



Caltrans Division of Research,
Innovation and System Information

Research

Notes

Geotechnical/
Structures

JANUARY 2014

Project Title:
Improved Design Details for
Steel Plate Girders

Task Number: 2578

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Completion Date: May 31, 2016

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Calibrating LRFD Geotechnical Axial (Tension and Compression) Resistance Factors (ϕ) for Driven Piles and Drilled Shafts

Develop Load and Resistance Factor Design (LRFD) resistance factors for pile and drilled shaft axial capacity.

WHAT IS THE NEED?

In 2008, as part of the Federal Highway Administration's (FHWA) mandated adoption of LRFD design practices, Caltrans began designing driven piles and drilled shafts using LRFD. At that time Caltrans rejected the American Association of State Highway and Transportation Officials (AASHTO) recommended resistance factors, since their adoption would have resulted in substantially increased foundation sizes. Since pre-LRFD design practice hadn't generated any foundation failures, adding additional conservatism to Caltrans design practice seemed wasteful. Instead of using the recommended AASHTO factors, Caltrans chose to simply back-calculate factors that would reflect pre-LRFD practice.

In 2013, as part of a FHWA review of Geotechnical Services, FHWA pointed out that while this back-calculation of resistance factors was suitable for a transition period to LRFD, it is inconsistent with LRFD's intended goal of achieving a uniformly reliable design. FHWA then requested that Caltrans perform a California specific calibration of its resistance factors, based on Caltrans design and construction practices.

WHAT ARE WE DOING?

A research team headed by Xinbao Yu of University of Texas, Arlington will work closely with project advisory team members to document Caltrans foundation design and construction practices and acquire foundation load-testing information. Professor Yu will then perform sophisticated statistical analysis of our design procedures and generate recommendations for resistance factors that are specific to Caltrans practice.



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WHAT IS OUR GOAL?

The goal of this project is to develop resistance factors to be used in LRFD based foundation design. Use of these factors in conjunction with our standard design practice should result in foundation designs that are uniformly reliable throughout the state, regardless of foundation type.

WHAT IS THE BENEFIT?

Through this research Caltrans will maintain compliance with FHWA mandates for LRFD adoption. The benefit of a well-calibrated LRFD design procedure is economical design that maintains uniform reliability.

WHAT IS THE PROGRESS TO DATE?

A project team was formed consisting of foundation experts from Caltrans Structures Design and Geotechnical Services. A call for submissions was made to solicit research proposals to perform the calibration work. Several excellent proposals were received and reviewed by the project team. Current activities are focused on establishing a research contract with the top ranked research team.