

Numerical Simulation of Axially Loaded to Failure Large Diameter Bored Pile

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Abstract : Ultimate capacity of large diameter bored piles is usually determined from pile loading tests as recommended by several international codes and foundation design standards. However, loading of this type of piles till achieving apparent failure is practically seldom. In this paper, numerical analyses are carried out to simulate load test of a large diameter bored pile performed at the location of Alzey highway bridge project (Germany). Test results of pile load settlement relationship till failure as well as results of the base and shaft resistances are available. Apparent failure was indicated in this test by the significant increase of the induced settlement during the last load increment applied on the pile head. Measurements of this pile load test are used to assess the quality of the numerical models investigated. Three different material soil models are implemented in the analyses: Mohr coulomb (MC), Soft soil (SS), and Modified Mohr coulomb (MMC). Very good agreement is obtained between the field measured settlement and the calculated settlement using the MMC model. Results of analysis showed also that the MMC constitutive model is superior to MC, and SS models in predicting the ultimate base and shaft resistances of the large diameter bored pile. After calibrating the numerical model, behavior of large diameter bored piles under axial loads is discussed and the formation of the plastic zone around the pile is explored. Results obtained showed that the plastic zone below the base of the pile at failure extended laterally to about four times the pile diameter and vertically to about three times the pile diameter.

Keywords : ultimate capacity, large diameter bored piles, plastic zone, failure, pile load test

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