Robertson's Remarks

- Myths of the CPT: "It doesn't collect soil samples" -

Welcome to Robertson's Remarks! My name is Peter Robertson and many of you may know me as an academic/researcher (c/o University of British Columbia then University of Alberta, Canada) via my publications about in-situ testing, especially the Cone Penetration Test (CPT). Hopefully, you may have also read the CPT book "CPT in Geotechnical Practice" which I co-authored with Tom Lunne and John Powell. I recently joined Gregg Drilling & Testing, Inc. (Gregg) in their southern California location (Signal Hill) and take this opportunity to contribute to the Gregg Geo News via this regular column.

This first column is about a pet peeve of mine. Engineers often state: "The biggest disadvantage of the CPT is that it does not collect soil samples". In the strictest sense this statement is true; during a Cone Penetration Test (CPT) you do not collect soil samples. However, it is possible to collect small diameter, disturbed soil samples with the same CPT pushing equipment immediately after the CPT. A common problem with conventional drilling and sampling is that samples are usually taken at regular depth intervals, commonly every 5 feet. This often results in many samples being obtained in soil layers that do not represent the critical layers for the given project. The preferred way to take soil samples is immediately following the CPT, when the soil stratigraphy is known in great detail. Samples can then be collected in an intelligent selective manner based on the actual soil profile, as defined by the CPT. It is common in North America that the CPT is performed using customized CPT trucks. These are usually 20 to 25 ton push capacity vehicles designed to push cones in a highly efficient and effective manner, where 600-800 feet of CPT can be carried out in one day!

What many engineers and geologists often don't know is that most CPT trucks are also equipped to push soil samplers. These are often small diameter tube samples that resemble a standard 10 or 15 cm^2 cone penetrometer but without the internal electronics. After a standard CPT, the truck can be moved a short distance to one side (typically a few feet) to obtain selected samples based on the detailed CPT profile. The sampler is pushed closed-ended to the desired sample depth, then the push-rod is retracted a short distance to expose the open-ended small diameter sample tube. The sample tube is then pushed to obtain the soil sample and the complete tube and push-rod retracted to the ground surface to retrieve the sample. A schematic of a direct-push soil sampler is shown at the right. Further soil samples can be retrieved from greater depths by pushing the sampler back down the same hole. Although the samples are disturbed, they are ideal for soil classification.

If high quality undisturbed soil samples are needed, boreholes are generally required, but again, boreholes and sampling should be carried out after a sufficient number of CPT's to define the detailed soil stratigraphy at the site.

Another little known fact is that the CPT can be performed using drilling equipment. Auger rigs are easily modified to perform CPT in a highly effective manner. Total production is usually less than that of a customized CPT truck due to a slightly slower set-up time (approx. 20-30 min.). Push capacity can be increased by using a single flight of auger to anchor the drill rig before pushing the CPT. Hence, high quality undisturbed soil samples can be obtained using the same drill rig as used to push CPT.

Some may know that Gregg mobilizes a support rig to the site with each CPT truck. These support rigs have a small auger rig on the rear, which can also be used to obtain soil samples. Hence, when you pay for one day of CPT, you also get a 'free' auger rig that can be used to obtain a small number of selected soil samples. What great value for your money!

Contact Peter with any questions or comments regarding Robertson's Remarks at: probertson@greggdrilling.com