



Stony Brook University

Civil Engineering Program

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SEMINAR

Thermo-Active Geosystems

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Abstract. “Thermo-active geosystems” is a general term referring to structural elements that serve as heat-exchangers, in addition to their primary function. For example, Energy Piles provide structural support and utilize the near-surface heat capacity of the ground (also known as “shallow geothermal energy” or “ground-source energy”). Heat exchange is accomplished using a fluid circulating through a piping system integrated in the structural elements that are embedded in the ground. When heating is desired during the winter, the circulating fluid extracts the geothermal energy from the ground to heat the structure. Alternatively, during cooling operations in the summer, excess thermal energy from the building is injected into the ground.

Structural elements or infrastructures, when equipped with heat-exchange pipes, will be able to utilize the green, renewable, and sustainable shallow geothermal energy. Such elements and infrastructures include deep and shallow foundations, earth retaining structures and various types of tiebacks, tunnel linings and underground structures, dams, levees, pavements, and pipelines. Despite the promising potentials of these systems to efficiently utilize geothermal energy and the associated low operational costs, a number of engineering design challenges prevents the broader acceptance and use of such systems. Two of the key design challenges are the lack of full understanding of the thermo-mechanical system behavior, and the long-term performance of the system, especially in climate regions where unbalanced thermal loads are expected. This talk will present numerical and experimental approaches developed to address these two design challenges for deep thermo-active foundations (Energy Piles), and the major design implications will be discussed.

Biography. Dr. Abdelaziz received his Ph.D. degree in Civil & Environmental Engineering from Virginia Polytechnic Institute in May 2013. Dr. Abdelaziz’s current research interests are related to sustainable and resilient infrastructures with the main focus on the area of thermo-active geo-systems, geothermal energy, and resilient materials. These areas are the cutting edge research points in geotechnical engineering.