

# Identification and Stabilization Methods for Problematic Silt Soils

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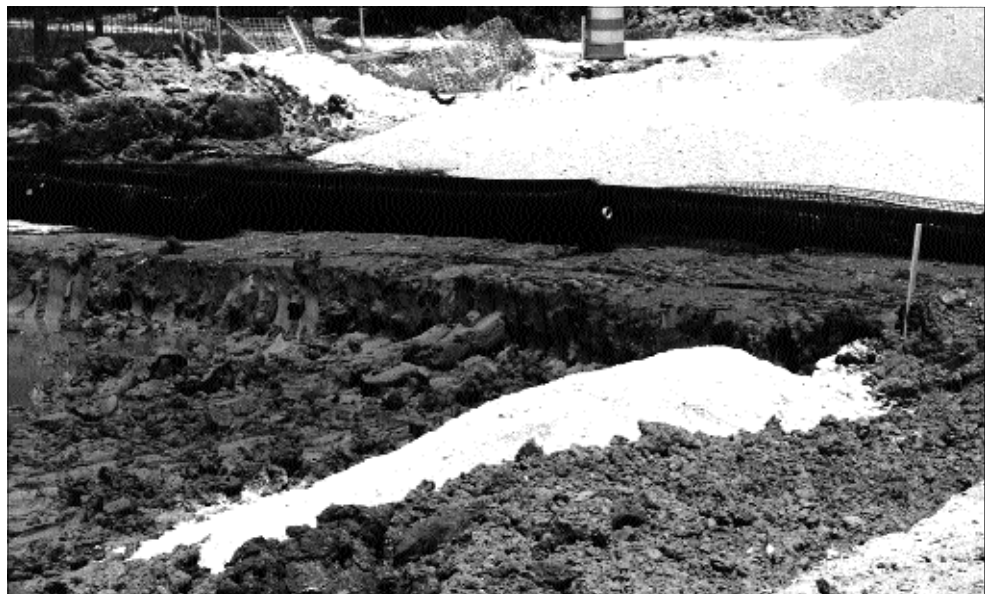
## Problem

The high silt deposits frequently encountered in pavement and embankment construction throughout Louisiana cause problems during construction and raise questions about the long-term performance of the finished product. Much of the soil found in Louisiana is proportionally high in silt contents, providing low strengths and minimal bearing capacity. In areas with a high water table, construction traffic can cause detrimental pumping action, and wet subgrades cause both

construction and performance problems.

Construction on these deposits has produced cost overruns and delays due to the current methods specified by DOTD for their use and/or the unstable nature of the materials. Common solutions to the problem include excavation and replacement, lime treatment, or cement stabilization.

Although alternative solutions to treating silt soils have been used,



Soft subgrade excavation in Mandeville, Louisiana.



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long term performance is questionable. Treatment with lime has been used to temporarily dry the soil enough to construct the pavement, but long term resistance to pumping is dependent on the integrity of the base and pavement structure. Premature failures can occur as a result of unstable foundations. Stabilization with reinforcements and Portland cement have been reported as having mixed results.

The percent silt content alone does not define the problem of instability. The percent silt content, clay content, and moisture condition have an effect on the stabilization requirements and results. A laboratory program is needed to identify the material characterization associated with weak subgrade performance and investigate the effectiveness of stabilization techniques.

### Objectives

The objectives of this research are to identify the soil properties and characteristics that contribute to an unstable condition, evaluate the effectiveness of the chemical stabilization techniques, and provide an evaluation of alternative solutions.

### Description

The research will encompass the following tasks:

- Examine the current state of the practice for construction over soft, wet silts.
- Develop a laboratory program for the identification of material characteristics and properties that contribute to an unstable condition, the evaluation of existing chemical stabilization techniques used by DOTD, and an evaluation of alternative solutions.
- Perform laboratory testing and analysis.
- Based on the results of the laboratory program, develop a procedure for identification of detrimental silt-soil conditions and guidelines for selection of the appropriate stabilization alternatives. Review existing DOTD standard material specifications for “usable soils” and recommend appropriate revisions.
- Perform an economic analysis comparing the recommended stabilization techniques to include material costs, construction costs, and user costs.

### Implementation Potential

The results of the study will be readily applicable to the design and construction of pavements at sites with subgrades that have a high percentage (65 percent) of silt. The approach used in this study will closely involve the input of personnel at the various DOTD districts. A check-list or guide will be developed to assist DOTD in anticipating the location of these soils based on geology or site conditions and/or to identify them as unstable based on their physical character. This checklist may include other design aids or graphs using density, plasticity, etc., for the evaluation of liquefaction potential. The most promising stabilization materials and construction techniques will be identified and will also be provided as a guide. The guide will provide a more systematic and cost effective approach to the problem.

Implementation will also occur with the application of those techniques identified as having potential in stabilizing this soil type. It will also support any changes required in a review of the current DOTD specification.