Elaboration of charts based on geometry variations for the design of thermo-active piles

Mila Smiljanovska¹, Hussein Mroueh², Julien Habert³, and Josif Josifovski⁴
¹Civil Engineering Institute Macedonia, Skopje, North Macedonia
²Laboratory of Civil Engineering and geo-Environment, University of Lille, France
³Cerema, France
⁴Faculty of Civil Engineering, "Ss. Cyril and Methodius" University, Skopje, North Macedonia

Contemporary living, the extreme climate changes and the necessity of renewable energy sources challenge the engineers around the globe to discover advanced methods of enabling a more comfortable life. For this purpose, geothermal energy systems are used to satisfy the calorific needs for cooling and heating. Thermo-active geo-structures, as dual-function elements, offer structural improvement and simultaneously provide eco-friendly and long-term cost-friendly solutions. This contribution provides an overview of the design of geothermal piles based on geometry variations. Hence, thermo-mechanical analyses are performed for axially loaded piles based on the load transfer approach using t-z curves method. With an absence of precise regulations and standards, the aim of these analyses is to simplify the design of thermo-active piles by generating an envelope chart utilizing the results for piles with different lengths and diameters. However, keeping a more realistic ratio of the geometry is of a significant importance, so that the piles are applicable on real project solutions.