, however the following three should suffice to outline the pitfalls. These have been taken from the specifications of an international supplier. The first suggests that hardness should be tested according to ASTM D2444. A search of www.ASTM.org indicates that this Standard which was last revised in 1999 is a "Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fitting by Means of a Tup (Falling Weight)". It is very difficult to understand what this would have to do with playground surfacing. Since **poured in place** surfaces can be detrimentally affected by water, seeing a test for water absorption as ASTM D530 would indicate the potential for valuable information. Again a search is performed and the result is that the Standard was withdrawn in 1987 without a replacement and during the 2 years that it was in force, it provided "Methods for Testing Hard Rubber". It is difficult to relate this to a playground application. A third example would also appear to be valuable as it is supposed to evaluate ultraviolet resistance with ASTM D3137. A simple search tells us that this Standard was most recently revised in 2001 and is a "Standard Method for Rubber Property – Hydrolitic Stability" and a search of the actual standard shows no mention of ultraviolet resis-

tance.

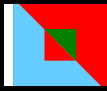
There are thousands of tests and standards for evaluating the performance of materials. A search of any of the above Standard Writing Bodies sites will have lists of the standards that are available from their organizations. Some of these tests are very specific and all cost money to perform. You might want to consider what information could be provided in a test that would be valuable to have and you might also be asked to cover the costs of the test if it is not normal to the application. The key is to read the standards directly and determine their validity and worth.

Conclusions

Poured in Place surfaces are highly technical and require an understanding of physics (configuration of components), chemistry (rubber and polymer properties and mixing ratios), climatology (some binders require or react differently to various temperatures and humidity or fluctuations during an installation), kinesiology (the installer must provide the appropriate amount of muscle, torque and pressure to the mixture as it is spread and finished) and how to make all of these create the surface that the owner/operator expects.

The owner/operator or their consultant/specifier, must do their homework and research the relevant standards, write specifications and warranties that reflect requirements of the standards and add a degree of comfort for future changes. Requiring field testing at the time of installation and during the warranty period is a key element in determining if standards and specifications are being met.

One pitfall many specifiers encounter is that they get involved in the specification of the chemistry, rubber components, tools etc. required in the installation. At this point they become the developer of the system and take responsibility for performance should something go wrong. All of the manufacturers and installers are subject to laws regarding the environment and worker safety and the systems that are installed will generally conform to these practices. The specifier should stick to the performance issues and protect their client through to post installation testing.



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**State of the Art is not a limit,
but a Point of Departure**

Ultimately the owner/operator will have to make a decision and the reputation and demonstrated reliability of the supplier as experienced by other clients over time will be a major factor. Knowing that the products being supplied have a proven history and that if and when something has gone wrong, such as vandalism, the surface has been successfully repaired rather than replaced, is a plus.

There is no perfect playground surface. **Poured In Place** surfaces can be a great benefit and provided the above concerns are dealt with appropriately, the owner/operator can be confident that their playground surfacing decisions contribute to many years of safe and rewarding play experiences.

