Research Project

06-6GT

Capsule

LTRC

Technology Transfer Program

November 2006

Update of Correlations between Cone Penetration and Boring Log Data

Starting Date: 10/1/2006
Duration: 12 months
Completion Date: 9/30/2007
Funding: State

Principal Investigator:
Khalid Alshibli, Ph.D., P.E.
Assistant Professor
Dept. of Civil & Environmental Engineering, LSU

Co-Principal Investigator:
Ayman Okeil, Ph.D., P.E.
Assistant Professor
Dept. of Civil & Environmental Engineering, LSU

LTRC Contacts
Administrative:
Mark Morvant, P.E.
Associate Director
Research & Technology Transfer
(225) 767-9124

Technical:
Zhongjie "Doc" Zhang, Ph.D., P.E.
Pavement and Geotechnical Research Administrator
(225) 767-9162

Louisiana Transportation Research Center

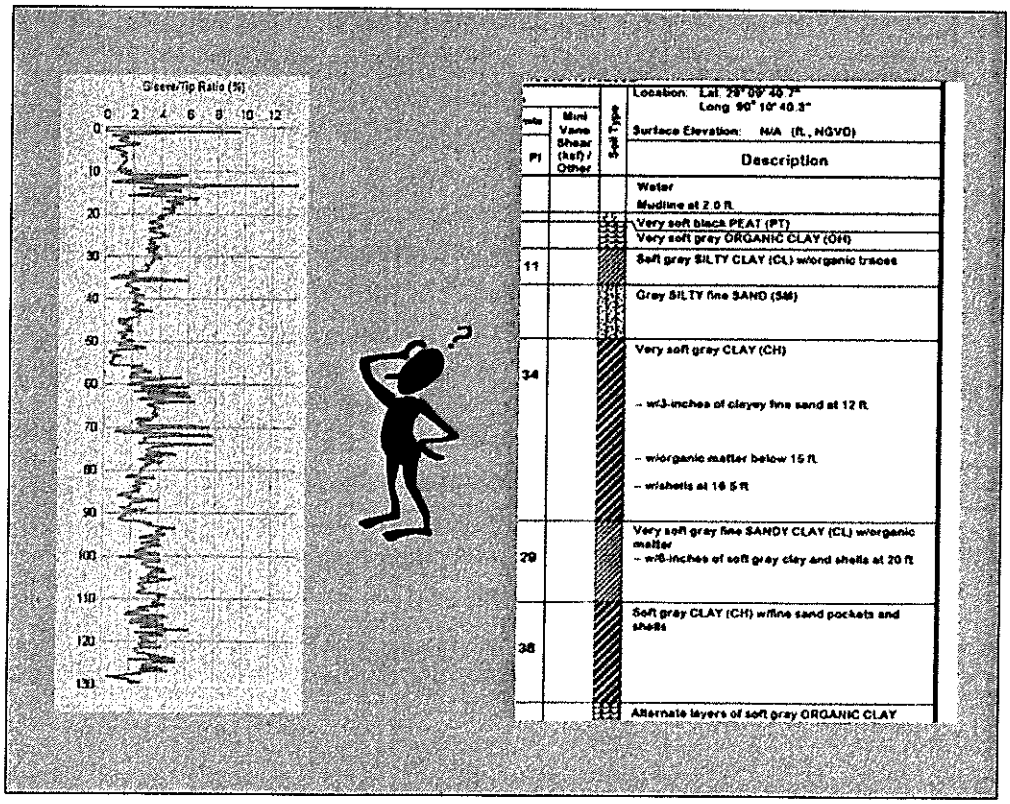
Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

4101 Gourrier Avenue
Baton Rouge, LA 70808-4443

Problem

Soil engineering parameters are the fundamental items of information needed for designing and constructing the foundations of highway infrastructures. Historically, the Louisiana Department of Transportation and Development (DOTD) has relied on a combination of exploratory drilling and laboratory analyses to gather the soil design data on which engineering decisions are made.

Due to the advantages and efficiencies of cone penetration test (CPT) and piezocone (PCPT) technology, geotechnical design work has become more dependent on CPT data. As DOTD adopts the provisions of the AASHTO Load and Resistance Factor Design (LRFD) methodology, correlations between CPT and conventional boring log data must be verified or modified for proper determination of soil engineering parameters. Possible applications of the



Cone penetration test data (left) and boring log data (right)

research include bearing capacity problems for bridge abutments, retaining structures, driven piles, drilled shafts, slope stability, etc.

Objectives

The objective of this research is to update the correlations that are currently used to interpret CPT and PCPT data for engineering design purposes and to assess the reliability of using CPT and PCPT data to estimate the magnitude and spatial variation of soil shear strength in the field. This project will provide crucial information about uncertainties inherent in the CPT results. Such information will support the calibration of the appropriate resistance factors for the design of DOTD substructures.

Description

Researchers will first examine and review the current practices for analyzing CPT and PCPT data. They will then collect available CPT, PCPT, and boring log data from DOTD and other possible sources.

The accumulated data will be processed and analyzed. GIS software will be used as a tool to store and display the CPT, PCPT, and boring log data on a Louisiana map so that a "zone" classification of field tests can be developed based on the collected data and geological background.

The state map will be divided into three color-coded zones. The Green Zone will include regions with a large number of CPT/PCPT soundings along with boring log data and measurements that yielded statistical models with reliable correlation coefficients. Such regions will not require future boreholes, thus engineers can rely on PCPT and statistical models to predict soil shear strength.

The Yellow Zone will include regions with a limited number of CPT/PCPT soundings along with boring log data that did not produce reliable correlations. For such regions, future CPT/PCPT soundings should be accompanied by fewer than usual soil borings and laboratory measurements. This zone could be upgraded to Green as more measurements are added to the database to increase measurement reliability.

The Red Zone represents regions with minimum or no CPT/PCPT measurements and boring log data. Future CPT/PCPT soundings should be accompanied by the customary number of borings. Such measurements will be continuously added to the database as they become available.

The final report for this project will contain a guideline that DOTD design staff can feasibly follow to improve the use of CPT and PCPT data for engineering designs.

Implementation Potential

The zoning classification system will be implemented via interactive Web-based tools. The product of this research will be a valuable engineering resource, improving the quality and efficiency of geotechnical design work. Savings of time and money are expected, as the need for future soil borings will be reduced.

For more information about LTRC's research program, please visit
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