GEOSYNTHETIC REINFORCED PILE SUPPORTED EMBANKMENTS

Jayasundara Mudiyanselage Pradeep Kumara

(09/8919)

Thesis submitted in partial fulfillment of the requirements for the degree of Master of Engineering in Structural Engineering Design

Department of Civil Engineering

University of Moratuwa

Sri Lanka

July 2015

Declaration

"I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books)."

Signature: … ***UOM Verified Signature*** Date: 17/07/2015

The above candidate has carried out research for the Masters thesis under my supervision.

UOM Verified Signature

Signature of the supervisor: ……/……/…… Date: 17/07/2015

Abstract of Thesis

The design of embankments on weak foundation soils is a challenge to the geotechnical Engineer. There are several issues related to bearing capacity failures, intolerable settlements and slope instability that need to be addressed. The piled embankments with the inclusion of a geosynthetic layer have proved to be one of the economic and effective techniques to handle such problems.

The inclusion of the geosynthetic reinforcement eliminates the need for inclined piles used in conventional piled embankments for resisting large lateral pressures. The geosynthetic layer enhances the load transfer mechanism and considerably minimizes the differential and maximum settlements.

This study attempts to analyze the various methods available today for the design of these structures. A numerical study is carried out. The effects of certain factors like pile modulus, stiffness of the geosynthetic reinforcement, height of the embankment, effect of the soil layer directly below the geogrid which are not considered by other available methods are studied using a finite element program – Plaxis 2D.

The results from two design methods are evaluated and compared with the results from Plaxis. It is found that numerical analysis was able to address many factors that were neglected by all the other available methods. It was also found to be more reliable than currently used methods. The German Draft Standard (EBGEO) approaches the numerical Plaxis calculations better than British Standard 8006

Acknowledgements

I would like to acknowledge the Department of Civil Engineering of University of Moratuwa, to provide me the opportunity for studying the Master of Engineering Degree Program in Structural Engineering.

I would like to express my sincere appreciation to all the staff members of this M Eng program for their encouragement and excellent guidance to complete this work in successful manner.

I am very grateful to my supervisors Professor M.T.R.Jayasinghe and Dr. L.I.N.De Silva of University of Moratuwa and Dr. Asiri Karunawardena, Director General of NBRO for their valuable support, guidance and encouragements.

Furthermore I like to express my sincere thanks and appreciation to Eng N Rupasinghe, the chairman of the Central Engineering Consultancy Bureau (CECB) for granting permission to carry out my Master of Engineering Degree Program.

Finally, I would like to extend my grateful thanks and appreciation to all who supported time to time, to achieve my goals.

TABLE OF CONTENTS

List of Figures

List of Tables

Page