ANALYSIS OF FLEXIBLE PAVEMENT SECTIONS USING A MECHANISTIC - EMPIRICAL METHOD

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DECLARATION OF THE CANDIDATE AND THE SUPERVISOR

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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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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