Florida Department of Transportation Research

Updating Florida Department of Transportation's (FDOT) Pile/Shaft Design Procedures Based on CPT and DTP Data
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FDOT's approved design methodology for static, or load-bearing, bridge pilings has been in use since 1978. Since then, stronger forms of concrete and steel, along with advances in pile-driving equipment, have enabled a significant increase in pile/shaft capacities and more cost-effective bridge designs. To determine if the approved design method needed to be updated, or whether an alternative method should be selected, researchers at the University of Florida evaluated 14 methods for calculating pile capacity.

Advanced pier designs like those at the 17th Street Causeway Bridge (above) require updated pile capacity calculations.

To evaluate these different methods, the researchers used cone penetration test, standard penetration test, and load test data that is available from FDOT's soil testing database. The data came from 21 sites in Florida and 28 in Louisiana. The researchers also used previously unavailable data on cemented soils that had recently been generated during testing performed to validate a new device, the dual tip penetrometer (DTP). Unlike the other test methods, the DTP allows cemented soils to be reliably identified. By incorporating DTP results, the new design method will provide more accurate predictions for these types of soils.

The researchers used the test data to evaluate the ability of the 14 methods to predict ultimate pile load bearing capacities and to provide associated load and resistance factor values. Analysis of the results showed that none of the 14 methods provided satisfactory load and resistance factor values.

The researchers proposed a new pile capacity design methodology that provides better load and resistance factor values and takes cementation data into account. The new design method has potential to result in improved, more cost-effective pile designs.

Project Manager: David Horhota, State Materials Office, david.horhota@dot.state.fl.us
Principal Investigator: Michael McVay, University of Florida, mmcva@ce.ufl.edu