SIMPLIFIED APPROACH TO ESTIMATE OVERLAY THICKNESS FOR PRELIMINARY PAVEMENT DESIGN USING AASHTO (1993) METHOD

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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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ABSTRACT

In the past, Benkelman beam test is used as a nondestructive test (NDT) to investigate pavements and to do overlay designs. The main advantage of the Benkelman beam method is that using this method, an overlay design can be done without carrying out detailed investigation of the existing pavement. This is possible because, design deflections obtained from Benkelman beam test are empirically related to the overlay thickness in the Benkelman beam overlay design guideline. However, this design method has become obsolete and the field work of this test is very time consuming and labour-intensive. Thus the Benkelman beam test is not widely used at present.

At present, Falling Weight Deflectometer (FWD) test is considered as the modern nondestructive testing (NDT) method for road pavements. To do a pavement overlay design with FWD data, it is required to follow AASHTO (1993) method. To do an overlay design according to AASHTO (1993) method, resilient modulus (M_R) of subgrade and effective structural number of the pavement (SN_{eff}) is required. Information of subgrade conditions is required to determine the resilient modulus of subgrade (M_R). Also thickness of the pavement layers is required to determine the effective structural number of the pavement (SN_{eff}). This means, to do an overlay design with FWD data, using AASHTO (1993) method, a detailed pavement investigation is required. During the pavement investigations, existing pavement will be damaged to some extent.

Since pavement overlay designs can be done without a detailed pavement investigation using the Benkelman beam test, there is a motivation to do pavement overlay designs also using FWD test without a detailed pavement investigation. Hence, this research is conducted to formulate a simplified approach to estimate overlay thickness for preliminary overlay designs using AASHTO (1993) method using FWD data only. The developed method is called "Simplified Method" to distinguish it from AASHTO (1993) method.

FWD data from four road sections are used to develop the Simplified method. In this method, M_R of subgrade is determined from Surface Modulus and SN_{eff} of existing pavement is determined from Hoffman's method. The overlay thickness calculated from the Simplified method and the AASHTO (1993) method is compared with the overlay thicknesses given in the design reports.

The outcome of the research enables the Engineer to do a preliminary pavement design during the feasibility stage of a project by using only FWD data, without carrying out a detailed pavement investigation. Thus this method will help to avoid damaging the existing pavements and save time and money for pavement investigations.

Keywords: FWD-AASHTO-Resilient Modulus-Effective Structural Number

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LIST OF ABBREVIATIONS

Abbreviation	Description
A001	Colombo-Kandy road
A011	Maradankadawela Habarana Tirikkondiadimadu road
B133	Ganewalpola – Dachchahalmillewa road
B212	Kekirawa – Ganewalpola road
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
CBR	California Bearing Ratio test
COV	Coefficient of variation
FWD	Falling Weight Deflectometer
iRoad	Integrated Road Investment Program
M_R	Subgrade resilient modulus
psi	pounds per square inch
RDA	Road Development Authority
SM	Surface Modulus
SN_{eff}	Effective structural number of the pavement
SN_f	Required structural number to carry future traffic
SSV	Soil Support Value
ORN 31	Overseas Road Note 31