Maintenance and Rehabilitation of Pavements and Technological Control

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Edited by

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Preface

The sustainable maintenance and rehabilitation of pavements is becoming a key challenge in many countries in 21st century. It is well known that road and airfield pavement is the backbone of the economic prosperity and public welfare. But, the sustainability challenges pavement builders and managers to respond creatively to new and dynamic problems of rehabilitating and maintaining pavements in the most environmentally friendly manner by lowering energy cost, reducing traffic noise, and minimizing air and water pollution.

With sustainability as the main theme the **MAIREPAV5** (**MAI**ntenance and **RE**habilitation of **PAV**ements and Technological Control) conference was organized at the Canyons Resort in Park City, Utah, USA by the University of Iowa, from August 8-10, 2007. This is the **5**th International Conference in the series of conferences organized to allow researchers, government agencies, consultants and contractors to exchange technological advancements and innovations of building and maintaining longer-lasting road and airfield pavement. The first conference was held in São Paulo, Brazil by Mackenzie University in 1999, the second in Auburn, USA by the University of Mississippi in 2001, the third in Guimarães, Portugal by University of Minho in 2003, and the fourth in Belfast, Northern Ireland by the University of Ulster in 2005.

This book consists of papers presented at the MAIREPAV5 conference. The book includes two keynote papers on FHWA pavement and materials program and importance of good construction on reducing maintenance costs and eighty-eight peer-reviewed papers. Each paper was reviewed by at least two experts from the International Organizing and Scientific Committee. The final revised manuscripts were then reviewed by the editors to ensure compliance with the recommendations and suggestion made by the reviewers. The book is organized into fifteen sections based on the order of the technical sessions presented at the conference: asphalt pavement materials, concrete pavement materials, pavement construction, asphalt pavement performance modeling, concrete pavement performance modeling, pavement economic analysis, asphalt pavement rehabilitation, concrete pavement rehabilitation and recycling, pavement evaluation, asphalt pavement recycling I, pavement noise and safety, pavement management, asphalt pavement recycling II, sustainable pavement materials, and pavement preservation.

We would like to recognize the co-sponsors of MAIREPAV5: International Society for Maintenance and Rehabilitation of Transportation Infrastructure (iSMARTi), Federal Highway Administration (FHWA), Transportation and Development Institute (T&DI) of American Society of Civil Engineers (ASCE), Transportation Research Board (TRB), Korean Society of Road Engineers (KSRE), and Public Policy Center (PPC) and Civil & Environmental Engineering Department of the University of Iowa. We would like to record our indebtedness to distinguished members of International Organizing and Scientific Committee who have peer-reviewed papers and guided us to the success of this conference. Finally, we would like to thank authors who convened in Park City, Utah from all over the world to share their knowledge and experiences in building and maintaining pavements and their invaluable contributions to this book.

It was our honor and privilege to host MAIREPAV5 and edit this book.

Hosin "David" Lee / M. Asghar Bhatti

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EVALUATION OF THE VISCO-ELASTIC PROPERTIES IN ASPHALT RUBBER AND CONVENTIONAL MIXES

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Abstract: Flexible pavements are subjected to a set of degradations on the pavement surface, such as cracks and other specific types of distress which arise from traffic and temperature variations and which are responsible for the users' unsafety and discomfort. The occurrence of temperature variations in the pavement leads to a severe aggravation of the reflective cracking phenomenon what implies a premature distress of the overlays. In this way, a theoretical study about the influence of temperature variation in the reflective cracking overlay behaviour was performed. To this end, a thermo-mechanical characterization of bituminous materials was made through a set of tests performed with an asphalt rubber mix and a conventional mix. It is intended to study the relaxation behaviour for four different temperature cases, 25°C, 15°C, 5°C and -5°C, which is a range of temperature variations similar to those that occur in the pavements located in the Northeast of Portugal. This paper presents a study in which the viscoelastic properties of asphalt rubber and conventional mixes, related with long-time loading and thermal loading, were determined through static relaxation tests using different test configurations. It also describes the material used, the test configurations applied to evaluate the viscoelastic properties and it finally establishes a comparison between the two mixes studied.

INTRODUCTION

The study of the influence of temperature variations in the behaviour of bituminous mixes requires a simulation of the relaxation effect subjected to long-time loading, such as thermal shrinkage associated to temperature variations (Minhoto et al, 2005).
For that purpose, a set of tests was performed in bituminous mixes samples to obtain relaxation capability evaluation, expressed by relaxation properties estimated for a set of temperatures. A constant strain was applied to a sample during a loading time under constant temperature conditions (Figure 1).

The definition of relaxation models must be developed for its integration in finite elements models used for calculate stress and strain states. The establishment of these models is based on the adjustment of representative curves of the experimental results to the generalized expressions which describe this type of behaviour (Minhoto et al, 2005).