TechLine

Forest Products Laboratory

Engineered Wood Fiber Surfaces Improve Accessibility for Americans With Disabilities

Wood-chip surface on playground at Governor Nelson State Park near Madison, Wisconsin.

A wheelchair user tests the SEWF surface at Governor Dodge State Park Cox Hollow beach path site.

What is the preferred playground safety surface material in the United States today? The answer is engineered wood fiber (EWF). EWF is the technical name for a loose, mulch-like mixture of hardwood chips that meets certain specifications regarding chip size and shape, consistency, drainage, impact attenuation, and other qualities. At a cost of just $1.00/ft² to cushion a 10-ft fall height, the loosely piled wood chips are a cost-effective way to increase playground safety. However, as playground designers incorporate accessibility features into their designs, traditional EWF does not meet their needs.

Existing EWF is difficult for wheelchair and walker users to navigate because the shifting surface and uneven nature make it difficult to roll or move across. Alternative surfaces, such as bonded rubber or synthetic foam, increase the price significantly, costing from $9 to $20/ft².

Researchers at the USDA Forest Service, Forest Products Laboratory (FPL), in Madison, Wisconsin, have developed a new, cost-effective alternative to traditional EWF called stabilized engineered wood fiber (SEWF). They have bonded a thin top layer of EWF together with stabilizing binders, including a urethane (Vitri-Turf) and an acrylic/polyvinyl-acetate polymer emulsion (Soil-Sement). This forms a resilient, yet stable, uniform surface that allows for easy navigation of wheelchairs and walkers, while underneath, the EWF remains loose and provides cushioning for falls.

Estimates indicate that this new surface will be a cost-effective alternative to traditional EWF, adding only $1 to $2/ft² to the price. “This is a big deal because wood chips are very cheap for a playground surface,” says Theodore Laufenberg, chief researcher on the project. “A wood-chip surface is about $2,000, compared with a rubber surface, which is about $30,000.”

The surfaces meet American Society of Testing and Materials (ASTM) standards that were developed for EWF to ensure consistency nationwide. The two-layer composite can promote wheelchair or walker accessibility (ASTM F 1951), while the loose EWF below it provides enough energy absorption (ASTM F 1292) to avoid many of the head-impact injuries sustained by children using playground equipment.

Playground Surfaces

As a field trial, the system was installed (October 2003) on a working playground at Governor Nelson State Park near Madison, Wisconsin. Three surface systems were included in the trial—untreated EWF, the urethane Vitri-Turf SEWF, and the polymer emulsion Soil-Sement SEWF.

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Within 1 month of installation, the park manager conducted a series of surveys of playground users to determine which surface was preferred. More than 90% chose the urethane Vitri-Turf SEWF surface. Other tests showed that the Vitri-Turf SEWF surface performed at an acceptable level for accessibility, impact attenuation, and durability, while the untreated EWF and Soil-Sement systems failed to perform as well.

To continue evaluation of the concept, researchers worked with a commercial EWF supplier, and in October 2004 a demonstration playground surface was installed at the H. Winship Wheatley Early Childhood Center in Capitol Heights, Maryland. A similar demonstration playground is planned for installation in Berkeley, California.

Trail Applications

Although targeted toward playground improvements, this concept is also being evaluated for outdoor recreational trails where traditional paving would be costly and would detract from the natural aesthetics. Current trail design considerations include quantity of traffic and type of use, such as walking and wheelchair use, biking, horse riding, and other allowed uses.

The applicability and field performance of the two SEWF systems—the urethane Vitri-Turf SEWF and the polymer emulsion Soil-Sement SEWF—developed for the outdoor playground were tested on a beach path and two bridle trails at Governor Dodge State Park in Dodgeville, Wisconsin.

Work on the beach path consisted of extending the path over an area of sand to Cox Hollow Lake, enabling park users to be able to maneuver a wheelchair directly to the water's edge where they could access the beach and a boat landing.

Field observations included comments by a wheelchair user on the beach path. According to the user, the Vitri-Turf surface was "nice and firm" and the Soil-Sement surface was "kind of soft." Maneuvering the chair was noted to be "easy" on the Vitri-Turf and "acceptable, but not as easy" on the Soil-Sement. The beach path held up well to normal pedestrian traffic.

Traffic loads do seem to be a limiting criteria. The SEWF bridle paths suffered near total loss of integrity within the first 2 months of installation. Shoed horse hooves broke the thin surfaces. Although a thicker surface would have lasted longer and probably held up to intermediate loading between pedestrian-to-equestrian, the clear implication is that highly concentrated loading, such as equestrian traffic, requires a much tougher surface to resist the higher forces applied.

As far as durability of the surfaces, the Vitri-Turf SEWF also appeared to perform better than the Soil-Sement system. Decay of the EWF below the surface was considered to be normal and acceptable in current EWF playgrounds.

Summary

Interest in the SEWF surfacing material is widespread because of the need to comply with the Americans with Disability Act and the low cost ($2 to $3/ft², compared with $9 to $20/ft² for most existing systems).

Because EWF and urethane binders are commercially available, volunteers or playground maintenance staff would be able to install the surface by following fairly simple instructions, which are being published by FPL and will be available from FPL's website (*www.fpl.fs.fed.us*).

Additional Information

Visit the Performance Engineered Composites website (*www.fpl.fs.fed.us/rwu/rwu4706/index.html*) for more information.

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