

Effect of Stage Compressive load on Single Pile Subjected to Time Effect: A Numerical Investigation

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Extended Abstract

The gradual process of construction by applying loads in increments to the foundation is called stage construction [3]. The experimental and numerical investigations on single pile and group piles considering time effect are limited. In the present study, the effect of stage compressive load on single pile considering time effect has been analysed by PLAXIS 3D [2]. The Mohr-Coulomb material model has been opted to represent the soil. The pile considered for analysis is 0.4m in diameter and 8m in length. Embedded pile option has been used to model the pile. The PLAXIS 3D [2] results have been validated by conducting a single pile stage compressive load test in the field. The field investigation has been carried out on a cast in-situ bored vertical pile to study the effect of compressive load on a single pile [3]. Two anchor piles are placed diagonally at a distance of 2.1m each from the main pile. The anchor piles are 0.4m in diameter and 10m in length. The pile cage is of 0.3m diameter consisting of 8 number of reinforcement steel bars (12mm diameter). Concrete of grade M25 has been used. Two diagonally opposite main reinforcement bars are instrumented with five electrical strain gauges. The subsoil exploration including sample collection and standard penetration test [4] has been carried out at an interval of 1.5m up to a depth of 20m. The ground water table is found at depth of 7.5m. The soil mostly consists of 69% silt size and 30% sand size particles. The average density of soil is 16.5kN/m³. The loading on the pile has been applied by a hydraulic jack of capacity 1000ton. The pile is loaded vertically with gradual increment of loads. The load increment was 7.2ton in each step which is about 20% of the expected failure load. The initial portion of the load displacement curve is linear whereas at later stage it is non-linear in nature. The load distribution along the pile shaft is calculated from the strain readings. As the depth increases, the intensity of load distribution decreases along the pile shaft. The intensity of load distribution decreases up to 0.25 times the pile length and it is minimal thereafter. The load distribution remains constant at the bottom end of the pile. A comparison has been made between the observed load-displacement and with the predicted load-displacement response. After validation, further analysis has been carried out by subjecting the pile to a constant compressive load for a time duration of three months. It is observed that due to time effect, the settlement has been increased due to build-up of pore water pressure. The analysis has also been compared with the reported results [5] for single pile connected piled raft foundation. The reported analysis [5] was based on constant surcharge load. But in this analysis, constant load has been applied over a constant period of time. The results are useful for designing pile foundations considering time effect.

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