

EXPERIMENTAL PROJECTS WORK PLAN

EVALUATION OF LAUNCHED SOIL NAILS (LSN) FOR SLOPE STABILIZATION

Location: Secondary 278 (C000278), Beaverhead County, Butte District

Project Name: Big Hole Pass-Slide Repair (CN 7466000)

Project Number: STPS 278-1(28)31

Type of Project: Slope Stabilization

Principal Investigator: Kris Christensen, Experimental Project Manager (ExPM)

Project Update: September 2011

Upon start of construction, after several attempts to place the launched nails, it was found that substantial rock rubble was within the slope prohibiting the insertion of the nails. The LSN effort was cancelled and the project went to conventional drilling to stabilize the slope.

Objective

Determine the effectiveness and long-term permanency of using launched soil nails to stabilize a failed slope in lieu of using traditional mechanically stabilized earth (MSE) walls or other comparable remedies.

Description

Launched soil nailing is a technique developed for the reinforcement of locally unstable soil masses. Launched soil nails are steel or fiberglass rods installed to reinforce or strengthen the existing ground. 20 foot (6.5 m) soil nails are inserted using high-pressure air using 2400 psi (17.2 MPa) up to speeds of 250 mph by a launcher that is mounted on a hydraulic excavator. As the nail passes into the soil, the ground around the nail is displaced by compression at the nail tip. This forms an annulus of

compression which reduces the soil drag on the nail. As the nail comes to rest, the soil rebounds onto, and bonds, with the nail. The soil nails reinforce the locally unstable soil mass by transferring the nail's tensile and shear resistance through the failure plane of the sliding soil. The nail maintains the resisting force because they are anchored beyond the slip plane.

Experimental Design

Scott: This is where I need your input when available. We need the length and depth of the slope, estimated number of nails to be used, spacing pattern; and what percent will be used for drains. Estimated duration of project and any other pertinent information (soil and seeding?, etc.) And anything else I've forgotten.

Evaluation Procedures

Research will document the installation for best practice and any constructions concerns germane to the performance of the product. Semi-annual inspections will report on slope integrity and any other measurable outcomes. Additional site inspections may supplement the semi-annual visits based on need.

Construction Documentation: Will include information specific to the installation events of the launched soil nail process.

Post Documentation: Will entail semi-annual inspections of the active zone slope restoration for evidence of slope movement or visual indication of nail shifting.

Evaluation Schedule

Research will monitor performance for a minimum period of five years annually, with every year up to *ten years (informally). This is in accordance with the Department's "Experimental Project Procedures". Delivery of a construction/installation report, interim, annual or semi-annual reports is required as well as a final project report (responsibility of Research). A web page will be dedicated to display all reporting from the project.

2011:	Installation/Construction Report
2012-2015:	Semi-Annual Inspection/ Annual Evaluation Reports
2016:	Final Evaluation/Final Report
2017-2022:	Annual Evaluation/Annual Reports (Informal-if required)