Nail down slipping soil

Machine launches steel rods into earth to prevent slides.

Photos from http://soilnaillauncher.com

This shows a classic shallow fill failure. If the fill has some strength, launched soil nails will fix the problem.

[This article was suggested by Rod Meredith, Riley County's assistant director for public works. Soil Nail Launcher, Inc. was one of many vendors at the annual NACE meeting in Grand Rapids, MI. We'll share more good ideas from NACE vendors in our next issue.]

. . . by Lisa A. Abraham, staff writer, Akron, Ohio *Beacon Journal* . . . . . .

Summit County (Ohio) Engineer Greg Bachman believes he has found the solution to the county's landslide problem: nails. Really, really big nails driven into hillsides at speeds of more than 200 mph. Bachman has convinced the County Council that a technique called "soil nailing" is the solution for landslides that have been troubling parts of the county since last summer's heavy rains and flooding. It will be the first time the nailing technique, which involves the insertion of 20 ft steel rods into unstable soil, will be used in Ohio, Bachman said.

Using high-pressure compressed air, a nail launcher with a movable arm blasts the rods into an embankment in a grid pattern at extremely high speeds. The Council agreed to hire Grand Junction, Colorado, contractor Soil Nail Launcher Inc. to perform work on seven embankments in the county that have had landslides or are at risk of having them. The process works because the soil consolidates around the rods, keeping it from slipping away, thus preventing slides, Bachman said. The nailing works best in areas where there is a high clay content in the soil.

"The nails are driven in quickly and with so much focused force there is virtually no visible damage to the surrounding area," he said, including none of the potential waterway sediment pollution caused by traditional excavation methods.

While the technique had not previously been used in Ohio, it has been used successfully in California, Oregon and Colorado by the U.S. Forest Service and by the Colorado Department of Transportation, Bachman said. There are numerous potential applications of the soil nail technology as a low-cost solution to geotechnical hazards.

According to the company's Web site—http://soilnaillauncher.com—the nail launcher was originally developed as a secret weapon. The British military developed the compressed-air launcher to deploy nerve gas canisters as far as seven miles away. When nerve gas warfare was abandoned, a private company acquired the device and modified it to launch steel bars.

Traditional methods of soil stabilization for the seven problem areas in Summit County could cost between $900,000 and $3.5 million, Bachman said, but the company has agreed to perform the nailing work for no more than $300,000.

"We're saving money doing it this way as opposed to traditional methods," said Councilman Tom Teodosio.

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The process works best in areas with clay soils.

How does it work?

The Soil Nail Launcher can accelerate a 1.5 in. diameter, 20 ft long steel bar at 220 miles per hour (see above). The bar enters the earth without significant abrasion. The soil particles then collapse onto the bar, providing surprisingly high pull-out resistance—many times greater than for driven bars and rods.

The Soil Nail Launcher is typically mounted on a tracked excavator. It can be mounted on about any vehicle or crane basket frame. It weighs about two tons, making it portable and able to reach remote locations.

A practical approach to small-patch asphalt recycling

. . . By Ken Skorseth, SD LTAP Field Services Manager and Arlie Long, LTAP Technical Assistance Provider . .

What do you do when you have a small area on an asphalt-surfaced road or street that needs full depth repair? Would it be nice to recycle it or do some type of reclamation that processes the material to make it reusable as subbase or base? Here is another scenario: Would you like to make a clean utility cut in a road or street by milling the material, remove it and then bring it back as base aggregate after the utility work is done? Maybe you just need a machine that will loosen very hard, compacted base or aggregate surfacing in order to remove or reshape it.

There are two problems in the situations just mentioned: Small jobs are hard to contract and the equipment available is often too large or too small. Small milling heads on skid loaders are only suitable for very small jobs in special situations. On the other hand, the large mills and recycling machines are really only suitable for projects of considerable size.

There is one possible solution. A machine is available that will do all these things. It is a commercially-manufactured reclamation and milling attachment that fits on a standard front end loader. The SD LTAP recently contacted one city and one county that have purchased these machines. Both gave good reports on the performance of these machines.

Mr. Phil McKaskill, Huron (S.D.) Street Superintendent, commented that their machine paid for itself on one job done three years ago. That job involved water main replacement on 40 blocks. They were able to mill the existing asphalt and base aggregate and haul it to a stockpile. After the utility replacement was done, the recycled material was brought back as base. They have also used the machine for other applications such as trimming an asphalt surface. In that case, Phil cautioned you must use water to cool the cutting bits.

A close up view of the machine.

Mr. Ray Roggow, Union County Highway Superintendent and Emergency Manager, commented that their machine is paying for itself this year on one road-widening job. This is being done prior to crack and seal and asphalt overlay of an old concrete pavement. The shoulder aggregate has been in place since the 1930s and is very hard to cut out and shape. They use their reclamation machine to mill up the aggregate to a uniform depth to get ready for widening.

Union County did a 9.5 mile job like this previously and found it a slow process to cut and remove very dense shoulder aggregate with motor graders. This machine does it in a fraction of the time. Union County has also used the machine to process distressed areas in exiting pavement and reshape it prior to paver patching. They have milled pavement up to 12 inches in depth.

We do caution our readers these machines have their limitations. Both managers told us these machines do not replace large rotomills or recycling machines used on large projects. They use them for spot repair, preparing utility cuts, or, as in Union County's case, for a special need on a road widening job. Both of these machines have a cutting width of four feet.

The machines have US manufactured engines for which parts and service are easily obtained. The cutting bits are standard, replaceable, carbide-tipped items which are also commonly used in other recycling equipment or on grader bit systems. They, too, are easy to obtain.

As more and more spot repair and rehabilitation and utility replacement has to be done on aging asphalt pavements, this may be a machine and a process your department can use. For more information on this machine, contact Ken Skorseth, South Dakota LTAP, at (800) 422-0129, or contact the manufacturer, Asphalt Zipper, in Utah at (888) 947-7378 or sales@asphaltzipper.com.

The KUTC thanks Ken Skorseth and South Dakota LTAP for granting us permission to reprint this article. Photo by Arlie Long. ■

K-TRAN research,
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duties of a county engineer. Here are three ways you can help make sure local-level projects are considered:

1) Respond to the request for project ideas sent to local agencies by KDOT's Bureau of Local Projects during the summer each year. Again, the deadline for response is September 1st, **but see Step 3 below if you missed this deadline.**

2) Submit ideas to the research group of the Kansas Association of Counties. If your project becomes a high priority for the KAC, it helps improve its chances of getting funded, said Dick McReynolds, Engineer of Research at KDOT.

3) Call Tom Mulinazzi at KU (785-864-2928) or Bobb Stokes at K-State (785- 532-1595)—or another faculty member you know—with your idea and, if it fits with his/her expertise, ask if he/she would be willing to develop it into a preproposal and submit it by the December 1 deadline.

So don't be shy. If you have an idea that needs research—especially if it's a topic that affects many local agencies in Kansas or the transportation system in general—here's your chance to try to get that research funded at no cost to you.

For more information about K-TRAN research, call Dick McReynolds at (785) 291-3841 or see the K-TRAN Web page at: http://www.ksdot.org/bureaus/burMatrRes/PDF/K-TRAN_University_Research_Program.pdf ■

Parking, *continued from page 9*

town centers. The problem is that these centers are still isolated from the rest of the community and cannot be accessed without a car. Places like this are unlikely to see reduced parking demand, but will use the parking provided more efficiently because of the mix of businesses sharing the same lot.

Re-instigate on-street parking. Our study showed that on-street parking was the most valued by customers and often the most convenient. In addition, on-street parking cuts down on the size of the off-street lot that is needed, thus reducing the amount of impervious surface. However, in the interest of efficient traffic flow, many towns have eliminated on-street parking and do not provide on-street parking in new development.

On-street parking brings other benefits in that it serves a traffic calming function, making a town center feel safer to pedestrians and more like a real center to drivers and pedestrians alike. On-street parking clearly delineates the street as a place rather than just somewhere to pass through.

Consider shared municipal lots: Our study suggests that effectively-run municipal parking systems provide many advantages in a commercial center. Lots shared among different types of businesses are used much more efficiently and do not have as many hours where they sit empty. In addition, consolidated municipal parking promotes a "park once" mindset, which benefits all the businesses in a center. Finally, the parking revenue from municipal parking systems can be used to landscape, beautify and maintain the streets and other public realms of the center. The issue of charging for parking is a contentious one, but our study and others suggest that customers are not resistant to paying a reasonable rate for parking.

Few cities and towns have a comprehensive plan for the provision of parking in their commercial centers. However, we believe many town centers could benefit immeasurably from having a considered and coordinated approach to managing parking demand. The current system of oversupplying parking appears to waste land and resources, is environmentally unsound, and dampens the economic and social vitality of commercial centers. The good news is that our study shows that relatively small changes (such as improving pedestrian connections) can go a long way in reducing the amount of resources that are devoted to parking and in creating more vibrant centers in our cities and towns.

For additional information, contact the authors: Norman W. Garrick, Ph.D. (norman.garrick@uconn.edu) and Wesley E. Marshall, P.E., (wesley.marshall@uconn.edu) at the University of Connecticut Department of Civil & Environmental Engineering.

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Soil nailer, *continued from page 10*

Bachman said he has an informal confirmation from the Federal Emergency Management Agency that the county may be able to get some of the costs reimbursed, since Summit County has been declared a disaster area because of storms.

While most of the sites haven't had severe slides, they have had continuous slipping over the years, with repeated cracking in pavement, Bachman said. "They're slow-moving ones where we've had to go and repave the road and it cracks by the next week," he said.

A free DVD showing footage of the soil nail launcher in action can be obtained by sending your name and address to bbarrett33@aol.com.

This article was adapted from "Summit plans to nail down troubled soil," posted Thursday, June 24, 2004, on the Soil Nail Launcher's Web site. ■