PLAYGROUND ADVISORY

Canadian Playground Advisory Inc.

Volume 4, Issue 1

February 2011

The Sustainable Playground Protective Surface

The owner/operator of the playground faces a complicated set of requirements in the installation and ongoing management of the playground surface assets at the time of specification, purchase, installation and throughout its entire life. Some of the requirements will have liability concerns; others will have civil rights considerations, and every choice goes through a decision blender of capital vs. maintenance budgets and resources.

Ultimately, for the entire length of time that the playground is open to the public, all of the standards and laws must be met. Failure my result in injury to a child, financial penalties for a liability claim or regulatory penalties for non-compliance.

The owner/operator may not have the expertise; however they are ultimately responsible for the outcome. In many cases they turn to consultants and suppliers as they are presumably in possession of specialized knowledge related to the sustainable playground surface that is durable and least cost.

Most consultants and manufacturers do not have a complete understanding of the performance requirements of the playground surfaces and either fail to write appropriate specifications or engineer their projects to create the sustainable playground protective surface.

The purpose of this paper is to explore the standards, laws and present best practices to ensure compliance. There will also be a discussion of some of the materials that have been used in surfacing playgrounds and how their designs lead or fail to provide sustainability.

Protection from Injury

The first role of the playground surface is protection of children from life-threatening head injuries & a reduction of the severity or all other injuries in the event of a fall. This surface is, according to ASTM F1292, to attenuate the impact forces on an object falling from a drop height determined by the owner/operator prior to purchase. The pass/fail values are that the Gmax shall not exceed 200 and the HIC shall not exceed 1000. Lower values of either Gmax or HIC do reduce the risk of a life-threatening injury as well as the severity of any other potential impact related injury. The ASTM F1292 requires that all surfacing suppliers will provide a not older than 5 year test for surface materials that are "identical in design, materials, components, thickness and manufacture as the installed playground surface." The requirement of the ADAAG is that the accessible route must comply with ASTM F1292 (1008.2.6.2) when the accessible route is within the play structure use zone as defined by ASTM F1487.

Compliance with ASTM F1292 is also a legal requirement within a number of States and Provinces through legislation governing Child Care, Health and Safety, Building Codes, etc. This requires the 3 temperature laboratory certificate and ongoing field testing to confirm compliance. In some jurisdictions where surfacing manufacturers have not performed the laboratory testing, a field test performed at the time of installation and ongoing passing of field testing is allowed.

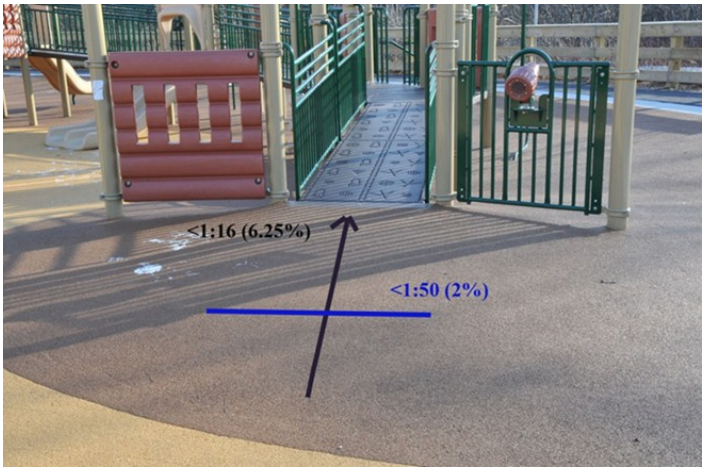
Compliance with ADA/ABA and the AODA

It must be understood that these requirements only apply to the section of the playground surface that is considered to be the accessible route, which is defined in the relevant law. Although many owners select a surface to meet the accessibility

requirements over a larger area, there is no requirement to make this extension.

The American with Disabilities Act and Architectural Barriers Act have been in place for more than 20 years and the playground rule has been in place for more than 10 years. The Accessibility for Ontarians with Disabilities Act was passed in 2005 and the playground portion will be largely based on the CSA Z614-07, Annex H, which in turn is heavily influenced in its performance requirements by the July 23, 2004 ADAAG. These are all legal requirements and in the United States this is a complaint driven system with investigation and enforcement by the US Justice Department, while in Ontario the inspection and enforcement will be generally with the Ministry of Community and Social Services and some other agencies where applicable.

Irrespective of the jurisdiction, there must be an accessible route in each playground that connects both elevated and ground level play components. Although there are limited exceptions to the width, an accessible route is typically a 3 dimensional space with a width of 60" (1524mm), vertical clearance of 80" (2032mm), a cross-slope that does not exceed 2% and a running slope for elevated components that does not exceed 8%, while for ground level components does not exceed 6.25%. All 60" x 60" (1524mm x 1524mm) turning or resting areas must have a slope in all directions that does not exceed 2%.



As an example all play structures with more than 8 elevated play components will have accessible play components, such as a slide, that will require travel from the elevated accessible route to a ground level accessible route. There will have to be an accessible route to this slide entrance and ultimately returning at ground level from the slide exit to the structure entrance. This same play structure will also require a minimum of 3 non-redundant ground level play components that must be on an accessible route. Generally one of the ground level components will be a swing and an accessible route must be provided for both the user of the swing and their potential caregiver. Depending upon the playspace surface system selected, such as poured-in-place or mats, it may be difficult to visualize the accessible route.

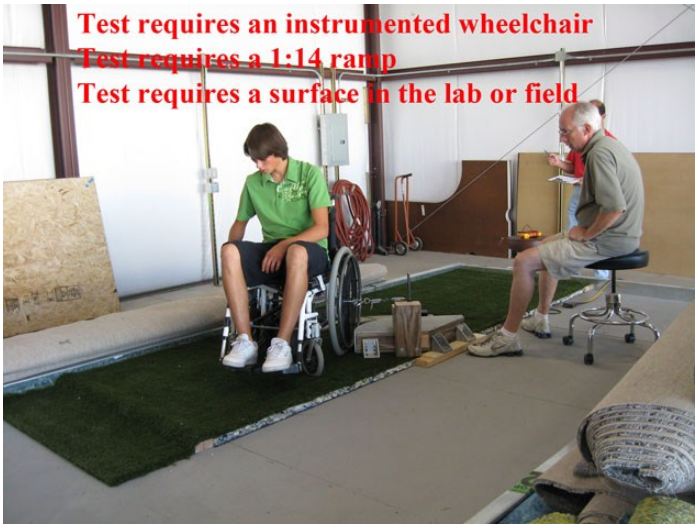
Changes in vertical level also have requirements for the accessible route. For the ADA the change in vertical height must be

less than ½" with the first ¼" allowed to be vertical and the second ¼" must have a slope of less than 2:1. For CSA Z614-07 Annex H the change of vertical height may be a maximum of 1" (25.4mm) with the lower vertical portion being ½" (12.7mm) and the second ½" (12.7mm) and must have a slope of less than 2:1. Additionally when the 60" (1524mm) straightedge is placed on the surface and across the accessible route there shall be no gap under the straightedge for the ADA greater than ½" (12.7mm), while for the AODA the measurement is 1" (25.4mm). This will be a particular problem at the junction with hard surfaces such as sidewalks, curbs and ramps.

Since a mobility device could become trapped in an opening in the surface, nowhere along the accessible route shall there be a gap greater than ½" (12.7mm). This is a particular problem for many synthetic surfacing systems that might shrink at the edges or at seams.

All surfaces used in the playground accessible route shall also have a certificate of compliance for the ASTM F1951-99 Standard (ADAAG 1008). The supplier is required to provide

a certificate of compliance to this Standard and the owner/ operator must ensure compliance to ASTM F1951 of the installed surface throughout the entire life of the playground. "Ground surfaces shall comply with ASTM F1951. Ground surfaces shall be inspected and maintained regularly and frequently to ensure continued compliance with ASTM F1951." It is commonly considered that the ASTM F1951 is performed in an indoor setting by an" accredited testing laboratory", but this test has been performed in the field with the transfer of the 'work measure wheelchair and data acquisition devices" to the playground and the tests performed by an" accredited testing laboratory". Although there is a significant cost associated with the transport of the devices, an owner may be required to perform the test should a complaint be lodged against a specific site. Depending upon the contractual stipulations, specifications, hold harmless statements and warranties, this cost might be borne by the owner/operator or the supplier of the system.



The properties of the accessible route would not just apply to the accessible route within the playspace, but also the accessible routes transitioning into the playspace, such as walkways and other junctions.

Other Standards for Protective Surface Compliance

There are standards writing bodies, such as ASTM and CSA that have established technical committees to write standards related to playgrounds and also for playground surfacing. Standards content is developed by the responsible sub-committee and committees and following complicated procedures a standard is published. The standards writing process allows and requires that standards are revised or reaffirmed within 5 years of the publishing of the current standard. This is the way in which standards remain relevant and reflect changes within the product, service and use environment.

ASTM F08.63 sub-committee has in addition to ASTM F1292 and ASTM F1951 developed standards for Engineered Wood Fibre, Poured-in-Place surfacing and a summary standard for the standards this group has published. There are work items moving toward becoming standards in areas such as firmness and stability of an accessible route, performance requirements for poured-in-place surfaces, loose rubber surfaces used in the playground and sand surfaces used in the playground. Some of these standards will take years to publish, while others will be published shortly. Some of these will be important in the provision of certain surfaces and the development of best practices.

The CSA Z614 technical committee has developed a comprehensive Standard that incorporates structures, surfacing and accessibility. This will have a role in determining the acceptability of surfaces. Although the bulk of the responsibility for surfacing falls upon the owner/operator, there is guidance for surfacing such as "Owner/operators of playspaces shall ensure the suitability of any surfacing material used, taking into consideration such factors as the presence of contamination (e.g., pesticides, toxic materials, paint/coatings, heavy metals and sharps.)." This also has a significant impact on the surfacing supplier and the acceptance of certain materials in Canada.

Protective Surfacing Design

When the impact attenuation of a protective surface is designed for, there are two primary considerations; the ability of the product(s) to absorb impact and the work required to return it to the original position ready for the next impact. Most surfaces consist of particles of rubber, stone, wood, or sand that are either loose or bound. The ability of the surface to absorb energy lies in the ability of the particles to move in rela-

tion to each other. Loose materials are generally installed in such a manner as to continuously absorb impact through the resistive moving of particles away from the force of the impact and this is repeatable in the playground when the surface materials have sufficient depth to resist excessive displacement and disruption. Synthetic surfaces rely on a binder to hold the particles together as in poured-In-place or mats, while other systems such as synthetic turf rely on the carpet pile to stabilize the loose fill particle, and the underlying bonded particles of foam move in relation to each other. How this movement is performed on a consistent basis will determine the impact attenuating properties of the surface. The ability of the particles to remain in place over time, continuing to provide the intended impact attenuation will determine the value of the surface as a viable system.

Temperature has a bearing on how these products perform and ASTM F1292 requires that surfaces systems be tested at 24F, 72F and 120F to demonstrate that they are suited to the range of temperatures children will play in. F1292 recommends that if the surface is to be installed outside the tested temperature range or in frozen conditions, tests should be conducted under those conditions to determine suitability to a particular environment. The recognition of the actual installed environment being a factor is further recognized with testing in the field to F1292. These tests are performed in the conditions and ambient temperature that the surface is found and air and surface temperatures and other weather conditions are recorded. Failure of this test in the field results in the play structure related to the failed surface being taken out of service until the surface complies.

The ASTM F1292 laboratory testing was established to allow comparative examination of surfacing materials and to allow manufacture to test uniform samples to a uniform procedure. From a practical point of view there are shortcomings to the laboratory testing.

It must be remember that sample size for the laboratory testing for ASTM F1292 is a box that is 18”x 18”. For synthetic systems the box structure can be left in place or removed as the rigid box side should not have an influence on the result. Alternatively for loose materials, the box sides cannot be removed and do not allow for the displacement of the materials sideways nor does it indicate how this surface will perform in traffic areas in the actual playground. As a result a test report for loose fill that provides excellent test results in a laboratory condition should not assure the owner/operator of continued “safe” performance in the field.

Factors not taken into consideration in F1292 are contamination during use or the aging of the surface under outdoor conditions. Many aggregate loose fill systems when abraded against their adjoining particles will breakdown and the dust will fill the void space that was originally there, with a resulting loss of attenuating features. This contamination causes many of these surfaces to fail the impact requirements. Although only mineral aggregates will be subject to this type of contamination, every material will be subject to contaminants that can be set between the systems particles. A peculiarity of wood chip systems is that when these products abrade and form sawdust, there is a tendency for the surface to have better impact attenuating properties. As a result each system must be review as to its performance during active use over 12 to 25 years.

Loss of depth through wind, rain, attrition or removal from the playspace is also not predicted by the results of ASTM F1292. It is for this reason that standards such as the CSA Z614 recommend the installation of a minimum of 12” of loose materials to allow for disruption over time.

ASTM F1292 laboratory testing is performed on new samples and there is no consideration of aging or weathering. Many bound rubber systems utilize a polymer binder that is not UV stable and these system tend to get more ridged over time. Given that almost every playground is outdoors, this potential for failure is a major problem for the owner/operator. Failure of these systems generally results in a complete replacement.

Poured-in-Place surfacing systems are actually the subject of a guide standard, ASTM F2479. This standard recognizes that there are choices in binders; the non UV stable and low cost aromatic binders and the UV stable and higher cost aliphatic binders. The choice of binder is made generally on a cost vs. longer term conformance to the ASTM F1292 for the installed

surface. Many manufactures make the least cost choice with owners finding that failure of ASTM F1292 testing places them with liability and non-compliance with the ADA, an embarrassing shutdown of the playground and an expensive replacement.

Beyond impact attenuation, elimination of other hazards needs to be considered in the design of the system. These will include, but are not limited to toxins, sharps and other hazardous materials. Toxins and sharps have long been understood to be undesirable as they might be skin absorbed or consumed should a child choose to do so. Sharps are a concern for tetanus and when there is a puncture that results in blood being left in the playground, participants may now be exposed to a biohazard. Additionally should a child consume a particle of the playground surface that contains exposed sharp metal this could cause havoc with their digestive system. For this reason the Engineered Wood Fibre Standard, ASTM F2075, does not allow for any tamp metal to be within the product and the proposed Poured-in-Place performance standard, while allowing ¼" exposed wire in the base cushion, the upper bound wear layer cannot contain any exposed steel and must be at least ⅜" thick to prevent exposure of the cushion layer to children. Other toxins, such as heavy metals, including lead, mercury and other known contaminants can be tested for. A list of contaminants and allowable levels should be available within federal, state or local requirements. This would also extend to lead limits for children under the age of 12 as set out by the US CPSC.

One concern in designing products using recycled components are toxins that could have been placed in the products as part of the original manufacturing process or toxins that could have attached or bonded themselves to the product during the first life of the product. This is a concern for wood

systems that use recycled wood materials as these might have had paints, stains or other preservatives placed on them during their life or as in the case of pallets, been subjected to spills. One notable lead contamination is from testing performed on products made from recycled tires that were removed from the road prior to the 1970's when lead was a part of engine exhaust. In this case there was a transfer of the lead on the roads to the tire tread. For these reasons the system designer should test for known contaminants and those that might be reasonably expected to have come into contact with their raw materials.

Maintenance of Surfacing

Since the playground surface must meet all of the performance requirements set out in ASTM F1292, CSA Z614, ASTM F1487 and other federal, state and local requirements and since no product stays as it was when originally installed, a maintenance procedure and program must be in place. Specifically ASTM F1487, section 13.2.1 requires "The owner/operator shall maintain the protective surfacing within the use zone of each play structure in accordance with Specification F 1292 appropriate for the fall height of each structure and Specification F 1951 where applicable" and section 13.2.2 requires "The owner/operator shall maintain the protective surfacing within the use zone of each play structure free from extraneous materials that could cause injury, infection, or disease. In Canada, the CSA Z614 considers both the maintenance program and the cost of such a program with the following "Playground inspection and maintenance are integral parts of budgetary costing. The cost of inspection and maintenance shall be considered and incorporated into the budget at the time of design, purchase of equipment, and installation."

Clearly the owner/operator will need and conversely the manufacturer must provide the maintenance instructions to allow the surface system to be maintained to its original condition and in a manner that will allow continued conformance with standards that the manufacture states in literature, the internet, trade shows and/or Standards compliance test certificates. Failure to provide the appropriate maintenance could likely lead to premature failure, liability, penalties and/or premature replacement. Having these maintenance costs might lead to the owner/operator to determine that the system is not financially feasible and another system will be selected.

For loose fill materials, maintenance can include loosening, regrading, topping up and even the removal and/or replacement of the entire system. The ADAAG and the CSA Z614, Annex H, state that regular maintenance will be expected, required and must be performed to ensure that the accessible route will continuously meet the performance requirements of both ASTM F1292 and ASTM F1951 and all other aspects of the physical measurements of the relevant laws. All of these

standards and laws do provide for testing of the installed surfaces with the portable test devices. Therefore the determination of a failure is generally not as difficult as some would be lead to believe.

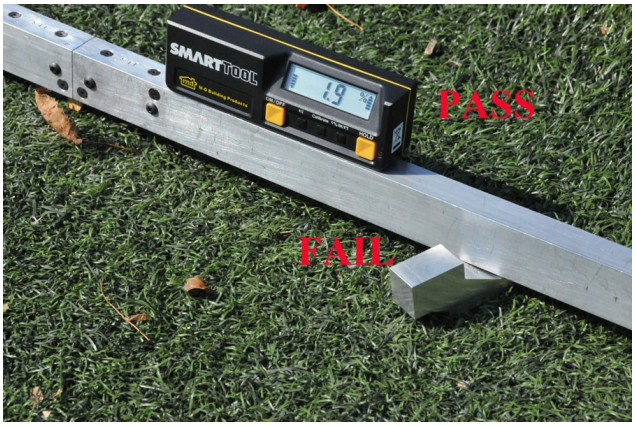
Best Practices

Designing or purchasing a playground surface is a complicated process. The owner/operator could face serious financial consequences for the performance of the surface over the life of the installation. Clearly the playground protective surface being dynamic and outdoors complicates any decision. Additionally there are the two aspects to the surface, the portion that will have to meet accessibility requirements and the balance of the playspace where accessibility may be desired, but is not a legal requirement.

Developing a Best Practice involves strategies that achieve component requirements and then reviewing if the one strategy is in conflict with other requirements or will the enhancement of one criterion beneficially affect other requirements. This does not mean that other strategies will not achieve a positive result. The beauty of best practices is that there can be many and each will have merit.

Since this is a market driven world the Best Practice is best adopted, mandated and enforced by the owner/operator as they have the most to lose financially. There will have to be well written specifications, performance measures, testing and financial penalties such as non-payment for non-performance and strong warranties. Taking this action will result in manufacturers, suppliers and installers responding in a competitive manor to provide the better products at competitive pricing.

The first recommendation of the Best Practice is to not pay for any part of the protective surfacing installation until it has been completely installed, the performance testing outlined below is confirmed, maintenance documents are presented and warranties are provided. Any payment prior to compliance might be lost to the owner/operator should the supplier fail to make corrections.



Impact Attenuation

The minimum requirement for impact attenuation is that the Gmax must not exceed 200 and the HIC shall not exceed 1000 from the fall height for each play component. Every surfacing supplier must have a test certificate that is less than 5 years old and the critical height must be greater than the fall height of any play structure to be installed.

Many surface systems will lose impact attenuation, either through attrition or system failure causing maintenance or replacement.

Standards allow and recommend that the owner/operator selects lower initial values and with the drop height being determined by the owner operator prior to purchase, this can be higher than the minimal fall heights in the structure standards.

Recommendation – Drop height for testing at the time of installation shall be the tops of barriers, guardrails, swings, climbers and any railing within 10^{o} of flat and the Gmax shall be less than 150 and the HIC shall be less than 800. At the end of the 5 year warranty period, the Gmax and HIC shall not exceed the requirements of the relevant standard from the initial drop heights.

Recommendation – The owner/operator shall acquire the critical height test certificate for the surface being installed and assure themselves that the surface system in the certificate is in fact the surface system that is being installed.

Recommendation – For loose surfacing systems, the supplier must provide a certificate that the surface depth being installed will remain sufficient during normal use to continue to meet the performance of the impact attenuation standards from the original drop heights.

Definition of Accessible Route

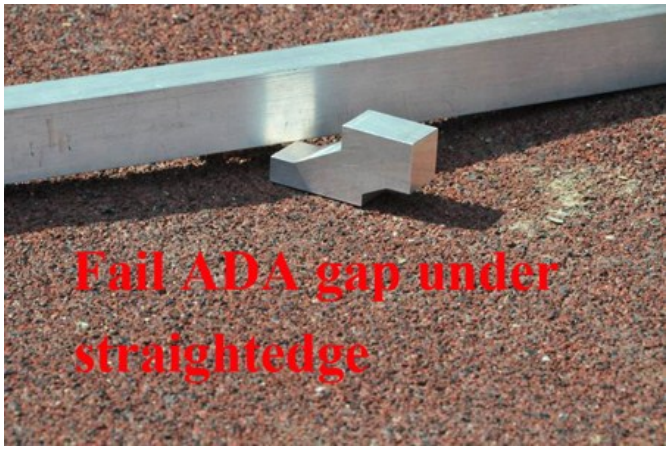
The accessible route for must be defined (laid out) for all of the play components, both elevated and ground level. There are playgrounds where all of the play structures are supplied by the same manufacture, while there are instances where the owner or their consultant selects structures from a number of manufactures. In any event each play structure supplier must define the elevated and ground level accessible components as required in the appropriate requirements. It will be the responsibility of the play structure suppliers and the owner or their consultant to ensure the accessible route is appropriately defined, particularly the ground level routes and the junction with accessible routes to the playspace.

Recommendation – Drawings defining the elevated and ground level accessible shall be included bed/tender and contract docu-

ments and signed off as appropriate by the consultant, play structure supplier and surfacing supplier. Any errors in the layout or deviations from the plan must be brought to the attention of the owner prior installation of that particular supplier's portion of the work.

Change of Vertical Height

Change in vertical height at any point on the accessible route will result in the failure of the surface to comply. The change could be at the entrance to the playspace, along ramps, within the surface system or at the entrance or exit of a play component. A failure could take place at the time of installation or at any time during the use of the playground. Each supplier of accessible route materials or systems, ramping for elevated routes and protective surfacing for ground level, must be able to assure the owner of continue compliance. Where the surface can be bonded to the surrounding hard surfaces a recess should be provided to ensure a smooth transition.



Recommendation – The bid documents and contract must contained a section where the accessible route supplier agrees that their product meets and will continue to meet the relevant requirements for changes of vertical level at junctions with other surfaces and within the surface system.

Running and Cross Slopes

The maximum running slope for a ground level accessible route shall not exceed 1:16 (6.25%) and the cross slope shall not exceed 1:48 (2.08%) for the ADA and 1:50 (2%) for CSA Z614-07, Annex H and for the resting and turning areas, the entire area shall not exceed the cross slope requirements. These are typically in high traffic areas and most disruption will cause either and change in slope and/or change in vertical level.

Recommendation – All plans and layouts shall set limits at 50% the allowed values for slope and the target for installation shall be 75% for the allowed slope with non-compliance requiring removal and replacement at the cost of the supplier.

Firmness and Stability

The accessible route must be firm and stable at all times to allow people with mobility devices to traverse the surface within a realistic limit of work. A measure of the work required was initially established with the work measure test published in ASTM F1951, and required in the ADA and CSA Z614-07, Annex H. Every surface system supplier should have a copy of their test certificate and be able to assure the owner that the materials tested are the same as those being installed. The owner prior to payment for the materials would be able to have their installed surface tested in the field to ASTM F1951 at a considerable cost to the supplier or, with the consent, or within the contract, test the site using the Rotational Penetrometer, which would be a lower cost. Beneficial Designs, Inc., the manufacturer of the Rotational Penetrometer, provide the device, a test method and measure for levels of firmness and stability. This device has demonstrated a high correlation with the results of the ASTM F1951.

Recommendation – A certificate of compliance to ASTM F1951 will be a requirement of any bid/tender submission. To limit the potential for accessibility complaints, or the expense of

ASTM F1951 testing in the field, the contract documents must allow for the testing in the field using the rotational penetrometer.
Recommendation – A prudent supplier will design and test their product to the anticipated values for firmness and stability to ensure themselves they will not incur costs for bringing their product into compliance.

Toxins & Sharps

Should a toxin, sharp or hazardous material be in the playground, the owner/operator will have to take steps to remove it. The toxin may be known as being in the raw materials by the nature of their manufacture, while other toxins might have come in contact with the raw material during storage or processing. These could be lead from car exhaust on old tires, liquids such as antifreeze, solvents or other liquid chemicals that were contacted during the primary life of the raw material. Additionally there may be naturally occurring toxins such as fungi in wood based products or organisms that become trapped in the pores of a poured-in-place system. Toxins must not be allowed in inorganic materials, while organic materials will have naturally occurring fungi and toxins, which the maintenance instructions must provide the solution for removal and remediation.
Sharps could be staples, nails, wires, etc. that could cause a puncture or internal damage should it be ingested. There may also be contaminated blood in the playground that becomes a biohazard problem that could close the entire playground.
Recommendation – The specifications, bid, tender and contract documents must include that the materials installed will not contain toxins that would not meet or exceed the levels permitted by local, state, or federal requirements at the time of installation.
Recommendation – The specification, bid, tender and contract documents must include that the materials installed shall have no exposed metal that could in contact with the playground user under normal use.
Recommendation – Should toxins or sharps be found at the time of installation they must be removed prior to operation of the playground and the warranty documents will include that toxins or sharps found during the warranty period will be removed at the cost of the installer.

Maintenance

Playgrounds and the protective surfacing are dynamic and subject to high traffic, wear, weather and other factors that can deteriorate the system. This can lead to a failure of one or more of the requirements and raise the need for maintenance or replacement of the system. Maintenance is the process of keeping a mechanical system in or close to its original state. Some systems will need more maintenance than others and this will have financial consequences for the owner/operator. The budget, in manpower, resources and replacement of materials, must be established prior to the purchase of any system. Each manufacturer/supplier should be able to supply a maintenance manual and frequency of maintenance for their system.
Recommendation – Require that maintenance manuals and cost requirements of maintenance to keep the system in its original condition with any bid/tender for evaluation. The prudent owner will include a section in the contract that the surfacing supplier will reimburse the owner/operator for any costs greater than 25% of the estimated maintenance cost over the 5 year warranty period.

Warranties

The owner has the protection of the specification and compliance testing at the time of installation to ensure initial compliance, but once the installation has been paid for there are only the terms of the warranty to ensure continued compliance. The terms of the warranty must be clear and performance based. Included must be the term of the warranty in years,

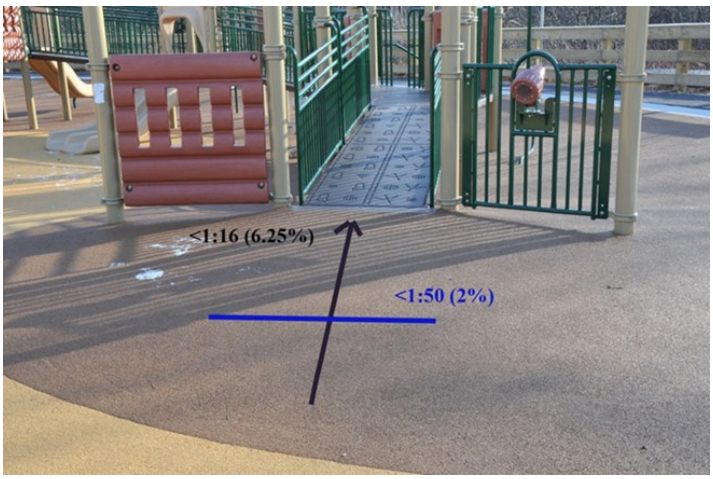
generally a minimum of 5 years, and the repairs or replacements that the supplier must perform and how quickly.
In some cases the owner has done everything right with a specification, testing at the time of installation and performing regular maintenance only to find that when there is a warranty claim the manufacture/supplier is either not around, or not capable of correcting the failure. This is often, but not necessarily the case with suppliers that are new or agents operating on behalf of the supplier who does not respond.

Recommendation – The bid/tender documents will have the terms of the warranty clearly stated and the corporate history of each supplier required. To limit liability on future claims and potential failure of the system, the contract will require a minimum of $2 million of comprehensive insurance.

General

There are financial considerations to every playground protective surface. The supplier must invest in the development,

manufacture and marketing of a system that must meet all of the requirements and is exposed to not being paid should the system not comply, or the cost of repairs during the warranty. Alternatively the owner/operator is often investing in a highly technical system they do not understand and are not sure of the long term performance to the battery of legal, standards and liability requirements. This is not child's play, it is a partnership that must last 15 to 20 years depending upon the replacement cycle for the playground. Ultimately care must be taken on both sides to reduce the risk of serious financial consequences. The ultimate outcome for the playground with and without the accessible route could well be a combination of surface materials in a number of locations within the playspace.



Recommendation – There are a number of laws, standards and industry practices that can be used to develop protective surface systems with positive long-term performance. The prudent manufacture/supplier would develop a product mix that meets the various performance requirements across the playground. The manufacture will also be very cautious in their claims for ADA or ASTM compliance when the compliance issue is more complex than just a single test.

Recommendation – The owner/operator must become familiar with all aspects of the standards and laws that they are being required to meet. They in turn will write specifications, performance requirements; testing programs, maintenance procedures all with financial consequences for their suppliers should the systems not perform as promised in literature, internet and contracts. The owner/operator would be wise to develop a hold harmless where the supplier who claims compliance to the ADA or the CSA Z614-07, Annex H, that should the owner/operator be faced with a claim for non-compliance, that the supplier will absorb any legal or remedial costs that the owner/operator must pay.

Conclusion

The mandated compliance to measurements and standards at the time of installation and over the life of the playground will force both the owner/operators and industry to work to better understand and provide the sustainable protective playground surface. This will be a benefit to everyone involve

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The Bogyman is not accessibility