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FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING

WATER RESOURCES ENGINEERING PROGRAMME

FINAL YEAR PROJECT PROPOSAL REPORT

PROJECT TITLE

INVESTIGATING THE MECHANICAL PROPERTIES OF COCONUT FIBER REINFORCED CEMENTED SAND

(CASE STUDY: KATANGA-KATAKWI TOWN, KATAKWI DISTRICT)

BY

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This report is submitted to the department of water resources and mining engineering as a partial fulfillment for a ward of a bachelor's degree in water resources engineering at Busitema university.

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ABSTRACT

Soil improvement by insertion of cement to the soi matrix increases the strength of the soil while the addition of fibers provides an increase in ductility, reducing the post-peak loss in strength. This research paper reports the mechanical properties of unreinforced and coconut fiber-reinforced cemented sand. The research was carried out using sand, Portland cement (O.P.C-CEM1 42.5), and coconut fibers of 25mm long. Three different cement contents (3%, 6% and 9%) and three fiber contents (0.5%,1% and 1.5%) were used in this experimental program. The analysis of the results shows that an increase in cement content results in an increase in flexural strength. Fiber insertion generated an increase in strength for all the three cement concentrations. It was observed the cemented sand reinforced with 1% coconut fiber demonstrated the highest flexural and compressive strength. However, beyond the optimum fiber content, there was a reduction in strength for all the three cement concentrations. The reduction can be attributed to an entanglement of the fibers in higher compaction strengths, disrupting the formation of cementitious bonds. Results of water absorption and density are also presented below.

DECLARATION

I, KONGAI FLORENCE, hereby declare to the best of my knowledge that this project proposal is original and entirely out of my own research and has never been submitted to any other university or institution of learnig for any academic award.

Signature:…………………………………………..

Date:……../……/…………..

APPROVAL

This final research report has been submitted to the faculty of Engineering for examination with a approval of my supervisors

Main Supervisor

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DEDICATION

This report is dedicated to my beloved parents Mr. Emmanuel Emoru and Mrs. Ruth Aluka in appreciation for their selfless and unflinching support provided to me since childhood, for the spirit of hard work, courage and determination instilled in me, which attributes I have cherished with firmness and have indeed made me what I am today.

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Acronyms

CFC- Coconut Fiber Content

CC- Cement Content

SDG- Sustainable Development Goal

PDM- Parish Development Model

NDP- National Development Goal

L9- Level nine

DOE- Design of Experiments

1.0 CHAPTER ONE: INTRODUCTION

This chapter briefly provides the general overview of the entire research study giving the background of the study, problem statement, objectives of the study, scope and justification of the study.

1.1 BACKGROUND

Having developed infrastructure is one of the basic requirements of any country. Due to the rapid urbanization, there is an increasing need for soil stabilization on a global scale, which is being driven by increased development and infrastructure work. However, during the construction of these infrastructures, the safe-bearing capacity of a soil at a given site may not be sufficient to maintain the given load, making the present weak or soft soil at a specific site unsuitable for supporting the needed infrastructure like buildings, roads, dams, and other civil engineering structures (Janalizadeh Choobbasti and Soleimani Kutanaei, 2017). Various attempts have been made to improve the strength of soils using different chemical additives in combination with lime and cement. Recent trend in research works in the field of geotechnical engineering and construction materials focuses more on the search for cheaper and locally available material (Osinubi and Eberemu, 2013). Different methods, such as soil replacement, using cement, geotextiles, and fibers, can be used to increase bearing capacity, shear strength of soil and to sustain the applied load (Janalizadeh Choobbasti and Soleimani Kutanaei, 2017). Cemented soils can be found naturally, or induced artificially for the purpose of improving the bearing capacity of weak soils.(Janalizadeh Choobbasti and Soleimani Kutanaei, 2017). Cementation plays a significant role in the behavior of soils under applied loads. Adding a small amount of cement will significantly increase the maximum strength and initial stiffness. However, addition of cement to the soil results in a brittle behavior. This behavior can be reduced and controlled by the use of fibers. The use of inclusions to improve the mechanical properties of soils dates to ancient times. It has long been observed that tree roots and vegetation effectively enhance the shear strength of soil. Adding fiber to soil can provide a reinforcement mechanism by developing tensile forces which contribute to the stability of the soil-fibers composite. There is currently a great deal of interest in developing the technology for using natural fiber materials in cement composites. Natural fibers exist in reasonably large quantities all over the world and natural vegetable fibers are produced in most developing countries. The use of natural Fibers is economical as compared to synthetic fibers. Natural fibers have been used to reinforce inorganic materials for thousands of years. For example; straw for bricks, mud and poles, plaster and reeds. During this century, other fibers such as bamboo, wood cellulose fibers wool or chips bast fibers leaf fibers seed and fruits fibers have been used in cement-sand based products (Duvaut and Terrel, 2000; Ali, 2012)

Fibers may be classified as either local or man-made. The use of natural fiber as reinforcement in cement-sand matrix has been comprehensively investigated in many countries (Rehsi,1991; Atnaw et al, 2011). The main reason for the use of natural fibers is because they are abundantly available and are comparatively cheap. Coconut fiber (CF) is an interesting fiber as it has the low thermal

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