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**USE OF CIRCLY (AUSTROADS MECHANISTIC
DESIGN SOFTWARE) FOR OVERLAY DESIGNS IN SRI
LANKA**

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MEng in Highway & Traffic Engineering

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree
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DECLARATION

I declare that this is my own work and this thesis/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. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:

Date: 20/07/2025

The above candidate has carried out research for the Masters thesis/dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Prof. W.K.Mampearachchi

Signature of the Supervisor:

Date: 04/09/2025

ABSTRACT

Road pavement design has been carried out complying with empirical methods which are not based on stress strain relationships. But the mechanistic methods which are based on stress strain relationships is the method that is complying with engineering fundamentals.

CIRCLY is a pavement design software based on mechanistic approach and calculate damage factors after the design period for a given traffic load distribution. The Austroads flexible pavement design method uses CIRCLY to calculate load-induced strains and deflections in model pavements. CIRCLY is an integral component of the AUSTROADS Australian Pavement Design Guide. Considering about the data required to carry out the design of road pavement it was recognized that Flexural Modulus, Poisson's Ratio, Volume of Binder in Asphalt Mix (VB %), Shift factor between laboratory and in-service fatigue lives (SF) ,Performance Exponent(b), as material properties while traffic load Distribution (TLD) data and Reliability (R) required to calculate loading conditions.

Shift factor (SF), performance exponent (b) and reliability(R) are the factors that have been recognized as factors varied upon the environmental factors in many researches. However, Reliability is considered as a kind of safety factor in AUSTROADS and lower the reliability, thinner the Pavement layers and lower the capacity pavement structure. This may lead to lower the durability. In AUSTROADS Performance exponent has been taken by performing series of tests for different materials and Conditions. Under this conditions, main consideration paid for finding Suitable Shift factor for Sri Lankan conditions. Conditions of Empirically designed roads are taken in to consideration in finding the variation of pavement capacity while varying the Shift factor, reliability and Damage Exponent. Suitable shift factor value has been derived in the research while observing the behavior of Reliability and damage Exponent.

Key Words: Circly, Austroads, Mechanistic, Traffic load Distribution (TLD), Pavement design, Shift Factor, Reliability, Damage Exponent.

DEDICATION

Each and every Individual who dedicate their lives in advancement of Highway
Engineering

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LIST OF ABBREVIATIONS

Abbreviation	Description
AASHTO	American Association of State Highway and Transportation Officials
ABC	Aggregate Base Course
AC	Asphalt Concrete
CBR	California Bearing Ratio
CDF	Cumulative Damage Ratio
CNSA	Cumulative Number of Standard Axles
ESAL	Equivalent Standard Axle Load
FWD	Falling Weight Deflectometer
M-E	Mechanistic-Empirical
RF	Reliability Factor
SAR	Standard Axle Repetitions
SF	Shift Factor
TRL ORN 31	Transport Research Laboratory Overseas Road Note 31
TSD	Traffic Speed Deflectometer