RESEARCH
PROJECT CAPSULE [20-2GT]
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TECHNOLOGY TRANSFER PROGRAM

# Instrumentation and Modeling of Geosynthetic Load Transfer Platform Performance

**JUST THE FACTS:**

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*30 months*

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**POINTS OF INTEREST:**

*Problem Addressed / Objective of Research / Methodology Used / Implementation Potential*

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## PROBLEM

Imposing a significant embankment load over a large area of soft clay soil can cause intolerable settlement, lateral movement, slope instability, and bearing capacity failures. Driven piles and drilled shafts are commonly used for the construction of embankment on soft clay soil to improve the soil's ability to carry the applied load.

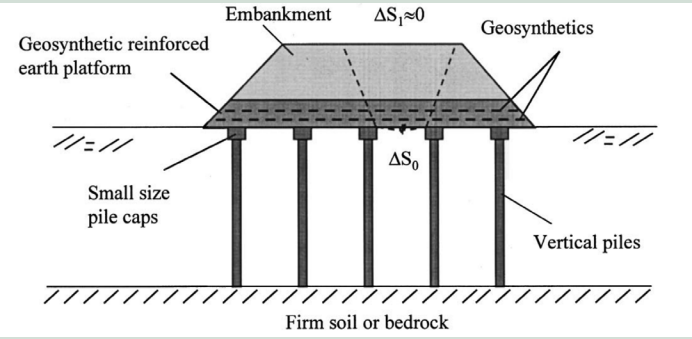


***Figure 1***
***Load transfer platform pile supported embankments***

To avoid excessive settlement under an embankment, closely spaced piles with large pile caps are often used. Most of the embankment load is transferred to the piles with only a small portion of the applied load transferred to the soft soil. Due to lateral thrust near the edges of an embankment, inclined piles are usually used.

The percentage of embankment load transferred to the piles depends on the embankment height, pile size, and spacing between the piles. As the number of piles increases, the construction cost and time also increases. To reduce the construction costs while ensuring most of the applied load is transferred to the piles, geosynthetic reinforcement can be added in the bottom part of the embankment to work as a load transfer platform (LTP) to transfer the embankment load to the pile caps, as shown in Figure 1 above.

The benefits of using an LTP can be significantly enhanced when pile spacing is increased, the size of pile caps is reduced, and by eliminating the need for inclined piles. The pile caps coverage area can be reduced from 30-70% for conventional methods without a LTP to about 10-20% for the case where a LTP is used between the embankment and the piles.

## OBJECTIVE

The primary objectives of this research are to monitor the short-term (during construction) and long-term behavior and performance of a geosynthetic LTP in the state of Louisiana; to evaluate and verify (and maybe modify) important design factors and parameters for geosynthetic LTP (e.g., load distribution, settlement,

and lateral thrust); to conduct a finite element parametric study to evaluate the effect of different variables on the performance of geosynthetic LTP; and to propose design and construction guidelines needed to establish related departmental policies and specifications.

## METHODOLOGY

Recognizing the potential benefits of using a geosynthetic LTP for local embankment approaching bridges, the Louisiana Department of Transportation and Development (DOTD) plans to build LTPs on top of timber piles as embankment support foundations on at least three selected project sites.

For each site, a section will be instrumented and monitored during construction and during long-term service. Load testing of the LTP will be performed using heavy loaded trucks under controlled conditions. The collected data will be used to verify (or modify) the design methodology, to better understand the whole LTP system's engineering behavior, and to calibrate finite element numerical models that will be developed to simulate that behavior.

In addition, finite element (FE) models will be developed, calibrated, and verified using the collected data from the field-monitoring measurements. Then an FE comprehensive parametric study will be conducted to evaluate the effect of different variables and parameters on the behavior of the geosynthetic LTP pile-supported embankments.

## IMPLEMENTATION POTENTIAL

Recommended design parameters for geosynthetic LTP, accounting for Louisiana subsurface soil conditions and use of local materials will be provided to DOTD. Guidelines and training for the design and construction of geosynthetic LTP pile-supported embankments in Louisiana will also be provided.