EXPERIMENTAL AND NUMERICAL MODELLING OF FLOATING ENCASED SAND COLUMNS SUPPORTING RIGID FOOTINGS IN VERY SOFT CLAY

By

Mahmoud Mohamed Ali Ibrahim

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
CIVIL ENGINEERING – PUBLIC WORKS

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
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Title of Thesis:

Experimental and Numerical Modelling of Floating Encased Sand Columns Supporting Rigid Footings in Very Soft Clay

Key Words:
Soft Clay; Encased Sand Column; Floating; Bearing; Soil Improvement

Summary:

The aim of this study is to investigate the effectiveness of partially penetrating encased sand columns on the settlement, and bearing capacity. In addition, consolidation process, stress transfer mechanism, and developed hoop strains are investigated through small-scale experimental model tests and numerical modelling. An experimental test for a partially penetrating GEC was modelled using the 3D finite element program (Plaxis 3D) for verification purpose. Using GECs with penetrating length ratios of 1.0, 0.8, and 0.6 resulted in settlement reductions of 82%, 80%, 68%, respectively, at a vertical applied load of 36 kPa. Bearing Capacity increased with increased the GECs penetration ratio. Hoop strains increased significantly at a penetration ratio of 0.6. Good agreement was observed between the results of the experimental and numerical models

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other universities or institute.

I further declare that I have appropriately acknowledgement all sources used and have cited them in the references section.

Name: Date:

Signature:

Dedication

This thesis is dedicated to the most valuable and precious people in my life, my Parents. Those who without them I would have never reached anywhere in this life and my lovely wife Aliaa Hassan Elwan.

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