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Numerical Simulation of Pile Dynamic Analysis Test

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Estimation of bearing capacity is a vital component in pile foundation design. There are various analytical and empirical methods to predict bearing capacity of piles which provide a quick approximation for foundation design. The results obtained through analytical and empirical approaches rely on empiricism and are site specific. Therefore, the results obtained should be validated by an in-situ load estimation method. In this scenario, Pile Dynamic Analysis (PDA) test is a widely used method for in-situ bearing capacity estimation of piles. However, validating theoretical bearing capacities of each and every pile through PDA test is not practicable due to its high cost. As such, only very limited number of piles are tested using PDA in very large projects. However, in relatively small projects, due to economic constraints, it is really difficult to conduct field load tests. As such in this this research study, PLAXIS-2D was used to model piles to estimate the carrying capacity of piles. PLAXIS-2D program has been performed on driven piles by the assistance of site investigations data. Soft soil and Mohr-Coulomb models were adopted for soft soil and completely weathered rock respectively, whereas linear elastic model was used to simulate piles. The data corresponding to the 0.5 m diameter spun concrete piles driven at Godagama Interchange in Southern Expressway Extension Project were used for this research study. Further, it can be noted that the ultimate bearing capacities obtained by analytical method, PDA test results and PLAXIS analysis are in good comparison with each other. However, bearing capacity obtained through analytical method is 10% lower than the PDA test results even though PDA test results do not represent the ultimate value. The bearing capacity obtained through PLAXIS analysis is very close to the field load test results indicating the applicability of the PLAXIS modelling for bearing capacity calculations.

Keywords: Analytical method, Bearing capacity, Pile dynamic analysis test, PLAXIS-2D