DEVELOPMENT OF DEEP FOUNDATIONS TEST SITE

PROBLEM STATEMENT

In a previous study, *Site Preparation for a Deep Foundation Test Site at the University of Central Florida* (BC355-05), a two-acre site was prepared at the University of Central Florida. The site will be used to conduct research and to demonstrate new construction techniques for the installation and testing of piles and drilled shafts. Findings during the course of BC355-05 revealed the following: (1) there were pressuremeter (PMT) test discrepancies between agencies, (2) additional, deeper standard penetration test (SPT) borings were needed, (3) laboratory triaxial, permeability, and oedometer tests were needed to characterize the site, and (4) results from the geophysical tests needed interpretation.

OBJECTIVES

This study is a supplemental research project designed to investigate issues raised in BC355-05. Specific objectives of this project include the following:

(1) provide laboratory testing on recovered Shelby tube samples and evaluate insitu test correlations for engineering parameters
(2) evaluate PMT test discrepancies and conducting a PMT workshop
(3) compare geophysical electrical resistivity (ER) and ground penetrating radar (GRP) measurements with those from SPT and cone penetrometer test (CPT).

FINDINGS AND CONCLUSIONS

A comparison of SPT estimated ϕ or cohesion values with laboratory triaxial tests suggests the SPT estimates used in FB-PIER are comfortably conservative. However, SPT E_{50} FB-Pier estimates were poor. CPT and DMT estimated ϕ values agreed well with triaxial data. DMT moduli estimates were poor with triaxial based values.

A testing program implemented to investigate PMT differences at the FDOT-UCF revealed: (1) A comparison of two different probes (ring and no-ring on tip) for cohesive soils shows no apparent differences. However, for cohesionless soils a significant difference occurred. (2) Interagency (FDOT-SMO, UF, UNCC, and FIT) PMT tests had total disagreement at the cohesive Lake Alice site. Although site variability may explain some of the disagreement, other unknown factors are occurring. However, excellent agreement was obtained between FDOT-SMO and UF at the cohesionless Archer Landfill site.

A comparison of the geophysical data with the traditional insitu test data shows excellent agreement. However, the SPT and CPT complement and assist geophysical interpretation.

BENEFITS

This supplemental research project further characterized the subsurface conditions at the Deep Foundation Test Site at the University of Central Florida to include information regarding deeper soil and rock layers to a depth of 200 feet. This information is necessary for this site to be utilized for deep foundation applications (i.e. driven pile, drilled shaft, and auger cast piles, etc.) in order to validate future research efforts, to use new technologies and construction methods under controlled conditions, and to serve as a training facility. The potential benefit of maintaining this site is that it can be used in conjunction with in-state and national efforts to optimize design and construction of deep foundations, to validate various load test methods and new technologies and construction methods, and to facilitate a means to provide much needed QC training for geotechnical engineers and technicians.

In addition to field tests performed at the site, samples were obtained to perform triaxial shear, consolidation, and permeability tests. Based on these laboratory test results, insitu test correlations for engineering parameters (ϕ, c, and E_{50}) were evaluated and recommendations made. These correlations will be necessary for researchers who will be utilizing this site for future research projects. They also will be used by statewide geotechnical engineers to incorporate the findings into FDOT policy and procedure for designers to use the most appropriate correlations for Florida conditions.

Interagency PMT testing resolved discrepancies at a cohesionless soil site, but disagreement continues between results at a cohesive soil site. The PMT workshop provided a standard PMT testing methodology and calibration procedure with accompanying data reduction spreadsheet. With the increased use of PMT for lateral load analysis, these initial efforts to standardize the testing method and calibration procedure will be incorporated into FDOT policy to ensure consistent and reliable results when this test is used in future projects.

Geophysical ER and GRP tests were found to accurately describe soil profiles. Geophysical testing offers the advantage of sampling a larger area than is possible with penetration testing. If geophysical tests are used to in conjunction with penetration tests to calibrate their results to typically use engineering parameters, then they can provide a means to determine the subsurface conditions over a wider area of a site, which would give the engineer a higher degree of confidence. As such, potential cost savings can be achieved by using a combination of insitu and geophysical testing for site characterization.

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