UNIVERSITI TEKNOLOGI MARA

PERFORMANCE OF HYDRATED LIME – POND ASH TREATED PEAT SOIL

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Thesis submitted in fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Geotechnical Engineering)

Faculty of Civil Engineering

October 2018

ABSTRACT

The economic slowdown in Malaysia has led many development projects to invade into peatlands, which is known as problematic ground. The behaviour of this ground to the loads required improvement to the soil structure in the hope that it can increase the bearing strength. This study was conducted to identify the peat soil bearing strength stabilised with hydrated lime and pond ash mixtures. The strength properties of different mixes of composition and soaking periods were also identified through laboratory tests and finite element simulations. Sixteen types of treated peat samples containing various hydrated lime and pond ash mixtures have been developed. These samples have been soaked in water for 10 soaking times ranging from 0 days to 150 days and tested for unconfined compressive strength respectively. Selected samples with good performance of strength were tested for permeability and consolidation. Further observations on the chemical content and microstructure of the treated peat were also being carried out. Based on the good mixture, the settlements of treated peat were simulated using finite element method. From this study, it is found that the treated peat with 20% pond ash with 12% hydrated lime with the longer soaking period gave the good strength. The evidence from scan electron microscope showed a good microstructure contributes to the strength. Effect of soaking is very significant to the hydrated lime-pond ash treated peat and can be prevailed from laboratory studies and finite element simulation. The scanning electron microscope shows the cementitious products have increased the pond ash-hydrated lime dosages and clogged the pore spaces. The optimal mix design resulted in maximum unconfined compressive strength contributed higher strength in 60 and 90 days soaking. The pozzolanic process blocking of the peat pores, reduces the permeability, increases the strength gain of the treated peat and decrease the compressibility of the treated peat. The analytical methods anticipate a less settlement than the finite element analyses.

ACKNOWLEDGEMENT

Firstly, I wish to thank God for giving me the opportunity to embark on my PhD and for completing this long and challenging journey successful. My gratitude and thanks go to my supervisor Dr. Kamaruzzaman Mohamed and my co-supervisor Dr. Ismacahyadi Bagus Mohamed Jais. Thank you for the support, patience and ideas in assisting me with this project. I also would like to express my gratitude to the staff of the MARA University Technology, especially Mr. Akbar, Mr. Fuad, Mr. Faiz, Mr. Hazri, Ms. Asdaarnida and all lab technician UiTM Shah Alam for providing the facilities, knowledge and assistance.

My appreciation goes to the Manager and crew members of the Jimah Energy Venture Thermal Power Plant Port Dickson, Negeri Sembilan who provided the facilities and assistance during sampling. Special thanks to my colleagues and postgraduate friends for helping me with this project.

Finally, this thesis is dedicated to the loving memory of my very dear late mother and late eldest brother for the vision and determination to educate me. Thank you to my father Haji Md. Yusof Haji Kayon, eldest sister, younger brother, my niece and nephew. This piece of victory is dedicated to all of you. Alhamdulillah.

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CHAPTER ONE
INTRODUCTION

This chapter provides the background and rationale for the study. The aim, objectives, scope and significance of the study are then addressed accordingly, followed by the outline of the thesis.

1.1 Background of Study

Southeast Asia has a land area of 4.5 million square kilometres (km^2) including, Burma, Thailand, Vietnam, Laos, Cambodia, Singapore and Peninsular Malaysia. All of these countries are known for humid climates as it receives more than 1,900 millimetres of rain per year. Although these countries experience humid climate and receive rainfall evenly throughout the year, the structure of the terrain and the type of soil that is found in Southeast Asia are disparate. As a result of this, some areas were acknowledged for volcanoes, swamps, waterlogged and agricultural areas (Capistrano and Marten, 1986). However, Leong and Chin (2000) identified that the ratios of the agricultural areas such as peatland are the largest in Southeast Asia incomparable to other regions.

Figure 1.1 shows the existence of peatlands in Southeast Asia. Seeing the potential of peat is very high in engineering, many engineers who are experts in the field of Geotechnical engineering have examined more the nature of the peat to see whether peatlands are suitable for construction (Leong and Chin, 2000). Capistrano and Marten (1986) have found that Malaysia is one of the countries which has a large peatland in Southeast Asia. According to Akol (2012), the Department of Land Resource Management and Conservation Division of Agriculture, Ministry of Agriculture, Malaysia has identified the location of peat soil in Malaysia especially in the parts of Peninsular Malaysia.