Improving Playground Surface Accessibility

By Theodore L. Laufenberg

Could accessibility be improved and maintenance be reduced for wood fiber-based playgrounds? In July 2001, the US Access Board asked the Forest Products Laboratory (FPL) for advice and a potential solution. Since that time new product standards have been adopted by ASTM for engineered wood fiber (EWF), new test techniques have been promulgated by RESNA (Rehabilitation Engineering and Assistive Technology Society of North America) for testing and correlating surface behavior to wheelchair user expectations, and we have explored a concept for stiffening and stabilizing EWF playground and trail surfaces. This is a summary of the EWF surfacing concept and its research and development effort, as well as a discussion of our 2004 (Phase III) project, which we are planning to apply the most workable systems at playgrounds in several climates around the U.S.

The traditional engineered wood fiber (EWF) and other loose materials, such as sand or pea gravel used in playgrounds, are generally effective at reducing injuries from falls, hut such surfaces pose a serious obstacle for anyone using a wheelchair or walker. The material, whether wood chips, sand or pea gravel, is able to shift or move so that the wheels or feet of a mobility device quickly sink in. This causes the wheelchair or other device to be stuck or, in the worst cases, the user may even tip over. In addition, the loose surface is susceptible to children digging holes and material slowly shifts away from the bottom of slides and swings, leaving a continual maintenance concern.

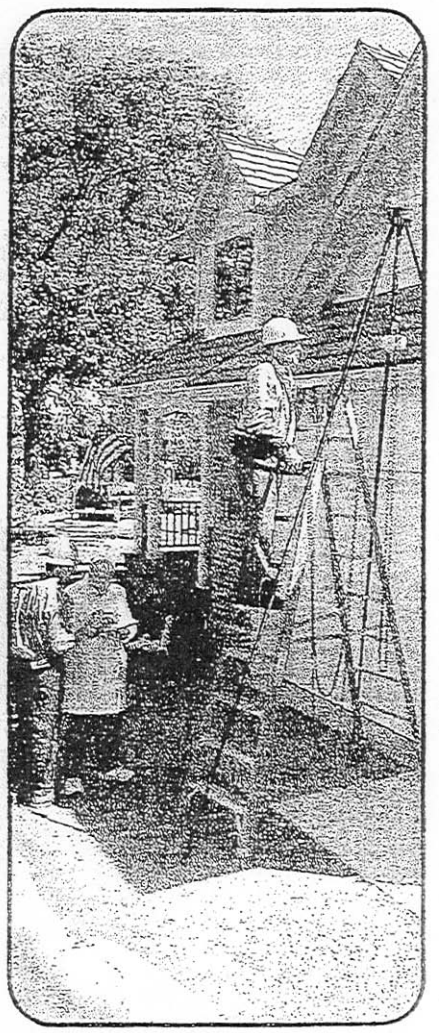
Building a better playground

At the FPL, we've been working to develop a cost-effective surfac-

ing material that combines the necessary shock absorbance with enough firmness to enable a wheelchair or other device to maneuver easily and safely. This material would make it less costly for states and local communities to comply with the seemingly conflicting federal regulations requiring impact attenuation and accessibility of playgrounds. One of the first obstacles is to recognize that these two criteria are indeed at odds with one another. We are really searching for a compromise between a soft impact surface and a hard surface for wheelchair or walker accessibility.

Our proposed solution to the lack of firmness and stability was to bind together the upper layer of wood particles over the soft 'unbound' EWF. Our research into different binders has yielded potential adhesives that will remain resilient for impact safety durable for weather-resistance at the playground, and firm / stable tor access. Our binders were chosen to be non-toxic and benign in consideration of children's exposure to them. We've worked with commercially available silicones, synthetic latexes and urethanes. We are presently initialing our Phase III testing of these two binder systems with a two-year evaluation on working playgrounds at several locations around the country.

Initial tests show good performance for both fall safety and accessibility



The EWF is mixed with a binder at the playground and then is raked, leveled and compacted (all by hand) in a thin layer on top of the existing EWF. It is a "poured-in-place" application with no joints.

The prototype surfacing material consists of a one and a half to two and a half-inch thick layer of engineered wood fiber mixed with an adhesive binder or stabilizer. in the playground area, this resilient layer of stabilized fiber is on top of a thick layer of loose EWF (up to 10-inches, depending on the equipment fall height). Under the EWF, we use the industry-standard drainage system of landscape fabric and a layer of washed stone.

How does it measure up?

To measure impact safety, we are using the 10-pound hemispherically shaped "falling head" impactor per ASTM F1292. Our

tests, in cooperation with Zeager Brothers Inc., are performed by simulating a 10-foot drop height with Triax 2000 equipment (Figure 1). Our intent is to maintain the excellent cushioning and safety qualities of EWF.

Accessibility is tested using a device that simulates the front caster of a traditional wheelchair. We measure the firmness of the surface when a standardized weight is applied to the wheel. We also measure the amount that the wheel digs into the surface when it is rotated 360°. The device, called a rotational-penetrometer (Figure 2) was developed by Beneficial Designs for correlation to the wheelchair test method (ASTM F1951).

We have evaluated the trial surfaces for two years in an exterior environment and are presently assessing durability and performance for impact and access. The working playground installations also include a deterioration measurement for EWF to assess the rate of decay for the materials. Thus far, our measures show we have achieved a good balance between impact softness and accessibility firmness/stability.

What next?

We have been pursuing the use of this bonded EWF for accessible playgrounds and paths and have recently made installations in two Wisconsin state parks to gain real-world experience. Stabilized EWF used on playgrounds (Figure 3) or trails has an aesthetically natural feel and look. It promises to give all users, regardless of their means of mobility, access to our recreational spaces.

Our future plans include working with cooperators to install trial playground surfaces in San Diego, San Francisco, Washington D.C. and Orlando. Please contact us if you are interested in more information or want to participate in trials of these improved access surfaces.

Ted Laufenberg, Research Engineer, USDA Forest Service, Forest Products Laboratory, One

Gifford Pinchot Drive, Madison, WI 53726-2398

BS MS Structural Engineering, University of Wisconsin–Madison

At FPL Ted is part of the Performance Engineered Composites Unit where their research helps develop the technology for use and recycling of wood-based materials in composites. He has been with the USDA for 24 years performing research on engineered materials' performance and processing, structural components and systems, load and moisture cycling and paper physics.

Figure 1. Playground safety surface impact testing of the Phase II exterior test pads.

Figure 2. Wheelchair accessibility has been correlated to this Rotational-Penetrometer test for firmness and stability of the surface.

Figure 3. Our first Phase III installation at a working playground at Governor Nelson State Park near Madison, Wis.

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