Ain Shams University
Faculty of Engineering
Department of Structural Engineering

Behavior of Laboratory Models of Footing Resting on Layers of Swelling Soil and Sand

BY

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B.Sc, Civil Engineering "Structural" (2008)

Ain Shams University - Faculty of Engineering

THESIS

Submitted in partial fulfillment of the requirements for Degree of Master of Science in Civil Engineering Structural Engineering Department

(Geotechnical Engineering)

Supervised By

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Cairo-2015


وَيَتَفَكَّرُونَ فِي خَلْقِ السَّمَوَاتِ وَالْأَرْضِ

Dedication

I would like to dedicate this thesis to all members in my family for supporting me and pushing me forward all the time

Ain Shams University
Faculty of Engineering
Structural Engineering Department

Abstract of the M.Sc. Thesis submitted by: **Marwa Samir Mahrous**

Title of Thesis:

Behavior of laboratory models of footing resting on layers of swelling soil and sand

Supervisors:

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Abstract

Expansive clay is one of the most detrimental problematic soils in Egypt in recent years due to the urban expansion in arid and semi-arid areas. During the last few decades, some expansive research efforts were carried out to investigate the geotechnical characteristics of these deposits and the swelling mechanisms of shallow foundations resting on such homogenous formation. However, in situ the soil formations of expansive soil are composed of either thick clay layer, layers of expansive clay inter-layered with seams of non-expansive soil; and mainly sand formation with lumps of expansive soil (6th of October city, New Cairo city). The objective of this research is to study the movement of footing resting on multi-layers of swelling clay and sandy soil using laboratory model tests. The effect of particles size of sand layers, number of swelling clay layers, activity of swelling clay, and water flow direction are taken into consideration. The final predicted movements of footings are predicted using empirical and semi-empirical equations. Laboratory tests are performed to study the geotechnical characteristics for three grained of sand used in this study and three types of swelling clay used which are classified using direct and indirect measurements tests. The swelling properties are determined using simple modified Oedometer tests. The footing and ground surface heave are measured and predicted for downward and upward water flow. The measured footing and ground surface heave were compared with that predicted values.

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

APPROVAL SHEET

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Faculty of Engineering-Ain Shams University

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STATEMENT

This dissertation is submitted to Ain Shams University for the degree of M. Sc. in Civil Engineering.

The work included in this thesis was carried out by the author in the Department of structural Engineering, Ain Shams University from 2009 to 2014.

No part of this thesis has been submitted for a degree or for qualification at any other university or situation.

Name : Marwa Samir Mahrous

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Date : / /

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Marwa Samir

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