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341st Missile Wing Public Affairs Office

7/17/2009 - **MALMSTROM AIR FORCE BASE, Mont.** -- The 341st Civil Engineer Squadron recently coordinated a contract with Western Federal Lands Highway Division and Soil Nail Launcher Incorporated to repair a landslide near Lewistown, Mont., with funding from Surface Deployment and Distribution Command.

The slide occurred on Forest Grove Road in May on an access road that leads to three Minuteman III launch facilities.

The slide was caused by natural spring water and heavy rains lubricating the soil under the road, which is composed of clay and sand stone, said Mike Miner, 341st CES project engineer.

"This slide was about 3,000 cubic yards of soil and rock," Mr. Miner said. "An average dump truck can carry six to 10 cubic yards, so roughly 300 dump truck loads of material composed the landslide mass."

When the slide occurred, Fergus County attempted to patch the road, but the material they added was washed away in another rain storm, he said.

"Since the county can't afford a large project like this and our [transporter erectors] travel the road, this job qualified for funding under the Defense Access Road Program," Mr. Miner said. "We began working with the SDDC to come up with a solution; the Soil Nail Launcher company gave a briefing and showed they could accomplish the job quickly without disturbing the wetlands."

To repair the road in a traditional manner, a retaining wall would be built; however, due to the immediate proximity of wetlands at the foot of the road's embankment, a lengthy process of paperwork and approvals would be needed for machinery to disturb the area, Mr. Miner said. The SNL could be operated from the road itself.

"That is half the reason we decided to go with them," he said. "It is a good solution, and a unique project."

A soil nail is a 20-foot long galvanized pipe. The pipes are launched into the embankment of a road by a pneumatically powered cannon attached to the backhoe of an excavator.

"The launcher was originally designed by the British military to launch gas canisters six to seven miles," said John Steward, SNL geotechnical engineer. "When it went into surplus, a plastics company adapted it to launch soil nails. This is an example of weapons to plowshares."

The cannon is pressed against the embankment, and when safety devices are disengaged and the 2,500 pounds per square inch of air pressure is released, the soil nails plunge into the ground at more than 200 miles per hour. About 260 nails will be used to repair Forest Grove Road, spaced about four and a half feet apart.

After the pipe is fired into the bank, they are then cut close to the ground, tapped and fitted with bolts that secure wire mesh webbing.

This mesh webbing provides reinforcement for Shockcrete, a concrete designed for vertical surfaces that is also applied from the existing road surface. Then a reinforced steel rod is placed inside the steel pipe with grout to make a more permanent fix, Mr. Steward said.

To add further protection against another slide, fiberglass pipes with small holes drilled in their sides, are also launched into the lower section of the bank to drain ground water.

"The nails help solidify the material and go into the bedrock," said Kent Nelson, Federal Highway Administration geotechnical engineer. "The fiberglass nails channel the water away from under the road, since there is a natural spring under the road, this is a concern. Opposed to a traditional repair, this is cheaper, faster, doesn't disturb the wetland, has a 75-year design life and is an overall good solution for this particular slide."

The project costs roughly \$240,000. Using an alternate road to access the three LF's was considered, however, six bridges on that alternate route would have required millions of dollars to rebuild in order to withstand the nearly 72-tons of a fully loaded transport erector.

The repair to Forest Grove Road is scheduled to be done early next week.

Photos

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The Soil Nail Launcher fires a galvanized steel pipe into the scarp of Forest Grove Road near Lewistown, Mont. Due to increased flow of a natural underground spring and heavy rains, a land slide occurred in May, taking about 3,000 cubic yards of soil from the road. Since the repair was beyond Fergus County's capabilities and transporter erectors assigned to Malmstrom Air Force Base traverse the road, repairs were funded by the Defense Access Road Program. To complete the repair, the pipes are cut just above the surface and a wire mesh is bolted to the ends of the pipes. This wire mesh is then covered in Shockcrete, a sprayable concrete used for vertical applications. (U.S. Air Force photo/Senior Airman Dillon White)

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