SITE PREPARATION FOR A DEEP FOUNDATION TEST SITE AT THE UNIVERSITY OF CENTRAL FLORIDA

PROBLEM STATEMENT

The University of Central Florida (UCF) is ideally located in the state of Florida for the Florida Department of Transportation to establish a deep foundation testing and research site. It can be used to conduct research and demonstrate new construction techniques for installation and testing of piles and drilled shafts. UCF is located in Central Florida and is easily accessible from different parts of the state. Another significant use of this field site would be the training and certification of FDOT personnel involved in pile installation and testing.

OBJECTIVES

The purpose of this research project was to prepare a deep foundation test site on the grounds of the University of Central Florida. This test site will be used for on-going and recurring testing for research and certification programs.

It will be utilized to demonstrate various piles and drilled shafts, compare various load test methods such as (i) Conventional static load test (ASTM 1143), (ii) Osterberg (O) cell, (iii) Statnamic, and (iv) Wave equation (ASTM 4945) – PDA / CAPWAP. The results from the field tests may also be used to compare various analysis methods. No such field test site exists in Florida and the results from the associated research may be useful in documenting newer pile types and construction methods for soils in Florida soils. In addition, the site will be utilized for the training of FDOT personnel in deep foundation installation and testing methods.

The objectives of this project included the following:

- **Site Preparation** – The initial preparation of the test site involving the clearing and grubbing of the site. A final survey prepared showing all test locations.
- **Earthwork and Compaction** – The site preparation involving grading and developing a staging area for equipment to be used to launch most project work.
- **Detailed Site Characterization**–The University of Florida at Gainesville conducted in-situ testing such as SPT, Cone Penetrometers (CPT), Dilatometers (DMT) and Pressuremeter (PMT). Inasmuch as the SPT is the most common in situ test, comparison is made between: (1) drilling operators, (2) hammer types and (3) casing vs. drilled mudded holes. Energy measurements are also conducted to compare the SPT data. A testing matrix is developed to compare several private and public field testing agencies.

FINDINGS AND CONCLUSIONS

A two-acre site has been established at the University of Central Florida. It has been cleared and grubbed, fenced, and subjected to a detailed program of soil investigation using several in situ tests has been conducted by the University of Florida. Based upon the in situ tests performed, the following conclusions were drawn:

1. The generalized soil profile from SPT borings is as follows:
    - 0–5 feet a Medium Sand;
    - 5–33 feet Sand to Silty Sand;
    - 33–52 feet Silt Clay to Clay Silt; and
    - 52 –60 feet Medium Cemented Sand (Gravelly Sand).
2. From the center eastward, a hard pan sand layer exists from about 10 to 15 ft.
3. SPT borings were obtained with a hollow stem auger and with a cased hole using an automatic trip hammer. Comparisons of the borings revealed little difference in N values.
4. SPT energy measurements were 82% for an automatic hammer and only 65% for a safety hammer.
5. Comparisons between DMT borings using three different agencies revealed consistent results with little variation between agencies.
6. PMT measurements between two different agencies revealed substantial differences. These differences are attributed primarily to an oversized friction reducer on the tip, which caused an oversized hole and subsequent near hole disturbance leading to a softer response.

Discussions between FDOT and university researchers in the state have led to the determination that the scope of this site will be extended to encompass other geotechnical engineering research areas. A list of potential research topics involving drilled shafts, pile foundations, and other geotechnical issues has been compiled.

BENEFITS

The overall objective for this project is to develop a statewide experimental site to field validate future research efforts, to utilize new technologies and construction methods at a controlled site with known conditions, and to serve as a training facility. The benefits that will accrue to the Department by maintaining this site include (1) optimizing design and construction of deep foundations, (2) providing QC training for engineers and technicians, and (3) validating various load test methods, as well as new technologies and construction methods. These benefits will directly affect how FDOT does business by increasing reliability in design, thereby reducing safety factors, and by having the potential for considerable cost savings. Training for designers will increase the confidence in the deep foundations for future projects, and thus increase the overall safety of the transportation system. Furthermore, the evaluation of new technologies and construction methods at this site may introduce innovation to the design and construction of projects, and so lead to considerable cost savings.

It is hoped that, in the future, this site will be incorporated into a national deep foundation test site, which would introduce to Florida nationwide research efforts. This would invite technology transfer from outside of the state and support the application in Florida of lessons learned by others to increase innovation and safety and to decrease overall project costs.

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