

ANALYSIS OF FLEXIBLE PAVEMENT SECTIONS USING
A MECHANISTIC - EMPIRICAL METHOD

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Dissertation submitted in partial fulfillment of the requirements for the degree Master
of Engineering

Department of Civil Engineering

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September 2014

DECLARATION OF THE CANDIDATE AND THE SUPERVISOR

I declare that this is my own work and this dissertation 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.

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ABSTRACT

Determining of the pavement life under given structural, environmental, and traffic conditions is considered as one of the main objectives in the pavement design and analysis. Studies in pavement engineering have shown that the design procedure for highway pavement is either empirical or mechanistic. An empirical approach is one which is based on the results of experiments or experience. Existing design methods for flexible pavements include empirical methods, limiting shear failure methods, limiting deflection methods, regression methods, and mechanistic empirical methods.

The goal of the Mechanistic-Empirical Pavement Design is to identify the physical causes of stresses in pavement structures and calibrate them with observed pavement performance. These two elements define this approach to pavement design: the focus on physical causes is the “mechanistic” part, and using observed performance to determine relationships is the “empirical” part.

In this study an attempt was made to study the influence on local road sections with mechanistic empirical methods. Frequently used design references in local road designs are; (1) guide to the structural design of roads under Sri Lankan conditions issued by Road Development Authority (RDA), (2) American Association of State Highway Transportation Officials method (AASHTO method) and (3) guide to the structural design of bitumen-surfaced roads in tropical and sub-tropical countries method (Overseas Road Note 31). Sometimes, design thicknesses chosen based on design guidelines are subjected to alter with the non availability of pavement construction materials in an economical distance to a construction project.

The road section for the study was selected from the Northern road rehabilitation project and there were several alternative proposals for the road section due to non availability of subbase material. The design alternatives were analyzed using the Mechanistic design software KENLAYER which was verified based on an experimental study conducted in a previous study.

Damage analysis was performed using KENLAYER software. Damage ratio was estimated for the pavement design alternatives and it was found that, the pavement sections designed for a design period of ten years, the sections designed using Overseas Road Note 31 methods needs earlier rehabilitation followed by AASHTO which will be failed at higher traffic category. This was identified as an indicative factor for comparing the efficiency and the performance of the design alternatives. Mechanistic tool used in this study was able to identify critical layers which will fail before the expected design life. The mechanistic tool used in this study was able to identify the best suitable pavement design composition.

Key words: Mechanistic – Empirical method — Damage analysis — KENLAYER

DEDICATION

To All Who guide me to the Success.



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ACKNOWLEDGEMENTS

It is with great pleasure and satisfaction, I present this research report for the partial fulfillment of requirements of the Degree of Master of Engineering in Highway and Traffic Engineering in Faculty of Engineering, University of Moratuwa.

To begin with my thanks, I first wish to thank the Transport Engineering Division of Department of Civil Engineering, Faculty of Engineering, University of Moratuwa for selecting me to follow this master's course in highway and traffic engineering. I consider it as a great honour to me for having the chance of studying for my master's degree in a university with an excellent name for engineering education.

I do thank Central Engineering Consultancy Bureau my employer, a statutory body under the Ministry of Highways for the sponsorship I received to follow this course as well as for releasing me to study for this degree on part time basis.

Next, I wish to thank Dr. W.K.Mampearachchi for his kind guidance and continuous support throughout this research. The knowledge I gained from him as my supervisor of research and as a teacher of Highway Engineering modules was also invaluable and greatly helped me to be shaped into an academically sound Design Engineer in my work place.

I do thank Eng. P.C Jinasena, Additional General Manager, (Highways and Airport Designs Division) and Eng (Mr). W.A.D.D Nandakumara, Deputy General Manager, Central Engineering Consultancy who greatly helped me in understanding the concepts of pavement design in my work place.

Last but not least I wish to thank my parents, my loving daughter, husband and parents of my husband, who are the divine strength and courage behind all the successes in my life.

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LIST OF ABBREVIATIONS

Abbreviation	Description
ORN	Overseas Road Note
RDA	Road Development Authority
TRRL	Transport and Road Research Laboratory
BS	Bitumen surface
GB	Granular road Base
GS	Granular sub base
AASHTO	American Association of State Highway and Transportation Officials
mesa	million equivalent standard axels
ESAL	Equivalent Standard Axels



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