



## Research Assignment - 2007

Principal Investigator Akram N. Alshawabkeh

Title Associate Professor

College/Department Civil and Environmental Engineering

Email aalsha@coe.neu.edu

Office address 400 Snell Engineering Center, 360  
Huntington Ave., Boston, MA 02115

Office phone 617 - 373 - 3994

Lab address \_

Lab phone \_

Title of research assignment

Development of a Rapid Soil Characterization System

Research abstract

In the area of the civil construction industry, there are no currently available testing methods or equipment to rapidly evaluate soil strength or density. Manual cone penetrometers (and other available stiffness measuring instruments) have operational issues besides inability to make adjustments for moisture variations. Besides, some tests are very operator dependent. The only established alternatives are nuclear gauges, which have environmental and security issues due to use of radioactive isotopes. Current methods are subject to many limitations, including incomplete soil assessment, inaccuracy, operator dependency, and potential for injury.

The objective of the overall program is to design and build a system to characterize in-situ soil properties including soil strength, moisture content, and classification to a depth of 36 inches. These measurements will be used for the following applications: (1) selecting optimal locations for vehicle crossings of soil surfaced-terrain obstacles, (2) prediction of soil deformation under vehicular traffic, and (3) site selection for contingency infrastructure facilities.

Extension of proven cone penetrometer technology that brings together measurement of soil strength, moisture content, and classification is being developed. The new technology will, for the first time, develop a man-portable instrument that provides a comprehensive field assessment of soil characteristics important for mobility operations. Such an instrument result will also reduce errors in true stiffness estimates that are known to be dependent on moisture and soil type. This will provide a significant advantage as a QC/QA tool in road, runway,

retaining wall, building foundation and other construction applications.

Research activities/experience

The teacher researchers will be involved in part of the project aiming to prepare correlation graphs for the new instrument and relate the measured data to the soil properties.

The participant is expected to work jointly with graduate students in the laboratory. He/she will need to ultimately develop an understanding of some topics in soil mechanics.

Expectations of RET

Researchers will be engaged in different activities include:

- Preparing different soil samples (with variety of properties)
- Installing experimental setup and data acquisition instruments
- Measuring soil properties
- Running tests and using computer to capture test results
- Pre-analyzing of results
- Preparing test reports

Special skills or interests that would help a YSP participant with this assignment (i.e., an interest in physics, experience with specific laboratory equipment, etc.)

An interest in the civil engineering and geotechnical engineering.

Lab safety/issues unique to this laboratory. A general Lab Safety Overview will be presented by Environment Health and Safety to both RET and YSP participants prior to the beginning of lab assignments.

General Lab Safety should be considered.

Suggested literature to be reviewed prior to beginning this research assignment.

Chapter one (8 pages), An Introduction to Geotechnical Engineering (By; Holtz & Kovacs, 1981).

Research/Lab Summer Hours      9:00 a.m. – 5:00 p.m.       Monday through Thursday  
 Monday through Friday

Scheduled Research/Lab Meetings      :    a.m. –    :    a.m.       Daily       Wednesday       To be  
 Monday       Thursday      determined  
 Tuesday       Friday

Research/Lab Supervisor    Ehsan Kianirad

Email    [eh\\_kia@yahoo.com](mailto:eh_kia@yahoo.com), [Kianirad.e@neu.edu](mailto:Kianirad.e@neu.edu)    Phone 781-507-5050