

DEVELOPMENT OF AN ALTERNATIVE APPROACH FOR BORED AND CAST IN-SITU PILE DESIGN USING PDA TEST RESULTS

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Many pile designs are done as bored cast-in-situ end bearing pile designs in Sri Lanka and the reason for that is the availability of hard bedrock at relatively a shallow depth compared to other countries. These designs are mostly done using ICTAD/CIDA guidelines. However, many researchers have identified some issues that are generated with conventional pile design methods and construction procedures of the piles. Test piles are widely being used to check the accuracy of assumptions that are generated with the designs. End bearing and skin resistance of the rock are only considered in most of the pile designs in Sri Lanka. Because of this phenomenon, skin resistance of soil layers that have a high SPT “N” value is not considered for the capacity estimation. In this study, the applicability of estimation of carrying capacity of the pile considering the soil layers which have higher SPT “N” value was verified. Therefore, a comparative study was conducted together with two main research objectives. It was required to evaluate which design procedure is more effective when comparing the estimation of the pile capacity considering all the layers which have SPT “N” values more than or equal to 15 (as criteria 1) or the pile capacity only considering the skin and toe resistance in the bedrock (as criteria 2), and a comparison of the estimated allowable carrying capacity values according to the ICTAD/CIDA and Euro code 7 guidelines with the actual allowable carrying capacity values which were taken from the CAPWAP analysis of PDA test results was also considered as a primary objective in this study.

As per the methodology, required data and information were gathered and the soil parameters were calculated by obtaining corrected SPT “N” values. Thereafter, allowable carrying capacity according to ICTAD/CIDA guidelines and design carrying capacity according to Euro code 7 guidelines were estimated for both criteria. The difference between the estimated values of both criteria was represented as a percentage. After selecting more suitable and applicable criteria, the capacity values which were estimated using those criteria were compared with actual allowable carrying capacity values.

According to the analysis, the difference between the estimated values of both criteria were approximately ranged between 6% - 65% for the estimation according to ICTAD/CIDA guidelines and 16% - 150% for the estimation according to Euro code 7 guidelines. Therefore, the estimation of the pile carrying capacity considering all the layers which have SPT “N” values more than or equal to 15 is better predicted than the estimation of carrying capacity of the pile only considering the skin resistance of rock and end bearing of the pile. As per the comparison of the actual and estimated allowable capacities, it is possible to obtain overestimations or underestimations that will rely on the assumptions made about the properties of soil and rock layers. Therefore, the accurate soil parameters and properties should be maintained in estimations and, the geotechnical investigation of the site should be more accurate.

Keywords: bored and cast in-situ piles; carrying capacity of piles; pile designing methods; high strain dynamic load test

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