Statement No. 05

Arkansas State Highway and Transportation Department
Transportation Research Committee

RESEARCH PROBLEM STATEMENT

DATE: 08/27/2010	**PROJECT AREA:** Design

TITLE: Evaluating Post-Liquefaction Capacity Of Piles: A Full-Scale Field Study

PROBLEM STATEMENT:

The recently released AASHTO Guide Specifications for LRFD Seismic Bridge Design (2009) require liquefaction assessment in much of Northeast Arkansas, and recommend assessment in an even larger portion of the state. The uncertainty involved with developing a safe, yet economical foundation design is greater in Arkansas than in most other parts of the country due to the presence of deep, loose, sandy soil deposits found within the Mississippi Embayment. Soil deposits are routinely encountered at bridge sites in Northeast Arkansas that appear to be loose enough to liquefy down to at least 100 feet deep (based on SPT empirical liquefaction triggering procedures). Two questions need to be answered in regards to these soils: (1) Will liquefaction be triggered during the design earthquake ground motions, and (2) What are the engineering consequences of liquefaction given its occurrence? A current MBTC research project, with matching funds from AHTD, is aimed at addressing question #1 and significant progress has been made. This problem statement is aimed at addressing question #2 in regards to pile foundations supporting bridges. Specifically, the proposed research will evaluate the post-liquefaciton axial and lateral capacity of piles using full-scale pile load tests conducted in soils that have been artificially liquefied by blasting.

OBJECTIVES:

The objective of this study is to conduct full-scale axial and lateral pile load tests in soils prior to, during, and after soil liquefaction. The soil will be liquefied using small explosive charges; a method that has proven safe and effective in generating liquefied conditions in several other field studies. These tests will provide important insights for evaluating axial downdrag (negative skin friction) and revised p-y curves for predicting lateral load response in liquefiable soils. Conducting tests of this nature will be invaluable for confidently evaluating post-liquefaction axial and lateral capacity of piles in the unique soil conditions of Northeast Arkansas.

Form of Research Implementation:

This research will provide design provisions that AHTD can use to more accurately determine the post-liquefaction axial and lateral capacity of pile foundations. This information will clarify questions that currently exist regarding how piles will perform during an earthquake without needing to wait for one to occur.

Total Estimated Cost and Project Duration: **$** 260,000 **and** 24 **months.**

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