Useche-Infante, D.J., Aiassa-Martinez, G.M., Arrua, P.A. et al. Model Tests and Numerical Modeling on Post-Grouting Effects of Steel Pipe Micropiles. *Indian Geotech J* (2024). https://doi.org/10.1007/s40098-024-00986-7

Model Tests and Numerical Modeling on Post-Grouting Effects of Steel Pipe Micropiles

Abstract

Steel pipe micropiles have been used successfully for deep foundations. To improve the performance of steel pipe micropiles, the post-grouting technology is employed worldwide due to its potential to increase the axial resistance and decrease the displacements in the micropile. This foundation is called grouted steel pipe micropile in the literature. The post-grouting is commonly carried out at the micropile sides using grout delivery pipes. In this contribution, the results of scale model tests and numerical simulations with grouted steel pipe micropiles are presented. Model micropiles were tested within a calibration chamber containing silty soil prepared with a unit weight of 14 kN/m3. The stress level remained constant in the sample with the application of an overload (100 kPa) on the soil surface. Based on the results of numerical simulations, the scale effect on the axial resistance of pipe micropiles is considered. Furthermore, the influence of grout injection pressure on the pipe micropile behavior is studied. The analysis reveals that, for steel pipe micropiles in compression, due to increasing of grout injection pressure from 26.7 to 30.0 kPa, the ultimate axial resistance was improved by 19.0 and 33.7% compared to the micropile with an injection pressure of 25.0 kPa. Two main factors that improve the behavior of the micropile were identified, the first is the soil densification under the micropile tip originating from the micropile driving; and the second factor is the improvement of the micropile friction resistance due to the grout penetration into the surrounding soil caused by the grouting. Finally, a multiple regression equation to estimate the ultimate axial resistance of grouted steel pipe micropile is presented.