

**REQUEST FOR PROPOSALS**  
**LTRC No. 14-2GT, SIO No. 30001425**

**Testing Protocol for Predicting Driven Pile Behavior within Pre-bored Soil**

**PROBLEM STATEMENT**

Pre-boring is a method used to facilitate large displacement pile driving in hard/dense soils. By pre-boring a pilot hole, the end bearing and side friction within the pre-bore zone are reduced, thus aiding pile driving. However, pre-boring complicates (a) the prediction of long-term pile capacity (specifically side friction) within the pre-bored zone and (b) the Wave Equation Analysis of Pile (WEAP) analysis, which aims to predict pile drivability.

There are three major unknowns that accompany the pre-bored zone: (1) Reduction of end bearing as it pertains to pile driving within the zone, (2) reduction of side friction as it pertains to pile driving within the zone, and (3) reduction of side friction as it pertains to long-term pile capacity within the zone. It is assumed that long-term end bearing within the pre-bored zone will not be an issue, as specifications prohibit predrilling to the tip elevation.

It is expected that the relative strength of the soil as well as the diameter of the pilot hole relative to the pile will have an impact on pile drivability and its long term capacity. Quantifying such an impact will greatly help geotechnical design engineers to understand the interactions among the factors of pre-boring, pile size, soil conditions, pile driving, etc. and improve the design and construction qualities of pile foundations in hard/dense soils. Therefore, the geotechnical design section in the Louisiana Department of Transportation and Development (LADOTD) needs a testing protocol that includes selecting multiple pile driving sites representing different soil strengths (e.g., a “hard” site, a “very stiff” site, and a “medium stiff” site); driving multiple test piles at each site using differently sized predrill holes with no predrilling as control for comparison; and performing monitoring during driving, restrikes, and static load tests using pile dynamic analysis (PDA) as well as strain gauge instrumentation.

**OBJECTIVES**

The objective of this project is to compile the state-of-the-art and best practice results available on the subject and develop a research and instrumentation testing plan for field data collection and select multiple pile driving sites representing different soil strengths (e.g., a “hard” site, a “very stiff” site, and a “medium stiff” site). The research is anticipated to encompass, at a minimum, the following tasks:

**TASK 1 - Literature Review**

This will include a literature search of previous and on-going nationwide research projects and case studies on the subject. A search on the TRIS database is a minimum.

### **TASK 2 – Survey with States Highway and Other Agencies**

This project will include a survey on the state-of-the art and best practices of other state highway departments and agencies. The research team is expected to work closely with the geotechnical engineers and staff of LADOTD to develop the survey questionnaire.

### **TASK 3 – Survey with Louisiana Construction Experience**

The research team is expected to work closely with the geotechnical engineers and staff of LADOTD to develop the survey questionnaire for collecting Louisiana contractors' experience on pile driving problems and compile historically collected geotechnical data from construction projects with other relevant data from LADOTD. It is beneficial for the research team to understand the current practice of using the pre-boring procedure in the Department to accomplish the study satisfactorily.

### **TASK 4 – Investigate Instrumentation Protocol**

The research team will develop the instrumentation protocol for future field testing instrument and data collection using the information available through the literature search and previous experience.

### **TASK 5 – Investigate Site Selection Guideline**

The research team will develop a site selection guideline for future field testing according to Louisiana's geological and geotechnical conditions to meet future research needs on the topic.

### **TASK 6 – Develop Specific Guidelines for Future Data Collection**

The research team will develop specific guidelines for future field testing and data collection that include selecting testing sites for potential field testing, establishing a factorial that covers all the factors that will affect the pile drivability and long term capacity with pre-boring, and developing field instrumentation and monitoring plans.

### **TASK 7 – Final Report and Recommendation**

The research team will prepare a final report to document the entire research effort. The final report should include all the data, results, and recommendation generated by this study.

### **SPECIAL NOTES**

- A. Task descriptions are intended to provide a framework for conducting the research. LTRC is seeking the insight of proposers on how best to achieve the research objectives. Proposers are expected to describe research plans that can be realistically accomplished within the constraints of available funds and contract time. Proposals must present the candidate's current thinking in sufficient detail to demonstrate their understanding of the problem and the soundness of their approach.
- B. LTRC projects are intended to produce results that will be applied in practice. It is expected that the implementation of the results of this research into practice will evolve as a concerted effort during this project. The final report must contain an implementation plan to include, as a minimum, the following:
  - a. The "product" expected from the research;
  - b. A realistic assessment of impediments to successful implementation;
  - c. The activities necessary for successful implementation; and
  - d. The criteria for judging the progress and consequences of implementation.

- C. To assist in the implementation process, the investigators of this research shall present the final results to LADOTD officials in an oral presentation to be held in Baton Rouge, LA at LADOTD Headquarters after acceptance of the final report.
- D. The proposal should include travel to meet with the Project Review Committee for a “kick off” meeting, presentation of interim report, and presentation of the final report at a minimum.
- E. LTRC’s mission includes the support of higher education in Louisiana. LTRC encourages the cooperation and collaboration between out-of-state institutions with Louisiana universities for the purpose of sharing of knowledge and increasing transportation expertise in the academic community.
- F. To equitably answer any questions regarding this Request for Proposals, the Louisiana Department of Transportation and Development (LADOTD) website, <http://notes1/agrestat.nsf/WebAdvertisements?OpenPage> will be updated with questions and answers and related documents regarding the project. The LADOTD makes these documents available for informational purposes only to aid in the efficient dissemination of information to interested parties. The LADOTD does not warrant the documents against deficiencies of any kind. The data contained within this web site will be periodically updated. Interested parties are responsible to be aware of any updates. Questions regarding this RFP should be submitted in writing to the LTRC contact person. Questions must be received by close of business seven calendar days prior to deadline date.

#### **ESTIMATED COST OF RESEARCH**

\$50,000

#### **ESTIMATED COMPLETION TIME**

12 months: The draft final report is due 9 months after the initiation of the study. Last three months of the contract is for LTRC review and approval of the final report.

#### **LTRC PRIMARY CONTACT**

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#### **AUTHORIZATION TO BEGIN WORK**

October 2013 (Estimated)

#### **PROPOSAL FORMAT**

All proposals are required to be formatted according to LTRC Manual of Research Procedures available on the web site: [www.ltrc.lsu.edu](http://www.ltrc.lsu.edu). Chapter 2 of that manual provides guidance on proposal development.

#### **PROPOSAL SELECTION**

The Project Review Committee selected for this project will review, evaluate, and rank all proposals received using the criteria established on the attached proposal review form.

#### **DEADLINE FOR RECEIPT OF PROPOSALS**

Ten copies of the proposal must be received by LTRC by the close of business July 19, 2013.  
Proposals to be submitted to:

Mr. Harold Paul  
Director  
Louisiana Transportation Research Center  
4101 Gourrier Ave.  
Baton Rouge, LA 70808

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