

STUDY ON COMPARATIVE FLEXIBLE PAVEMENT THICKNESS ANALYSIS USING VARIOUS DESIGN METHOD

Gunalan Vasudevan¹, Hidayu Murni Bt Abu hussain²

¹Faculty of Engineering and Built Environment, Lecturer, Tunku Abdul Rahman University College, Malaysia

²Department Highway, Engineer JESS Sdn. Bhd, Malaysia

Abstract

Recently, there is a lot of variability in guide to design a pavement. Although all kinds method available, but still pavement suffers damage caused by unsuitable thickness. It is critical to determine the most appropriate pavement thickness for a given traffic level and subgrade condition. To overcome the problems, there is a need to study the comparative pavement thickness analysis using various pavement design methods so that it will be cost effective and long lasting. The input parameters in flexible pavement design are identified and have been used in obtaining different pavement layer thickness by conducting various pavement design method, that is Arahan Teknik (Jalan) 3/83 Jabatan Kerja Raya (JKR), AASHTO Method and Asphalt Institute Thickness Design Program (SW-1). Finding from this study indicate that thickness from Arahan Teknik (Jalan) 3/83 Jabatan Kerja Raya (JKR) gave better results than the others because it produced more thinner flexible pavement layer compared to the two other design method. In terms of cost, it will be more cost effective since the cost of material can be reduced.

Keywords: Flexible Pavement, AASHTO and Asphalt Institute Thickness Design

1. INTRODUCTION

The purpose of a pavement is to carry traffic safely, conveniently and economically over its extended life. The pavement must provide smooth riding quality with adequate skid resistance and have adequate thickness to ensure that traffic loads are distributed over an area so that the stresses and strains at all levels in the pavement and subgrade are within the capabilities of the materials at each level. The performance of the pavement therefore related to its ability to serve traffic over a period of time. From the day it is opened to traffic, a pavement will suffer progressive structural deterioration. It is possible that the pavement may not fulfill its intended function of carrying a projected amount of traffic during its design life, because the degree of deterioration is such that reconstruction or major structural repair is necessitated before the end of the design life. There are two main types of failure, functional and structural, associated with pavement deterioration. Functional failure is that wherein the pavement is unable to carry traffic without causing discomfort to the road users. This failure depends primarily upon the degree of surface roughness. Structural failure, on the other hand, indicates a breakdown of one or more component making it incapable of sustaining the loads imposed upon its surface. In flexible pavements, this failure may result from bituminous surface fatigue, consolidation, settlement, and shear developing in the subgrade or inadequate performance of the sub, road base, and surface, as a result of inadequate pavement thickness.

2. LITERATURE REVIEW

2.1 Flexible Pavement

Flexible pavements are those which are surfaced with bituminous (or asphalt) materials. These types of pavements are called "flexible" since the total pavement structure "bends" or "deflects" due to traffic loads. A flexible pavement structure is generally composed of several layers of materials which can accommodate this "flexing". Flexible pavements comprise more than 90 percent of our paved roads.

There are many different types of flexible pavements. It covers three of the more common types of Hot Mix Asphalt (HMA) mix types commonly used. Other flexible pavements such as bituminous surface treatments (BSTs) are considered by most agencies to be a form of maintenance and are thus covered under maintenance and rehabilitation. HMA mix types differ from each other mainly in maximum aggregate size, aggregate gradation and asphalt binder content or type. Guides are available on dense-graded HMA in most flexible pavement sections because it is the most common HMA pavement material. (HAPI, 2002). components makes it incapable of sustaining the loads imposed upon its surface. In flexible pavements, this failure may result from bituminous surface fatigue, consolidation, settlement, and shear developing in the subgrade or inadequate performance of the sub, road base, and surface, as a result of inadequate pavement thickness.

Study On Comparative Flexible Pavement Thickness Analysis

**Sandra Erkens, Xueyan Liu, Kumar
Anupam, Tan Yiqiu**



Study On Comparative Flexible Pavement Thickness Analysis:

Application of Multi-Criteria Decision Analysis in Environmental and Civil Engineering Dilber Uzun Ozsahin, Hüseyin Gökçekuş, Berna Uzun, James LaMoreaux, 2021-02-28 The use of a multi criteria decision making theory was first studied in the 1970s Its application in civil and environmental engineering is a new approach which can be enormously helpful for manufacturing companies students managers engineers etc The purpose of this book is to provide a resource for students and researchers that includes current application of a multi criteria decision making theory in various fields such as environment healthcare and engineering In addition practical application are shown for students manually In real life problems there are many critical parameters criteria that can directly or indirectly affect the consequences of different decisions Application of a multi criteria decision making theory is basically the use of computational methods that incorporate several criteria and order of preference in evaluating and selecting the best option among many alternatives based on the desired outcome

GeoPractices Towards Sustainable Infrastructure, Volume 2 V. Padmavathi, Sireesh Saride, Hari Prasad Chennarapu, 2025-06-15 This book discusses the proceedings of the National Conference on GeoPractices for Sustainable Infrastructure GeoPractices 2024 focusing on the sustainable aspects of geotechnical engineering practices particularly in highway construction and related ground improvement techniques It covers topics such as alternative and sustainable construction materials processes and design considerations for pavement construction and enhancing weak soils The publication highlights advanced practices and developments including the use of geosynthetics bioremediation and incorporating industrial byproducts to lower carbon footprint preserve natural resources and minimize waste generation The book is intended to be a valuable resource for emerging researchers and industry professionals interested in advancing sustainable infrastructure

Bearing Capacity of Roads, Railways and Airfields Andreas Loizos, Imad Al-Qadi, Tom Scarpas, 2017-07-20 Bearing Capacity of Roads Railways and Airfields includes the contributions to the 10th International Conference on the Bearing Capacity of Roads Railways and Airfields BCRRA 2017 28 30 June 2017 Athens Greece The papers cover aspects related to materials laboratory testing design construction maintenance and management systems of transport infrastructure and focus on roads railways and airfields Additional aspects that concern new materials and characterization alternative rehabilitation techniques technological advances as well as pavement and railway track substructure sustainability are included The contributions discuss new concepts and innovative solutions and are concentrated but not limited on the following topics Unbound aggregate materials and soil properties Bound materials characteristics mechanical properties and testing Effect of traffic loading In situ measurements techniques and monitoring Structural evaluation Pavement serviceability condition Rehabilitation and maintenance issues Geophysical assessment Stabilization and reinforcement Performance modeling Environmental challenges Life cycle assessment and sustainability Bearing Capacity of Roads Railways and Airfields is essential reading for academics and professionals involved or interested in transport

infrastructure systems in particular roads railways and airfields

Green and Intelligent Technologies for Sustainable and Smart Asphalt Pavements Xueyan Liu, Kumar Anupam, Sandra Erkens, Lijun Sun, Jianming Ling, 2021-12-24 Green and Intelligent Technologies for Sustainable and Smart Asphalt Pavements contains 124 papers from 14 different countries which were presented at the 5th International Symposium on Frontiers of Road and Airport Engineering IFRAE 2021 Delft the Netherlands 12-14 July 2021 The contributions focus on research in the areas of Circular Sustainable and Smart Airport and Highway Pavement and collects the state of the art and state of practice areas of long life and circular materials for sustainable cost effective smart airport and highway pavement design and construction The main areas covered by the book include Green and sustainable pavement materials Recycling technology Warm cold mix asphalt materials Functional pavement design Self healing pavement materials Eco efficiency pavement materials Pavement preservation maintenance and rehabilitation Smart pavement materials and structures Safety technology for smart roads Pavement monitoring and big data analysis Role of transportation engineering in future pavements Green and Intelligent Technologies for Sustainable and Smart Asphalt Pavements aims at researchers practitioners and administrators interested in new materials and innovative technologies for achieving sustainable and renewable pavement materials and design methods and for those involved or working in the broader field of pavement engineering

Transportation Research Dharamveer Singh, Avijit Maji, Omkar Karmarkar, Monik Gupta, Nagendra Rao Velaga, Solomon Debbarma, 2023-12-18 This book is a collection of selected research papers from the 14th conference of the Transportation Planning and Implementation Methodologies for Developing Countries TPMDC It covers the broad area of transportation planning and policy pavement design and engineering emerging technologies in transportation traffic management operations and safety and sustainable mobility in transportation The book aims to provide deeper understanding of the transportation issues solutions and learnings from the implemented solutions This book will be of best interest for academicians researchers policy makers and practitioners

Research in Airport Pavements National Research Council (U.S.). Transportation Research Board, Georgia Institute of Technology, 1978 The volume of the proceedings of a FAA sponsored conference contains material on pavement management systems pavement design mix design quality control and pavement evaluation and performance

Sustainable Materials Arvind Kumar Agnihotri, Krishna R. Reddy, Ajay Bansal, 2024-06-24 This book contains peer reviewed and selected papers presented during the International Conference on Environmental Geotechnology Recycled Waste Materials and Sustainable Engineering EGRWSE 2023 held at NIT Jalandhar It discusses the recent innovations trends concerns practical challenges encountered and the solutions adopted in waste management and engineering geotechnical and geoenvironmental engineering infrastructure engineering and sustainable engineering This book can serve as a useful resource for researchers educators policymakers and professionals working in the field of civil engineering chemical engineering environmental sciences and public policy

Functional Pavement Design Sandra Erkens, Xueyan Liu, Kumar Anupam, Tan Yiqiu, 2016-10-14 Functional

Pavement Design is a collection of 186 papers from 27 different countries which were presented at the 4th Chinese European Workshops CEW on Functional Pavement Design Delft the Netherlands 29 June 1 July 2016 The focus of the CEW series is on field tests laboratory test methods and advanced analysis techniques and cover analysis material development and production experimental characterization design and construction of pavements The main areas covered by the book include Flexible pavements Pavement and bitumen Pavement performance and LCCA Pavement structures Pavements and environment Pavements and innovation Rigid pavements Safety Traffic engineering Functional Pavement Design is for contributing to the establishment of a new generation of pavement design methodologies in which rational mechanics principles advanced constitutive models and advanced material characterization techniques shall constitute the backbone of the design process The book will be much of interest to professionals and academics in pavement engineering and related disciplines

Highway Research in Progress, 1967 *Rigid and Flexible Pavement Design and Rehabilitation* National Research Council (U.S.). Transportation Research Board, 1993 **World Survey of Current Research and Development on Roads and Road Transport**, 1968 *Pavement Design and Analysis*, 1995 Papers presented at the 1995 TRB Annual Meeting **Cement and Concrete Reference Book**, 1925 **Index to Publications** National Research Council (U. S.). Highway Research Board, 1973 *Pavement Analysis, Design, Rehabilitation, and Environmental Factors, 1991* National Research Council (U.S.). Transportation Research Board, 1991 *Flexible Pavement Design -- Research and Development 1958, 1959* **Index of Publications** National Research Council (U.S.). Highway Research Board, 1969

Transportation Research Record, 1996 **Government Reports Announcements**, 1973 **HRIS Abstracts** National Research Council (U.S.). Highway Research Information Service, 1989

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