MODELING AND EVALUATION OF STRIP FOOTINGS ON ANCHORED GEOSYNTHETIC REINFORCED SOIL OVERLAYING LOOSE SAND

By

Mohamed Kamal Hussein Mohamed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSPHY
in
CIVIL ENGINEERING – PUPLIC WORKS

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

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Key Words:
Shallow Foundations, Anchored Geosynthetic Reinforcement, Pullout Resistance, Passive Resistance, Reinforced Soil.

Summary:

This thesis presents the results of laboratory and numerical models to study the behavior of shallow footings resting on anchored geosynthetic reinforced dense soil overlying loose. Laboratory model tests are performed to study the effect of reinforcement length, reinforcement depth, number of layers, and anchorage condition on the performance of a strip footing on geosynthetic reinforced soil. Finite element verification is performed using Plaxis 2D and an additional parametric study is performed to numerically investigate the effect of reinforcement length, deadman height, deadman width, and geosynthetic stiffness for different anchored geogrid configurations. An analytical method is developed to calculate the tensile forces in the reinforcement and ultimate bearing capacity. The pullout resistance of the geogrid significantly increases when anchoring the edges due to the development of passive resistance on the deadman resulting in an increase in bearing capacity. Uniform strains are generated along anchored reinforcement compared to the bell-shaped strain curve for conventional reinforcement. The optimum reinforcement length is six times the footing width for conventional reinforcement, on the other hand, the optimum reinforcement length is equal to footing width plus reinforcement depth for anchored reinforcement.

Disclaimer

I hereby declare that this thesis is my 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 : Date :

Signature :

Dedication

To the most loving and caring parents,

Kamal Hussein Mohamed and Nawal Hassan Ahmed

To my beloved wife,

Mai Samir Abo El Soud

To my beloved son and daughter,

Zeyad and Menna Allah

Thank you for giving me the tools to be successful in life
and the motivation to use them.

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