

# DESIGN OF RIGID PAVEMENT JOINT SPACING FOR LOW VOLUME ROADS

A.M.A.N.Karunaratne

(09/8088)



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Degree of Master of Science

Department of Civil Engineering

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This Thesis Submitted in Partial Fulfillment of the Requirement for the Degree of Master of  
Science

Department of Civil Engineering

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## DECLARATION

I, A.M.A.N. Karunarathne hereby declare that the content of this thesis is the output of original research work carried out over a period of 15 months at the Department of Civil Engineering, University of Moratuwa, Sri Lanka. Whenever others' work is included in this thesis, it is appropriately acknowledged as a reference.



Date: 22-01-11.....

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## *UOM Verified Signature*

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Dr. W.K. Mampearachchi

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## ABSTRACT

During the last decade, the government has given great emphasis on development of the road sector. The government also promoted the construction of concrete roads in rural areas. The major reason for this is that the rural communities can manage the construction of concrete roads as it does not require special equipments and skilled work force. Therefore the local contractors within the areas can handle the projects with the help of villagers. However, recently constructed concrete roads are having lot of defects due to poor construction.

Inadequate knowledge on concrete as a road paving material is the major reason for poor construction of concrete roads in many rural areas. Concrete is a stiff material compared to the asphalt or macadam. The higher stiffness has both benefits and drawbacks. Concrete changes the volume with the thermal effect from surrounding. Effective precautions should be taken to avoid the destruction from this volume reduction.



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This research study was based on the simulation of volume changes and corresponding stress changes in concrete with thermal effects from surrounding.

Daily variation of temperature in a slab was integrated in a finite element model. The finite element model was verified using a prototype slab. The verified model used to obtain the corresponding length change of the slab panel.

Length change due to shrinkage of concrete pavement was obtained using the information given in BS 8110.

Load transfer through the propagated crack under pre-defined weaker plane was investigated in this study. The load transfer efficiency (LTE) with respect to crack opening was measured to develop a relationship between LTE and crack width. Maximum crack opening to be maintained to satisfy the specified load transfer efficiency was established based on the experimental results.

The suitable joint spacing was figure out by the volume reduction of the concrete and load transfer efficiency requirement as the outcome of the research.

## DEDICATION

*To All Who Guide Me to the Success*



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The support given by Prof.M.T.R.Jayasinghe (Head, Department of Civil Engineering), and Prof.J.M.S.JBandara (Research Coordinator, Department of Civil Engineering) are acknowledged gratefully. I also like to appreciate the guidance from Dr. H.P. Sooriyaarachchi (Senior Lecturer, Faculty of Engineering, University of Ruhuna) as a member of my progress review panel. I owe a very special gratitude to Mr.W.P.H.Gunaratne (lecturer in Transportation Engineering division)for his valuable advises and immeasurable support. I thank all the other lecturers for the positive attitude they adopted in promoting research at Civil Engineering Department.

I specially thank Mr. B.S.S.S. Dareeju and all the research students at the Transportation Engineering Division of the Department of Civil Engineering, University of Moratuwa for giving me the support throughout the research.

I would like to take this opportunity to extend my heartfelt appreciation to all the academic and non-academic staff of the University of Moratuwa, who has assisted me in numerous occasions. Furthermore I would like to put on record the civil engineering students in '07 batch in University of Moratuwa for their contributions in numerous ways.

*A.M.A.N.Karunaratne*

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