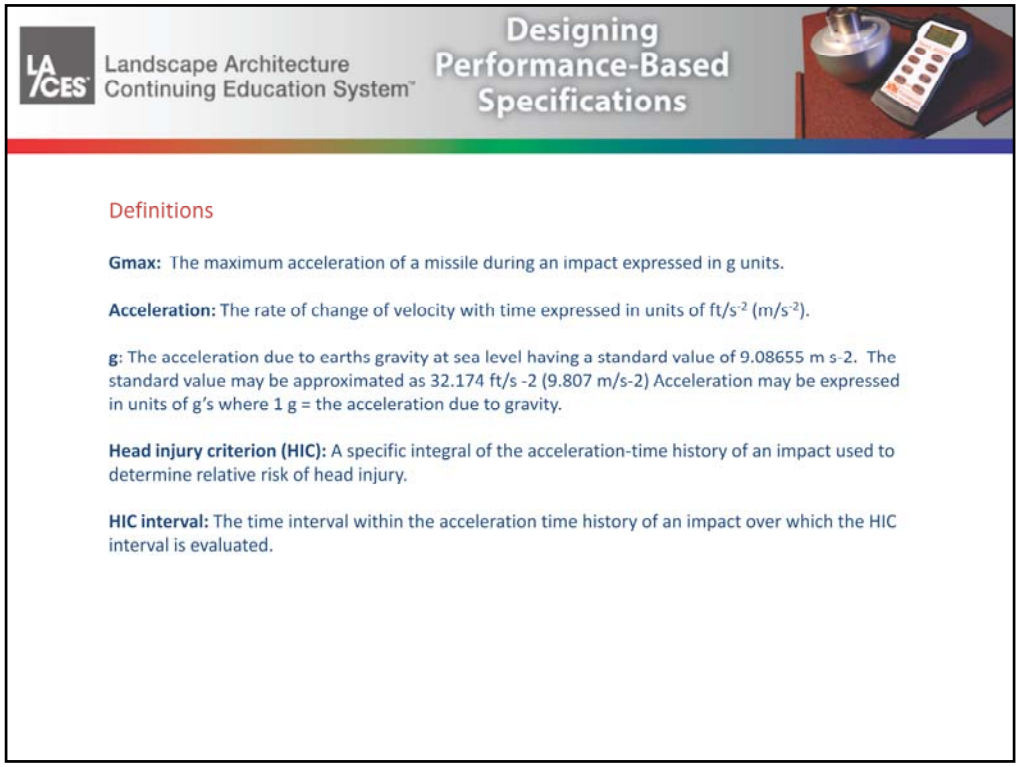
Introduction

In early 2011, SofSURFACES was accepted as an approved provider of Professional Development Hours (PDH's) through ASLA's continuing education system (CES) in an effort to further educate landscape architects on the best ways to create a performance-based, playground safety surfacing specification.

At present, there are several common misconceptions with respect to the standard specification for playground surfacing performance (ASTM F1292) . The most common misconception stems from the thought that if a playground surfacing system complies with the ASTM F1292 standard, than it must be safe.

There a variety of reasons as to why these misconceptions have developed and most are linked to the complexity of the 23 page standard specification. The document itself is lengthy and highly technical which can prove difficult for the average reader to understand and interpret.

SofSURFACES has taken the liberty of designing a discussion which breaks down and explains the key concepts within the standard in a manner that is simple and easy to understand. In short, the standard was designed to specify minimum performance requirements for playground safety surfacing and it encourages the users of the specification to consider performance levels which exceed the minimum requirements in order to ensure long term safety performance.

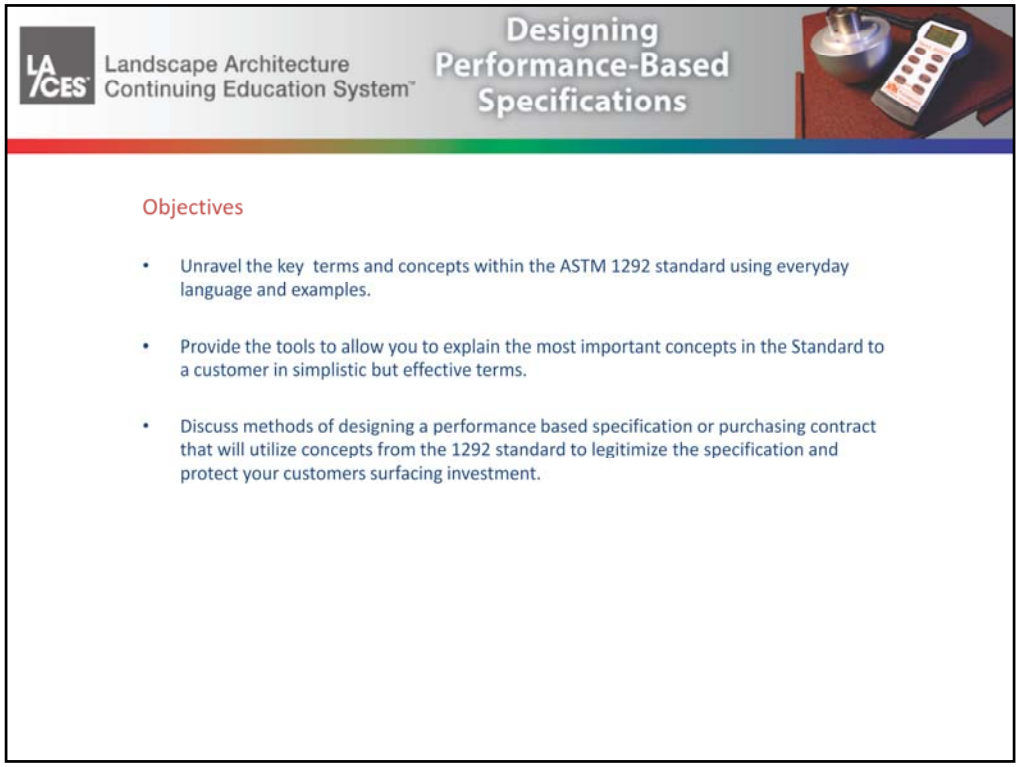


Question - What makes the standard so complex and difficult to understand?

Answer – as an introductory, there are over 30 technical definitions in the first 4 pages of the document all of which the reader is expected to understand.

In this slide we've presented 5 definitions to help illustrate the language in which the standard was written.

If the reader isn't able to fully understand these definitions, it makes it difficult to read and understand the remaining 19 pages of the standard.



Through the course of our discussion today, we hope to accomplish the following:

1. We are going to get past all of the technical jargon and find out what the standard really means.

2. As we develop a better understanding of the F1292 specification, we hope to provide you with the tools to help you explain the most important concepts of the standard to your customers in simplistic but effective terms.

3. And lastly, we want to discuss ways to include performance-based features in your specifications as opposed product based features that are often designed by, and in the best interest of, the manufacturer.

Including performance-based features are going to help legitimize your specification or purchasing contract while protecting both your investment as well as the users of the surface over the life of the playground.

It's important to have a base understaning of few key definitions contained within the standard.

The first definition is Gmax.

Gmax – simply put, is the impact force of a child's head as it makes contact with the playground surface.

Think of a baseball bat as it makes contact with the ball. The force of that impact is Gmax

In accordance with the F1292 standard, a playground surface can not exceed 200 g's at any time throughout the life cycle of the playground.

In addition to Gmax, having an understanding of HIC is a critical aspect of understanding safety surfacing performance.

HIC – Head Injury Criteria can be viewed or understood as a Head Injury Score. In short, HIC is a head injury measurement based upon the impact force (gmax) and how it relates to brain trauma.

The measurement of HIC is based upon a surfaces ability to absorb the shock of a fall upon impact (thereby minimizing the shock/force to the brain). In the event of a fall, HIC describes how quickly the force of the impact is being absorbed by the surface. This measurement will ultimately increase or decrease the likelihood of serious brain injury depending the surfaces performance levels.

In accordance with the F1292 standard, a playground surface can not exceed 1000 HIC at any time throughout the life cycle of the playground.

The following discussion focuses on 5 important things to know about the F1292 standard.

The ASTM F1292 standard has been based upon a wide body of proven scientific data stemming, initially, from the US military and subsequently from research conducted with the automotive industry.

In the 1950's the US Military began research using accelerometers to gauge g force (gmax) in an effort to better understand the effects on the brain in the event a pilot was required to eject from an aircraft. Their intentions were to design better safety equipment.

As there was a call for safer vehicles, this research progressed into the automotive industry and crash test dummies, outfitted with an array of accelerometers, were used to again gauge the effects of g force on the brain. These studies were designed to help create safer motor vehicles.

The ASTM F-1292 committee borrowed testing methods from both of these industries and used this data to design a safety standard specific to playground safety surfacing and the risk of head trauma.

Despite its complexity, its important to know that the standard is designed to prevent life threatening and debilitating head injuries only.

To help put this in perspective, consider the following:

-A single blow to the head from a professional boxer exhibits an average of 52 g's of force.

-A car crash/impact at 25 mph exposes a driver to an average of 125gs (when ejected from the car seat, into a windshield)

-Myth Busters video clip – This episode of Myth Busters uses accelerometers to help us understand the correlation between g force and the potential for brain injury.

Myth Buster Experiment Conclusions:

• Being hit over the head with a full beer bottle exerts an average of 28 g's. The current ASTM F1292 standard allows for a maximum of 200 g's!
• Experiments conducted within the field of sports concludes that a concussion occurs at roughly 100 g's. Again, the current ASTM F1292 standard allows for a maximum of 200 g's!

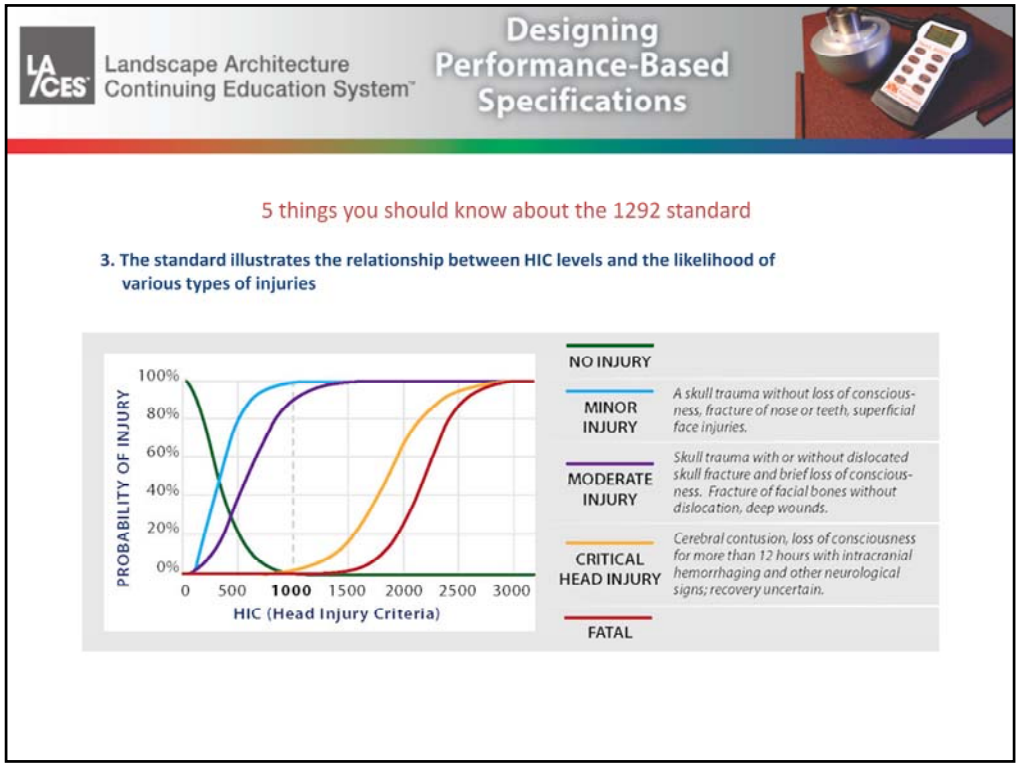
When considering the above, we believe, that as an industry, we can do better. Simply complying to the minimum requirements of the standard is taking a far too passive approach to safety. Simply conforming to the minimum requirements of the standard is not safe practice.

The standard states that the playground surface CANNOT measure a HIC value greater than 1000 .

Simply put, 1000 HIC is the line in the sand which can never be crossed, at any point, throughout the life cycle of the playground. All rubber surfaces have a “shelf life”. The closer a surface measures to 1000 HIC or 200 Gmax, the closer the surface is to expiration. This can be equated to buying a new set of car tires. The point at which there is no tread left on the tire is 1000 HIC. Buying a safety surface which measures close to the 1000 HIC and/or 200 Gmax thresholds, is, in effect, purchasing a product at the very end of its life cycle.

According to the standard, if a playground surface exceeds the minimum requirements of the standard, the playground must be closed down and remain closed until the surface can be brought back into compliance. In most cases, this will require complete surface replacement at great expense to the owner. Cleaning or coating a playground surface will not improve fall height performance to any significant degree.

Consider that the CPSC (Consumer Products Safety Commission) confirms that almost 80% all playground injuries are related to falls to the play surface. Additionally, children are not necessarily falling from decks and platforms of play equipment. They’re often falling from heights much greater than what the playground equipment standard (ASTM 1487) states shall be considered the fall height of the playground.



This graph is detailed on page 17 of the ASTM F-1292 standard.

It does an good job of describing the likelihood of injuries at various HIC measurements.

For instance at 1000 HIC:

-Minor head injuries – 100% probability of occurrence

-Moderate injuries – 90% probability of occurrence

-Critical Head injury – the probability of occurrence begins to depart from zero

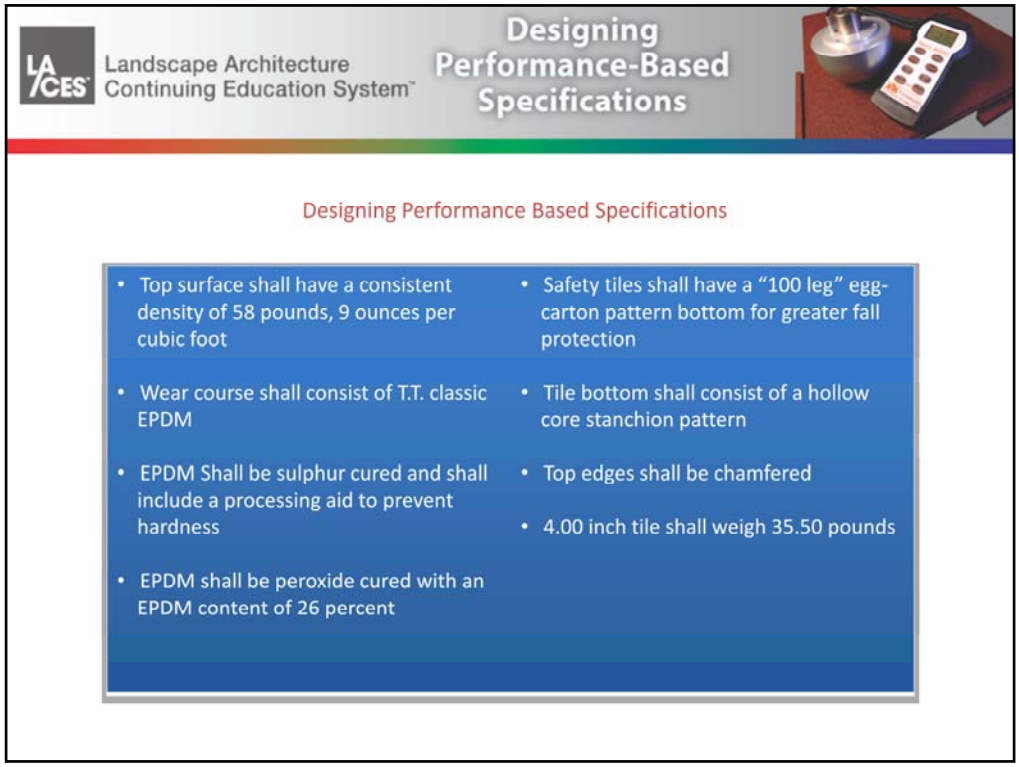
In addition to describing the probability of injury severity, the graph reinforces the fact that the standard was designed to provide minimum performance guidelines for playground surfacing.

The standard allows the playground owner or specifier to “ask for more” in relation to the safety performance of a play surface while acknowledging that the impact attenuation of a play surface will diminish with time and exposure to the elements.

Knowing this, the playground owner or specifier can specify additional safety performance requirements in their specification or purchasing agreement provided that they exceed the minimum requirements detailed in the standard.

In 2004, the ASTM F1292 standard introduced a provision for field testing (page 10 of the standard). This introduction provided a tool to owner/operators to definitively verify, following installation, that the surface installed complies with the standard as well as the requirements of their specification. Testing is often completed prior to payment for the surface being issued and only issued once compliance to the spec has been confirmed.

Lower HIC values and post installation field testing has gained significant momentum across the industry and are now being included in a growing number of specifications and purchasing contracts.



Historically, playground surfacing specifications have been feature focused as opposed to performance based. Often, the particulars of a specification are driven by the manufacturer and are often designed to preclude competing brands.

Designing a performance based specification which focuses on the ability of a product to meet a predetermined set of performance criteria (700 HIC, fall height guarantees, certified installation, stronger warranties) protects the integrity of the bid process while providing the owner/operator with the latitude to source products from a variety of qualifying manufacturers.

Another performance based consideration is determining the appropriate fall height specific to the project.

The playground equipment standard (ASTM 1487) assigns the responsibility of determining the fall height of their playground to the owner/operator. The fall height cannot be lower than the minimum heights outlined in the standard but specifying higher fall heights may be prudent based upon the particulars of a specific playground.

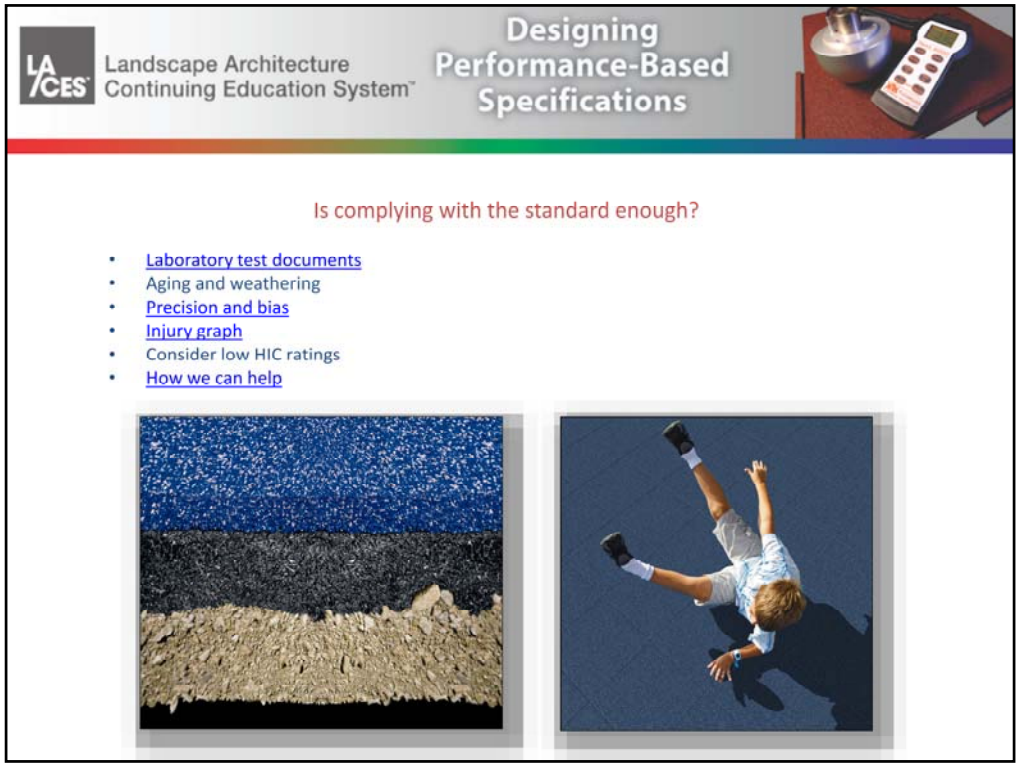
Consider this - scientific data confirms that the relationship between fall height and HIC measurements is exponential. (i.e. a HIC measurement at 5' does not double at 10'). In short, "the higher they are, the harder they fall".

The informal drop testing conducted in this video is based on the Canadian CSA Z 614 standard, in which the minimum fall height for a play structure is determined from the top of the protective barrier.

The drop testing results reemphasize that the relationship between fall heights and HIC measurements are exponential (non-linear).

- 5’ Deck Height – 473 HIC
- 8’ Rail Guardrail- 1057 HIC
- 10’ Highest point – 1500 HIC

Today’s engineering technology has allowed some playground surfacing manufacturers to build surfacing products that are capable of providing fall protection from the protective guard rails and barriers at no additional cost ensuring the safest possible playground environment.



Is complying with the standard enough? Based on the information provided, the answer is no.

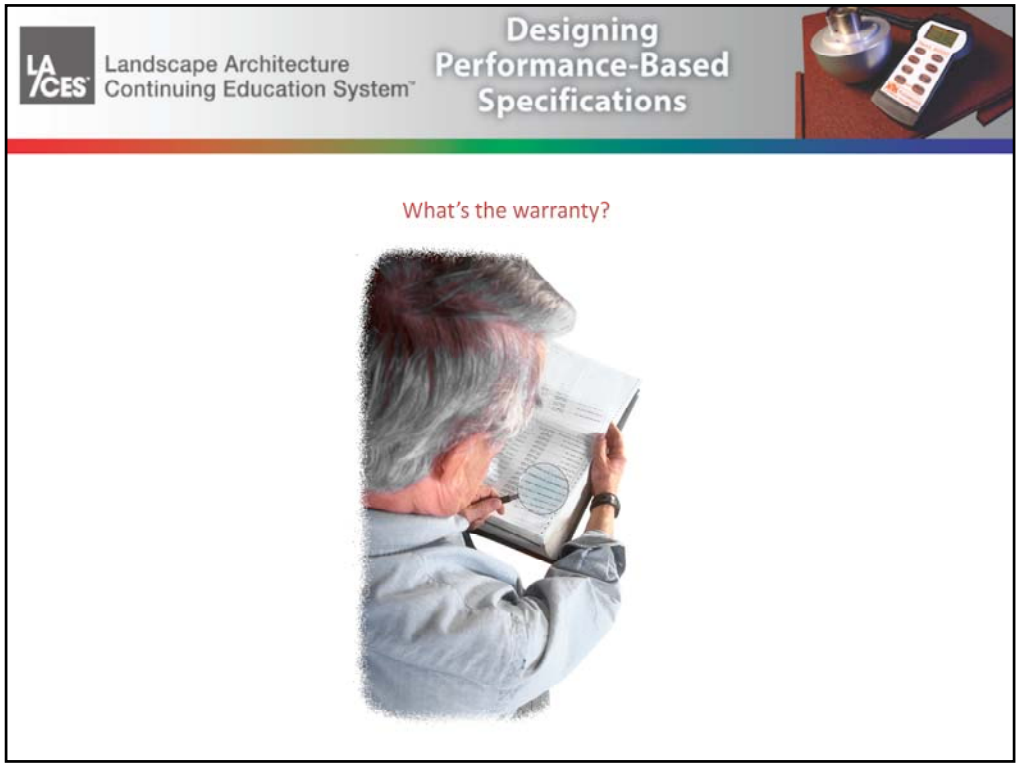
Sadly, in today's tough economic environment, installing surfaces as close to the maximum allowable limits has become common practice in many areas. Aside from the obvious risk associated with this approach (injury, liabiliy, loss of investment), manufactures adopting this philosophy do not, in almost any case, offer any kind of fall height protection guarantee.

We can now review manufacturer's laboratory test documents with a better perspective. Laboratory test results play a small role in determining the actual performance of a play surface.

Consider the elements of aging and weathering; these 2 elements alone are the most destructive elements to play surfaces especially to rubber unitary surfacing products.

Precision & Bias- the standard also explains that there is an expected precision and bias in the testing results from one laboratory to another. This range includes +/- 5% for GMAX and +/- 10% for HIC. For example a 180 gmax indicates a range of 171 to 189. A 900 HIC indicates a range of 810 to 990.

Considering the above, it is good practice for the playground owner or specifier to consider lower HIC and Gmax measurements at the initial stages of the buying process.

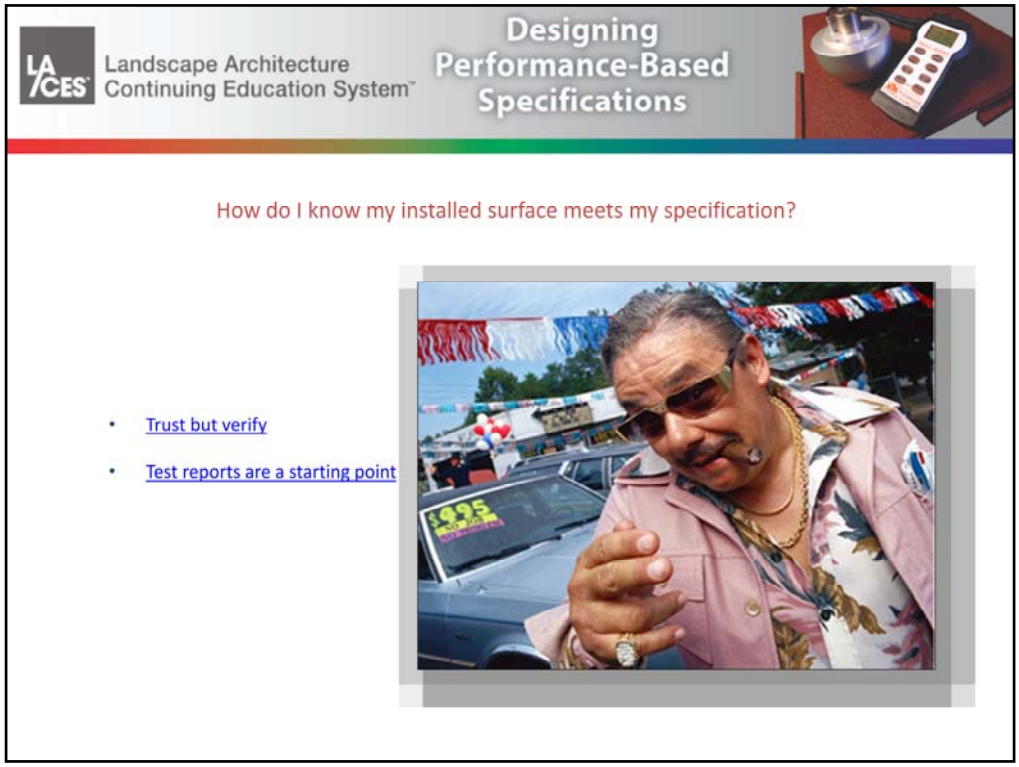


Thoroughly review the warranty of each play surface vendor.

Make sure there are inclusions for fall protection as per ASTM F1292

Why? Not all manufacturer's warranty's include a provision for fall protection compliance. In fact, most safety surfacing warranties do not include fall protection compliance within the warranty offering.

There are manufacturers capable of providing warranties of 10 years or more.



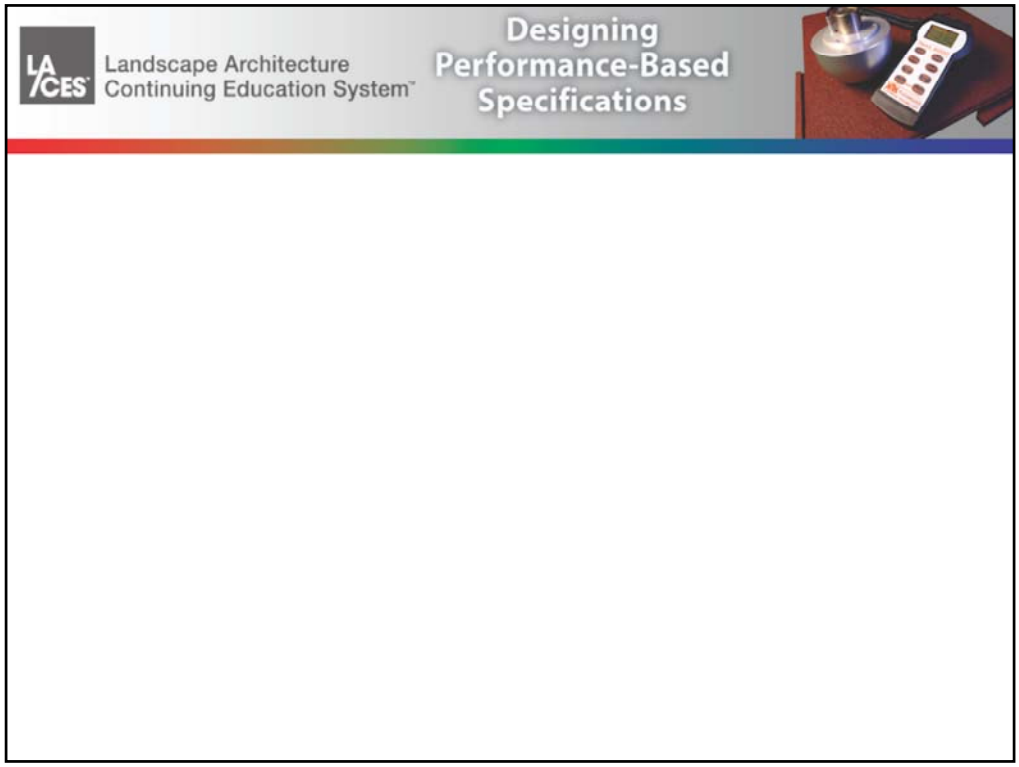
“How do I know if my installed surface meets my specification?”.

Ronald Reagan famously coined the phrase “Trust but verify”. Begin the evaluation process by requesting independent laboratory test reports to get a sense for the philosophy of the manufacturers you are considering. Are they comfortable with 1000 HIC when tested in a laboratory or are they testing to much lower values and offering guaranteed fall protection for extended time periods?

Simply put, laboratory test reports are a testing point with verification coming by way of an onsite field test following installation.

Any reputable manufacturer will gladly comply to specified field testing requirements.

In fact, there are manufacturers willing and able to assist in implementing field testing into the buying process at no additional cost to the customer.



Conclusion

Despite the complexity of the ASTM F-1292 standard, it is an extremely important and relevant document for anyone considering the purchase of a playground safety surface.

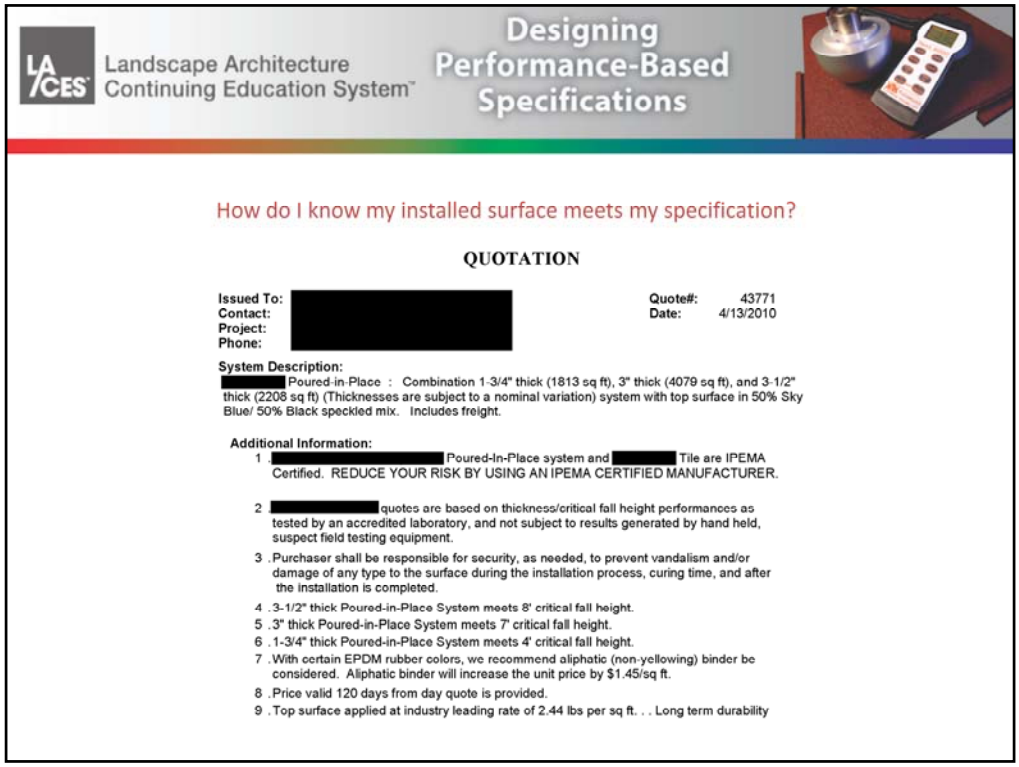
Understanding the document and designing a performance based specification protects the interests of owner as well as the users of the playground.

• It protects the specifier by ensuring that products chosen meet a predetermined set of performance criteria and allows the specifier to confirm compliance to their specification prior to issuing payment.

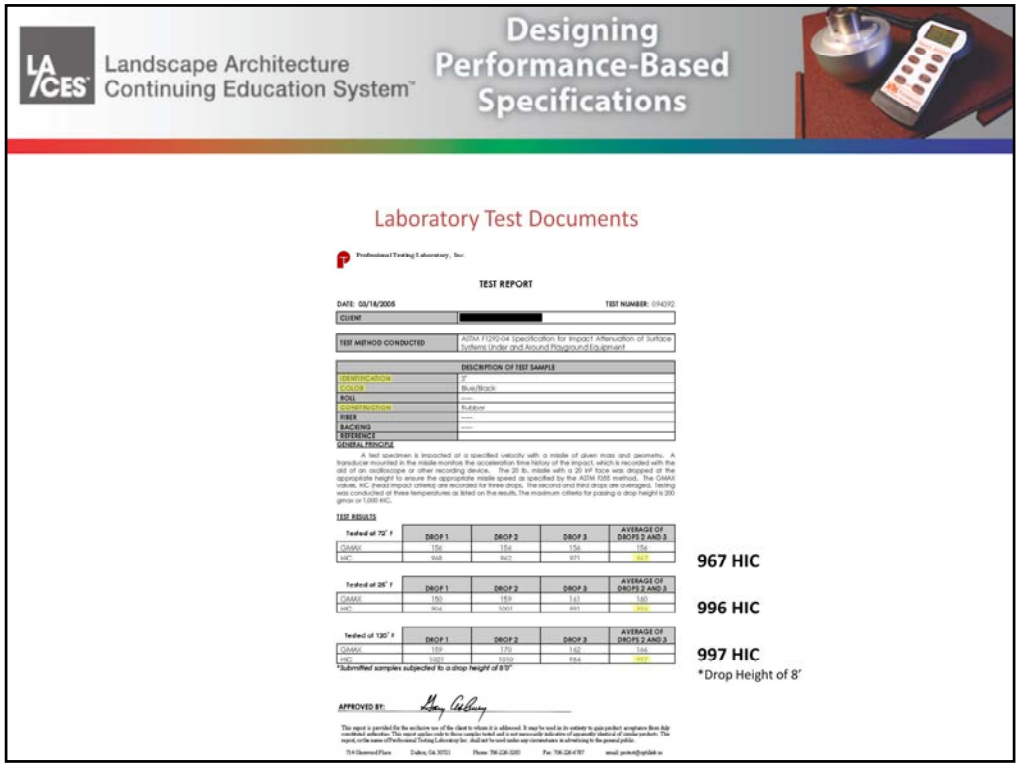
• It protects the investment of the playground owner and significantly reduces their liability exposure.

• Most importantly, this process helps protect the children using the playground equipment. Reducing the probability of life threatening and debilitating head injuries is the responsibility of everyone involved in the design, specification, purchase and installation of a playground safety surface.

As an industry, we can do a better job of assisting playground owners in designing specifications which improve the quality of products purchased while simultaneously ensuring safer playground environments. Hopefully some of these tips can be incorporated into your next play surfacing project.



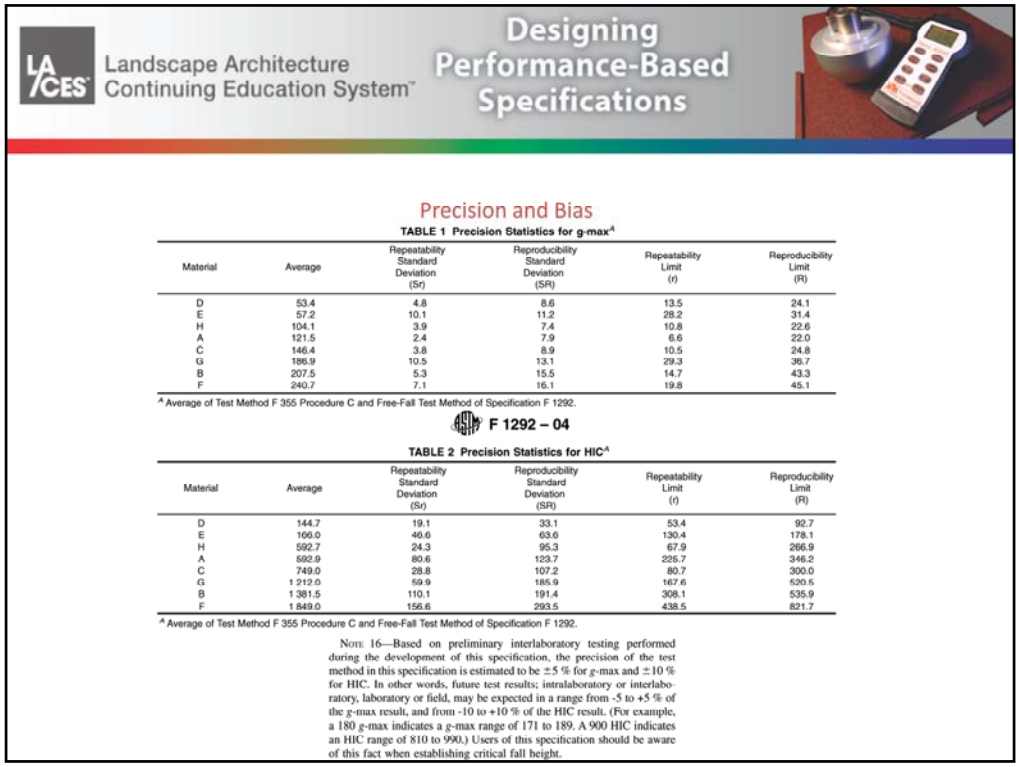
The above test report is an example of a product/manufacturer which provides no degree of assurance that their product will comply with the standard when installed at any point in time. In fact, all liability associated with this responsibility is removed from the manufacture as outlined within the fine print. The liability then falls on the sales rep, specifier and owner/operator.



The above test report provides valuable insight into the philosophy of this particular manufacturer. When considering the results (an average of 987 HIC in a laboratory) there is little hope that this product, when installed in the field, would meet the required specification.

• Laboratory tests are conducted at 3 different temperatures; hot (120 F), cold (25 F) and moderate (72 F)

• The laboratory technician conducts 3 drops at each temperature, and averages the scores of the last 2 drops



This chart is taken from pages 12 and 13 of the standard, which illustrates the expected variance in testing results that the committee discovered between 7 different testing facilities using the exact same surfacing samples.

Landscape Architecture Continuing Education System™

Designing Performance-Based Specifications

How We Can Help