Behavior of Drilled Shafts Used as Geothermal Heat Exchangers

Wednesday, February 5, 2014, 4:30 – 5:30 PM

1670 Beyster Building (North Campus), University of Michigan

Refreshments served before and after the seminar

Abstract: Drilled shaft foundations with embedded heat exchangers (energy foundations or energy piles) have gained attention by employing the same materials to not only provide structural support but also improve the energy efficiency of building heating and cooling systems. Two case histories of buildings having instrumented energy foundations will be presented, focusing on lessons learned from the construction of these systems as well as data on their thermal and thermo-mechanical performance. The observations from the case histories indicate that there are no adverse effects of heat exchange on the performance of drilled shaft foundations, confirming that this is a sustainable technology that can be implemented for little additional cost beyond that of the foundation. Soil-structure interaction analyses used to predict the thermal axial stresses, strains, and displacements in energy foundations will be discussed, including thermo-hydro-mechanical finite element analysis and a modified load transfer (T-z) analysis. Further, experimental methods being developed to define the relevant properties needed to perform these analyses will be presented, along with typical results. The presentation will close with a discussion of current and future research opportunities in the emerging field of energy geotechnics.