STUDY OF DESIGN AND CONSTRUCTION METHODS OF BORED PILES IN SRI LANKA

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Abstract

This research was done as a case study, to highlight some basic conceptual changes needed in pile designing and philosophy adopted in Sri Lanka. Even though the results are based on single case study similar trends are observed in many other projects. However, further research in this respect may be needed before adopting the recommendation given in the thesis in design practices.

Since 1960's Cast ln-Situ Bored (CIB) Piles have been a popular choice for deep foundation in America. Bui in Sri Lanka, only now it is getting more popular. It's due to large number of high-rise buildings coming up mainly in the capital city, Colombo. In Sri Lanka. CIB piles are commonly constructed by drilling or boring 300mm-1800mm diameter boreholes.

Research for CIB piles began in the 1960s, but the recent increase in popularity of these deep foundations reveal that there are still many variables in the design and construction process that have yet to be standardized. Questions still arise as to how construction methods influence the behavior of CIB piles, such as if bottom cleanliness affects bearing capacity, or how much skin friction effect the end bearing capacity, orN how much skin friction is reduced due to permanent and temporary casing.

Foundation system is one of the key elements in any structure. Designing the foundation system with a correct safety factor is a responsibility of the Design Engineers. It can be seen that Design Engineers tend to rely heavily on the approximate design parameters given in soil investigation reports. In most cases those design parameters are not match with local conditions. Most of them are extracted from research reports, books and journals published in other countries, developed to suite their subsurface conditions. Comparatively a hard rock stratum exists below the subsurface of most parts of Sri Lanka and the compressive strength of the intact bedrock is comparatively high than the normal. However the naturally existing rock mass is fractured and hence the strength may be much less than that of intact rock specimens. Therefore, construction quality controlling of piles is a valid consideration if higher value of end bearing to be used. It is worthwhile to look at the possibility of using much higher compressive strength than the value currently used. By doing so the pile diameter may be reduced and may achieve a higher quality product with an economical design.

Other main area to be considered is the depth to the bedrock. In coastal zone it's around 10-30m below the mean sea level. Another important consideration is the presence of a strong weathered rock layer at a depth of about 10-20m level below the MSL, The conventional skin frictional resistance assumed for this rock layer varies from

DECLARATION

I, P.D.J.Mohotti, hereby declare that the content of this thesis is the original work carried out by me. Whenever others' work is included in this thesis, it is appropriately acknowledged as a reference.

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Contents

Notations

CIBP	Cast In situ Bored Piles
EB	End Bearing
SF	Skin Friction
SFR	Skin Friction in Rock
SFS	Skin Friction in Sand
PDA	Pile Dynamic Test
SLT	Static Load Test
ASF	Actual Skin Friction
ESF	Estimated Skin Friction
D	Pile Diameter
K_0	At rest earth pressure
ϕ'	Friction angle
Q_s	Side resistance kN
q_s	Side resistance kN/m^2
β	Pertaining empirical factor
Z_i	Depth to the middle of the layer from pile top
Z_c	Critical depth
N	SPT number
P_a	Atmospheric pressure
IGM	Intermediate Geometerial
Pu	Ultimate load capacity
C	Pile soil adhesion
q_{uc}	Unconfined compression strength
Qp	End bearing (kN)
q_p	End bearing (kN/m^2)
A_b	Pile cross sectional Area (m^2)
MSL	Mean sea level
g	Gravitational acceleration (m/S^2)