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NUMERICAL ANALYSIS OF EMBEDDED REINFORCED SOIL FOUNDATION ON TWO-LAYER SOIL SYSTEM

INSTITUT PENYELIDIKAN, PEMBANGUNAN
DAN PENGKOMERSILAN
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR
MALAYSIA

BY :

NG KOK SHIEN
SITI FATIMAH BINTI SADIKON

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Associate Professor Dr. Ahmad Redzuan Abdul Rahman
(Director of UiTM Perlis)

Associate Professor Dr. Nik Ramli Nik Abdul Rashid
(Campus Deputy Director PJI)

Syuzila Saad

PJI Staff

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ABSTRACT

The behaviour of strip footings resting on subsoil consisting of a reinforced-granular fill layer overlying a low bearing capacity soil was studied. Model setup was divided into two: surface footing and embedded footing. A series of finite element (FE) analysis were performed on a prototype model of both reinforced and unreinforced foundations using FE commercial software PLAXIS. Updated mesh analysis based on Updated Lagrangian formulation was adopted in this study. The purpose of this study is to determine the effect of geosynthethics reinforcement on the ultimate bearing capacity and settlement characteristics of the strip footing resting on a granular fill – soft soil system. Particular emphasis is paid on the fill depth, embedment depth, fill and soft soil strength, reinforcement stiffness and length, and number of reinforcement layer. Besides, investigations on effects of laying geosynthethics at the interface or into the layer of fill were studied. The method of analysis was verified by comparison with analytical solution and previous study. Based on the result, the reinforcing effect of two layer soil system is quantitatively evaluated.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The decreasing availability of proper construction sites has led to the increased use of marginal ones, where the bearing capacity of the underlying deposits is very low. In an effort to improve the performance of poor soils four potential option can be taken by geotechnical engineers. These are: (1) replace part of the weak cohesive soil by an adequately thick layer of stronger granular fill or combination of materials, (2) improve the properties of the poor soil, (3) redesign the structure to meet the soil limitation, and (4) bypass the soil by the use of deep foundation. The inclusion of geosynthethics as soil reinforcement is within the first option.

In the case of shallow foundation, if the footings are closely spaced and soil is weak, then the size of footing required may be so large as to necessitate a combined footing or a raft foundation. Isolated spread footings are always more economical than combined footings or a raft foundation. Thus, the type of foundation itself can be changed, by increasing the allowable soil pressure, using the reinforced soil technique. The investigators, through model tests, have qualitatively demonstrated that a geosynthethic reinforcement placed below a footing (so called reinforced soil foundation, RSF) can increase both the ultimate bearing capacity and allowable bearing stress at a given settlement.