MUD CONCRETE PAVING BLOCK FOR PEDESTRIAN PAVEMENTS IN TROPICAL CLIMATIC CONDITIONS

MASTER OF SCIENCE

IN

CONSTRUCTION PROJECT MANAGEMENT

G.H.Galabada

Department of Civil Engineering

University of Moratuwa

Sri Lanka

April 2016

MUD CONCRETE PAVING BLOCK FOR PEDESTRIAN PAVEMENTS IN TROPICAL CLIMATIC CONDITIONS

By

G.H.Galabada

Supervised by

Dr. R.U.Halwatura

The dissertation was submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfilment of the requirement of the Degree of Master of Science.

Department of Civil Engineering

University of Moratuwa

Sri Lanka

April 2016

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

Signature:  Date:

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

Signature of the supervisor: Date

Abstract

The road network of Sri Lanka has been developing rapidly in recent years. Parallel to the expansion of the road network, most of the urban areas are also being upgraded with township development. Some of these developments follow a proper master plan, while there are others which do not pay attention to proper strategies. The attention paid for sustainable, law cost materials has been minimal. Hence, these unplanned developments are causing severe environmental issues such as global warming, heat island effect, lowering the ground water table, losing the natural appearance etc. Therefore, it is essential to invent new sustainable and low cost materials to counter balance the stated issues.

This research is focused on developing a paving block using mud concrete as a replacement for existing artificial paving materials used in urban walkways along the road network and within recreation areas. The main aim of this research is to produce a mud concrete paving block that can withstand the required strength according to the SLS standard, and which has a wet compressive strength of 15 N/mm^2. The suitability of the developed block is then evaluated for their thermal performance and skid resistance. The current research status is identified through a literature survey. An online questionnaire survey is carried out to identify public perceptions on pedestrian pavements and paving materials used in them. A field survey was carried out among the paving block manufacturers to identify the cement percentage used by them. This was then used to develop the mix-designs for the laboratory experimental work.

In the laboratory, blocks are cast in three stages and are tested for four variables, viz: cement content, soil composition, moisture content and vibration time. Temperature measurements are taken of different pavement systems to evaluate their performance. The skid resistance of the block surfaces is measured using the Pendulum Skid Resistance Tester. Results have proven that the mud concrete paving block is a good alternative to pedestrian walkways while reducing thermal impact on the surrounding environment.

Key words: *pedestrian pavements, paving materials, user comfort, heat island effect, sustainability*

Acknowledgement

First, I am immensely grateful to my research supervisor, Dr. R.U. Halwatura of the Department of Civil Engineering for his invaluable guidance and support throughout the research period.

The support given by Prof. S.M.A Nanayakkara (Head, Department of Civil Engineering), Dr. L.L.Ekanayake (Head, Division of Construction Management and Research Coordinator, Department of Civil Engineering) is greatly appreciated.

I wish to extend my heartfelt gratitude to Dr.(Mrs) W.B.M. Thoradeniya (Senior Lecturer, ITUM) for her invaluable encouragement and guidance.

The support given by Dr. R.U. Halwatura's group of Research Assistants is also greatly appreciated.

I also extend my kind appreciation to all the academic and non- academic staff of the Department of Civil Engineering, and to everyone who helped me in completing this research successfully.

Finally, I would like to thank my husband for his unwavering support throughout my studies, and my three daughters for uncomplainingly sacrificing some of their entitled time with me.

Table of Contents

List of Tables

List of Figures

List of Annexes