

Technology Deployment Initiatives and Partnership Program Request for Funding FY 2004

FHWA Strategic Goal Area:

Project Title:

Frost Heave monitoring and Reduction

Problem Statement:

Frost heave is currently a problem in many of the northern areas of the United States. Frost heave can damage roadway foundations, retaining walls, and other susceptible transportation features.

Proposal:

Our plan is to gather baseline frost heave information, incorporate different remedial measures to eliminate frost heave, and determine the relative effectiveness of the remedial measures undertaken.

To gather existing frost heave information, we would monitor at least three different sites between 200 and 1000 feet long along a 12 mile paved road near Cascade, Idaho, for quantity (height) of heave with respect to daily temperature in order to set a knowledge base of existing conditions at known areas of severe frost heave. Thermistor strings and data loggers would be installed in these severe frost heave locations to measure the actual depth of frost penetration. Ground surveys would be accomplished in the summer when no heave was present and in mid winter and possibly once per week in order to physically determine the greatest amount of frost heave. This would be done over several seasons in order to obtain a two or three-year knowledge base of existing frost heaves.

Once the baseline measurement of frost heave is known, three different remedial measures to eliminate the frost heave would be constructed as part of the Cascade-Warm Lake construction project. These will include the placement of geocomposite drains, the use of "Rock Cap" drainage layers, and significantly deeper cutoff drains than what is normally installed.

After construction, the thermistor strings and data loggers would be reinstalled and ground surveys redone (with new baseline at the same location) in order to measure the relative effectiveness of the different measures to eliminate the frost heave. The sites would be monitored for at least the next year after construction, and it may make sense to monitor it for three years after construction, depending on severity of weather.

Most project work would be accomplished through an interagency agreement with the Forest Service, Idaho DOT, and possibly Valley County, Idaho. A technical working group would be formed to co-ordinate the study and insure that it does not replicate previous studies. There are several choices for the author of the report as there are Forest Service, State, and University personnel who would be interested.

Benefits:

This study will allow for better methods and possibly lower cost methods to remedy frost heave problems. This project will provide additional information for current CTIP studies involving freezing indexes and also Portable Falling Weight Deflectometers. This project will directly partner with the State of Idaho, Valley County Idaho, the Forest Service, and the Federal Highway Administration. Other State DOT's and Universities will be indirectly involved. The results of this project will provide a documented relative comparison of the effectiveness and costs of the three different frost heave correction methods.

Resources/Cost:

The total estimated cost of this proposal including deployment is \$ 90,000

Duration:

2004	Install thermistor and datalogger , survey and monitor	\$ 20,000
2005	Survey and monitor	\$ 20,000
2005	Construction, reinstall equipment – establish new baseline	\$ 30,000
2006	Survey and monitor, author final report	\$ 20,000

Organization/Method:

A final report will be completed documenting all work and available data corresponding to this project.

Champion:

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