



Cairo University

3D NUMERICAL STUDY OF THE BEHAVIOR OF FLOATING STONE COLUMNS IN DEEP SOFT CLAY

By

Khaled Hussein Abdelaziz Hussein Elmeligi

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
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Under the Supervision of

Prof. Dr. Mohamed Mamdouh Aly Sabry

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Title of Thesis:

3D Numerical Study of the Behavior of Floating Stone Columns in Deep Soft Clay.

Key Words:

Stone Column; Consolidation; Soil Improvement; Floating; Plaxis 3D.

Summary:

Stone columns are one of the most effective systems used in soil improvement techniques which depend on alteration of the in situ properties of soil by installation columns composed of granular material. This improvement in soil is focused on reducing settlement, increasing bearing capacity, accelerating consolidation time, increasing stability of structures and control liquefaction. In most cases, end bearing stone columns are used. But in cases where deep soft soils are found, floating stone columns may be adopted.

Generally, the behavior of floating stone columns has not been well understood. Therefore a 3D numerical modelling technique using Plaxis 3D software is necessary to understand this behavior to provide some practical vision in geotechnical design. A verification model has been conducted to validate stone column modelling and its output results using actual field data measurements.

The 3D numerical model has been used to study and evaluate the effect of practical values of floating stone columns lengths and spacing. In addition the effect of related practical parameters such as loading technique, foundations dimensions and foundations rigidity. And study the effect of these parameters on the consolidation settlement of the soil and the required time of consolidation.

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 university or institute.

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

Name: Khaled Hussein Abdelaziz Hussein Elmeligi

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Signature:

Dedication

This work is dedicated to my beloved FATHER soul.

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