

Geotechnical/  
Structures

DECEMBER 2020

Project Title:  
Instrumentation Strategies  
for Improved Pile Capacity  
Estimates

Task Number: 3671

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## Impact of Installation Method on Side Resistance of Permanent Steel Casings

Foundation research to better predict the load capacity of Cast-In-Drilled Hole (CIDH) piles with permanent casing

### WHAT IS THE NEED?

Permanent steel casings are commonly utilized to facilitate construction in problematic soil deposits when constructing Cast-In-Drilled Hole (CIDH) piles. A permanent casing also provides additional structural capacity and may be assumed to contribute to geotechnical resistance. Currently, Caltrans allows side resistance to be utilized in the design of the CIDH pile with permanent casing only where an impact hammer is used to advance a permanent steel casing into the subsurface. American Association of State Highway and Transportation Officials Load and Resistance Factor Design Bridge Design Specifications does not contain specific recommendations for casings that are vibrated, rotated or oscillated into the subsurface.

### WHAT ARE WE DOING?

Caltrans is initiating a test program that will compare the side resistance of casings installed using several common construction methods including driving with an impact hammer, vibrating with a vibro hammer, oscillating under load, and rotating under load. Test casings will be load-tested. Each test casing will include strain measuring instrumentation along their lengths to enable the calculation of side resistance. Differences in test casing side resistance will be used to develop adjustment factors that can be used for the design of permanently cased piles.



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## WHAT IS OUR GOAL?

The objective of the research is to develop side resistance adjustment factors that account for casing installation methods such as impact hammer, vibratory hammer, oscillator and rotational methods.

## WHAT IS THE BENEFIT?

Use of permanent steel casings has become more common in California as environmental restrictions have limited other design options. Since it is widely recognized that casing installation procedures such as vibration, oscillation or rotation degrade side resistance, engineers commonly discount side resistance entirely since there is a lack of guidance on expected levels of degradation. The net result is that these foundations are designed to be larger and deeper than necessary. The development of adjustment factors for these different installation methods will enable use of reduced but still substantial side resistance in the foundation design resulting in greater economy.

## WHAT IS THE PROGRESS TO DATE?

Professor Erik Loehr of University of Missouri has been selected as the Principal Investigator. A project team has been selected in February 2020.

## IMAGE



Image 1: Typical oscillator rig (Source: IMECO)