

Prof. Fred Kulhawy

SESSION 5 - MONITORING AND CONTROL

Session Objectives

- Methods Needed for Quality Control
- Verification of Bearing Capacity
- Environmental Aspects

REGIONAL (AMERICAN) PRESENTATION
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Will focus on

- QC (from a designers' perspective)
 - BC verification (of field tests)
- (will leave environmental issues to others)

will pose issues that need general resolution

QUALITY CONTROL - FROM A DESIGNERS' PERSPECTIVE

basic issues that are needed to make micropiles (or any other "newer" foundation type) "acceptable" in routine design

- proper understanding of capacity issues
 - is all of the load in side resistance?
 - is the side resistance the same in tension and compression?
 - how does load transfer develop down the micropile shaft?
 - how much tip resistance actually develops?
- valid design equation, addressing fundamental behavioral issues and robust enough to accommodate construction variations
 - for example, consider side resistance by effective stress analysis

$$Q_s = \pi B (K / K_o) \int_0^D \bar{\sigma}_v(z) K_o(z) \tan [\bar{\phi} (\delta / \bar{\phi})] dz$$

can we quantify these terms, or must we lump them as below?

$$Q_s = \pi B \int_0^D \bar{\sigma}_v(z) \beta(z) dz = \pi B \int_0^D f(z) dz$$

- if we can't quantify all terms, then all is empirical (same category as tiebacks, requiring proof tests during installation)
- standard installation methodology, accommodating micropile type variations
- robust specifications
- sound and reliable method for field checking of installed foundation
- sound and reliable method for cost estimating installed foundation
- documented experience base

VERIFICATION OF BEARING CAPACITY (OF FIELD TESTS)

need to have consistent and versatile framework to conduct, interpret, and assess field load test results

specifically, we need to develop and/or agree upon the following

- minimum geotechnical site documentation
 - need stratigraphy with ground water table
 - need properties and their variation with depth
 - lumped or average parameters are not sufficient
- consistent procedure to conduct the test
 - such as an ASTM Standard type of procedure
 - must agree on rate of testing
- minimum level of instrumentation to make sense of the test results
 - need sufficient detail to determine tip and side resistance
 - need sufficient detail to determine side load transfer
- consistent methodology to interpret test results and define consistent "interpreted failure load"
 - see L_{ST} and L_2 methods figure ($L_{ST} \approx 0.85 L_2$)
- realistic and honest framework to compare results from different micropile types

