DEVELOPING A COMPRESSED ENGINEERING SOIL BLOCK STABILIZED WITH BOTTOM ASH AND PADDY HUSK ASH

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Master of Science in Materials Science

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Thesis submitted in partial fulfilment of the requirements for the degree.
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DECLARATION

I hereby declare that the current work is wholly original to me, and that no material previously submitted for a degree or diploma at another university or institution of higher learning has been included in my thesis or dissertation without appropriate acknowledgement. To the greatest extent of my understanding and belief, it also doesn't include any content that has already been published or authored by someone else, unless it's specifically recognized in the text. Additionally, I confirm that the research report's details were exclusively conducted by me under the guidance of Eng. S.P. Guluwita, a Senior Lecturer. I assure that all information contained within this research report is accurate and reliable to the best of my knowledge.

Name: K. A. D. S. N. Kumarapeli Signature: _____ Date: _____

Under my supervision, the aforementioned candidate conducted research for the master's dissertation.

Supervised by: (Senior Lecture Department of Material Science and Engineering)

Eng. S. P. Guluwita Signature: _____ Date: _____

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Abstract

Building bricks are extensively used in construction projects in Sri Lanka as well as worldwide. As the population continues to grow at a rapid pace, various types of industrial waste materials, including fly ash, bottom ash, paddy husk ash, and fuel sludge, are frequently released into the natural environment. The research study aims to develop economical, lightweight, low-water absorption, and low thermal conductivity sustainable compressed soil stabilized blocks using bottom ash, paddy husk ash, and cement. It is subsequent help of reducing environmental impact through the use of industrial waste as a stabilizer, resulting in an eco-friendly product. The study focused on utilizing agricultural waste materials like rice husk ash and readily available bottom ash from the Norochcholai power plant to enhance the strength characteristics of soil. The research involved mixing bottom ash, paddy husk ash, and a constant 3% cement content to stabilize the soil, with varying percentages of paddy husk ash and bottom ash by dry weight of soil. A total of 450 sample blocks were produced based on the proposed mix design. These blocks underwent several tests, including compressive strength, water absorption, and dry density tests, to determine the optimal ratio. The results indicated that a soil-stabilized block with a weight percentage of 12%,20% and 3% bottom ash to paddy husk ash and cement respectively by weight of dry soil, exhibited a maximum compressive strength of 4.63 N/mm^2, a density of 1.756 g/cm^3, and a water absorption rate of 15.11% after 28 days of curing. As per the study of the reliability of the manufacturing soil stabilized soil blocks for the industry, the final results suggest robust evidence for the reliability of Group 2-A4 mix proportion (12% bottom ash, 20% paddy husk ash, 3% cement by weight of dry soil), which is a stronger group to recommend for the future generation. Moreover, it is a credible, eco-friendly, and sustainable product for the industry.

Keywords *– stabilised soil blocks, with bottom ash, paddy husk ash*

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