Making An Educated Decision on Playground Surfacing.

It's no secret that kids have vast imaginations matched only by their relentless pursuit of adventure. To see this up close, one only needs to take a trip to their nearest neighborhood playground.

How often have we seen children using play equipment in a manner inconsistent with its original design intent? A well-designed guardrail becomes a high wire act or a slide becomes a giant wave to be surfed down. Unfortunately, and in spite of our best efforts, the very nature of children's play makes falls to the surface inevitable. It is estimated that over 70% of playground injuries are due to falls to the surface. In light of this, it is a wonder that protective surfacing options remain one of the most overlooked and under evaluated aspects of playground design.

The following information has been provided to give a basic overview of the main types of playground surfacing available, along with the particular advantages and limitations that are unique to each type of system. Whether you are an architect, day care owner, PTA member or playground equipment provider, this article contains the information necessary to provide you with the right tools to make an educated playground surfacing decision.

Playground surfacing is as diverse as the equipment placed upon it. The many different types of surfacing available can be generally broken down into two main categories consisting of loose fill and unitary materials. There are many loose fill materials in use today such as wood chips, pea stone, sand, bark mulch, rubber mulch and engineered wood fiber (EWF). Of this group, engineered wood fiber is the dominant surfacing type comprising of approximately 75% of the market by volume.

Engineered wood fiber generally consists of new wood that has been debarked and ground into a fibrous consistency. Each loose piece of wood fiber has an approximate length to width ratio of 10 to 1 with a minimum length of 2 inches. In addition to size, ASTM F2075 establishes a number of requirements to ensure purity and uniformity.

Engineered wood fiber offers the user a number of advantages. The primary advantages are cost and impact attenuation ratings. EWF offers one of the lowest initial purchase costs. EWF also provides one of the most favorable initial impact attenuating ratings when tested in laboratory conditions. Additional advantages include ease of installation, conformance to ASTM F1951 (wheelchair accessibility) and adequate resistance to flammability (rate of flame spread).

However, EWF also provides a number of disadvantages. As with all loose fill surfacing, a regular maintenance program will need to be implemented in order to preserve and maintain compliance to both ASTM F1292 (impact attenuation) and ASTM F1951 (ADA accessibility). A typical maintenance program would involve regular raking, leveling and sifting of the loose material to counter the effects of decomposition, compaction and material displacement. In the absence of a maintenance program, consistency in fall protection and wheel chair mobility can be compromised. Detailed inspections will also be required to detect and remove embedded objects that can be dangerous and unhealthy. Replenishment

of the material can be a regular requirement to accommodate for decomposition, compaction and displacement of the loose particles.

All of these factors make loose fill materials a relatively high maintenance product negating much of its low initial cost. Regardless of the type of loose fill material used, the same factors contribute to the generally high life cycle costs.

The second category, unitary surfacing, consists of two major types of products including poured in place (PIP) and prefabricated mats or tiles.

Poured-in-place (PIP) surfacing is a dual density system consisting of a low density base course and a higher density top wear course. The base course is comprised of elongated recycled tire rubber mixed with a polyurethane binding resin. The top wear surface is made with a virgin rubber material mixed with a higher concentration of binding resin. The base course of the material is manufactured at different thicknesses depending on the fall protection required while the top wear course is typically made at 3/8 or 1/2 inch in thickness. The poured-in-place system is mixed, leveled and finished on site by specially trained installation personnel representing the manufacturer.

Poured-in-place surfacing offers many functional advantages including low maintenance, and low life cycle costs. Since the material is unitary in nature, extensive maintenance is not required in order to maintain consistent fall protection and wheelchair mobility. Additional advantages unique to poured-in-place include the ability to conform to irregular shapes and grade changes within the playground. Graphics can also be incorporated into the play surface adding play value.

There are also several limitations inherent to the poured-in-place system. The highly-valued designs that the surface is capable of offering can be susceptible to damage caused by environmental factors. Since this product is manufactured at the installation site, inconsistencies can develop during the installation process which can lead to detrimental variation in performance. Environmental conditions as well as the skill level of the installation crew are highly relevant to the final quality of the surface. With the top wear surface being field applied, it cannot typically be compressed sufficiently to provide the density required to withstand heavy wear. As a consequence, deterioration can occur in high traffic areas such as the base of swings and slides. Requiring specialized knowledge for installation can also increase the final price making PIP the most expensive surfacing option available.

Another unitary surfacing option that is growing in popularity is a prefabricated product often supplied in a mat or tile form. These materials are generally made from a combination of recycled tires and virgin rubber combined with a polyurethane resin. Unlike poured-in-place that is field manufactured, this product is compression molded in a manufacturing environment prior to being shipped to the playground for installation.

Pre-manufactured products offer the same functional advantages that field manufactured unitary surfaces offer in that they do not require a high level of maintenance thus providing a comparatively low life cycle cost.

Pre-manufactured products are seen to offer several additional advantages involving cost, consistency, and durability.

Unlike field manufactured products, this system is typically molded under high compression affording it a higher degree of density or durability. Manufacturing in a controlled environment also removes many environmental and human variables that impact consistency in poured-in-place systems. Strict process controls result in consistent and reliable fall protection and wear characteristics. The cost of a tile system generally falls between poured-in-place at the higher end and engineered wood fiber at the lower end of the cost scale. Although both tile and poured-in-place are generally made with the same types of raw materials, the cost savings are realized in production efficiencies, lower installation costs as well as the longevity of the pre-manufactured product.

Disadvantages of tile systems include tile-to-tile separation, limitation in graphic design potential, and stringent requirements for base preparation.

Because the tile product is supplied in a block or square dimension, the design capability is limited to geometric shapes rather than the free flowing designs offered by PIP. Unlike PIP, a pre-manufactured product cannot conform to the sub-surface. As a result, great care must be taken in sub-surface preparation to ensure proper compaction and leveling.

Many tile systems can also be susceptible to separation between the seams of the product which is often caused by

heat-related expansion and contraction of the rubber material. Some companies however have managed to successfully eliminate this issue by incorporating systems that secure one tile to its adjacent tile. This design feature essentially locks each tile together, thus eliminating the issues relating to tile separation.

The makers of synthetic surface materials are making significant strides in developing a variety of products that are both attractive and impact absorbing. Advances in manufacturing technologies are fueling the process, providing opportunity for better products to be developed more efficiently and more economically. The result of ongoing manufacturing developments, is a greater variety of choice for designers and owner/operators of playground facilities. Technical advances have also led some suppliers to ensure greater ease and precision of installation, the elimination of expansion and contraction problems and product durability over time.

Synthetic products are increasingly becoming the preferred surfacing materials for playgrounds for reasons of design, safety durability and accessibility. Within this scenario, interlocking tiles are especially gaining in popularity. With their particular advantages, they could well become the generally preferred system of choice within the industry. Regardless of which type of playground surfacing meets your particular needs, it is important to remember that the quality of a system can vary significantly from one manufacturer to another. In order to ensure that your surfacing product exceeds in the critical performance categories, the following questions should form an integral part of your product inquiry.

1) Does my surface comply with current ADA standards?

One important component of an accessible playground is the surface. By default, most unitary surfaces automatically meet this requirement. Although some loose fill materials also meet the requirement, many others do not. Particular attention should be given to this requirement when investigating a loose fill option.

2) Does the surface meet the latest standard for impact attenuation?

ASTM F1292 is the standard that applies to the impact absorbing properties of a playground surface. In a very general description, a "crash test dummy like" instrument is dropped onto the surfacing sample which sends key measurements to a computer upon impact. The two key measurements are HIC (Head Injury Criteria) and GMAX, both relating to the ability of the surfacing system to absorb impact or cushion falls. The standard allows for a maximum HIC reading of 1000 and a maximum GMAX reading of 200. In order for a surface to meet the standard, it must provide readings below these numbers at a pre-specified height.

The categories of surfacing listed above should comply with the current standard provided they are installed to the manufacturer's specifications. Surfaces such a packed dirt, gravel and asphalt however do not meet the standard.

3) What test results did the surface achieve at the specified fall requirement?

Although ASTM F1292 states that a surface must perform under 1000 HIC and 200 Gmax, these readings are the maximum allowable limit and they must be maintained throughout the entire life span of the product. When purchasing a safety surface, it is important to consider a system that provides ASTM F1292 test results that are significantly lower than the maximum threshold established within the standard. By requiring lower performance measurements, you are, in effect, building in a safety margin to compensate for future wear and tear on the surface. A surface producing results close to the upper limit, is unlikely to remain compliant over the long term. Every manufacturer should be able to provide you with a certified test report listing the ASTM F1292 results for their surfacing product. Looking for the lowest possible HIC rating within your budget will help to ensure that the surface remains compliant for many years.

4) How long is the surface guaranteed to meet the F1292 standard?

In addition to building in a safety margin as described above, it is important to carefully look at the warranty offered by the manufacturer. Test reports provided by the manufacturer are laboratory reports and do not necessarily take into consideration certain factors that may be unique to your site. To ensure

performance over the long term, it is important to look for a surface that has a minimum 10 year warranty to ASTM F1292 when tested on site. Mandating periodic field testing is another way to monitor proper compliance. It is very important to carefully evaluate the warranty. Many products do not include long term compliance to the ASTM F1292 standard.

5) Consider Field testing of your surface post installation

The purchase of a unitary surface can represent a significant investment. Although every potential buyer should carefully evaluate the manufacturers test documents indicating their compliance level to ASTM F1292, these documents are really just the starting point. In the absence of requiring a post installation field test there is no way to determine if the surface installed and paid for actually meets the safety standards on day one let alone in the future. In light of this many buyers are mandating post installation testing as part of the purchasing contract.

6) How long is my surface guaranteed against defects in material and workmanship?

One of the biggest challenges for a surfacing manufacturer is finding the balance between resiliency and durability. Manufacturing a surface that is exceptionally durable or exceptionally resilient can be achieved quite easily. The difficulty however, is in manufacturing a product that is both soft enough to provide long term fall protection but also durable enough to withstand the wear and tear of typical playground use. To ensure that your surface has succeeded in meeting both requirements you should be looking for a minimum 10 year warranty against premature wear in addition to fall height performance.

7) What type of surface is going to provide the best value equation over the long term?

When shopping for a safety surface, the initial purchase price is an important consideration, but even more important is the actual cost of the surface projected over a period of years. More often than not, lower initial priced surfaces end up being the higher priced surface in the long term due to extensive maintenance and replenishment costs.

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