GEO-INSTITUTE
7th ANNUAL LIVE STREAMING WEB CONFERENCE

The Geo-Institute Sustainability in Geotechnical Engineering Technical Committee will live-stream the session "*Novel Approaches toward Sustainable Geotechnical Engineering*" on Tuesday, December 6 at 2 PM EST. The topics include:

"*Field-Scale Implementation of Enzyme-Induced Carbonate Precipitation (EICP) as a Ground Improvement Technology*,"
by ***Kimberly Martin*** Ph.D., P.E., ENV SP, M. ASCE

This presentation will describe a field-scale program where Enzyme-Induced Carbonate Precipitation (EICP) was used to create biocemented soil columns. The program was completed in the Center for Bio-mediated and Bio-inspired Geotechnics test pit facility. Seven columns were installed using a conventional permeation grouting technique to create columns ranging from 0.3 m to 1m in diameter and 1 m to 2.4 m in height. The enzyme for the field program was extracted from jack beans using a simple process on-site. The geometry of the columns and the strength achieved were evaluated in situ through shear wave velocity measurements and a pile load test. The final results demonstrate that EICP can be applied at field scale and that downhole shear wave velocity has a high potential for use as a non-destructive verification method.

"*Foundation Reuse – an Excellent Approach to Decarbonization,"* ***Gerald Verbeek***, MSc, M. ASCE

When the topic of decarbonization of foundations is discussed the focus is often on the material selection, the concrete mix design or the size of the foundation. But especially in urban areas (in cities like New York or Chicago) another way to achieve decarbonization can be as simple as reusing foundations that already exist at the construction site. Quite often this approach is almost instantaneously rejected: by the engineer because of the risk involved in doing so, and by the contractor as this approach may result in a scope reduction. In this presentation the reuse of foundations will be addressed from different angles to demonstrate that it can be a viable option, especially when all stakeholders work together.

"*Accelerated Calcite Precipitation (ACP) Method to Investigate a Clogging Potential of Recycled Concrete Aggregate (RCA)*," by ***Jinwoo An***, Ph.D.

Recycled concrete aggregate (RCA) is widely used as a replacement of virgin aggregate in road construction, embankment, and building construction, etc. However, the utilization of RCA in a drainage system is limited or prohibited by many state highway agencies due to its potential creation of calcite precipitation that may cause a clogging in its drainage applications. The accelerated calcite precipitation (ACP) method has been developed to evaluate the long-term geochemical performance of recycled concrete when used in drainage systems. With the ACP method, the total amount of calcite precipitation from RCAs within life cycle of a drain system can be determined. Depending on the source, RCAs may have varied chemical component which affect the amount of calcite over life cycle. Thus, via the ACP method, engineers can easily investigate the long-term performance of RCA prior to the use in the field. In this talk, the whole process of ACP method is introduced and parametric study for optimizing the method, with different types of RCAs (fresh, demolished and weathered RCAs), are presented and discussed.

“*Environmental Impacts of Drilled Shaft in Sand*,” *by* ***Mina Lee****,* M.A.Sc

Drilled shafts are one of the widely used deep foundation solutions because of their versatility, cost-effectiveness, high load-carrying capacity, and minimal disturbance (e.g., vibration and noise) to surrounding areas. They are well suited in urban settings where vibration cannot be tolerated to near existing buildings, and large diameter drilled shafts are commonly used for major bridge constructions. Concrete and steel are the main materials used in constructing drilled shafts which are also known to be energy and carbon intensive materials that contribute significantly to global warming and climate change. As the use of drilled shafts continually increases, it is important to understand their environmental impacts through quantitative methods. Life cycle assessment (LCA) is a widely used tool to quantify environmental impacts of a product or system considering all processes that the product or system undergoes during its lifetime. Examples of these processes that are relevant in geotechnical construction are extraction and refining of raw materials, manufacturing, transportation, construction, maintenance and repair, demolition, and reuse and recycling. Using LCA, various environmental impacts can be quantified including global warming, acidification, eutrophication, particulate matter formation, and so on. LCA can be helpful in determining the effects of soil properties, design parameters, and construction/site-specific factors to environmental impacts. Charts and tables for quick estimation of environmental impacts (e.g., global warming) can be developed based on the results of LCA to assist in achieving sustainable drilled shaft designs without the use of specialized LCA software programs. LCA is not limited to drilled shafts, but can also be applied to other types of foundations, retaining structures, and slopes.