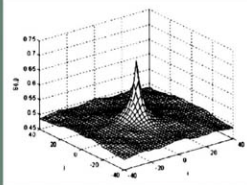
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Asphalt Concrete

Simulation, Modeling, and Experimental Characterization





Edited by
Eyad Masad
Vassilis P. Panoskaltsis
Linbing Wang

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ASPHALT CONCRETE

SIMULATION, MODELING, AND EXPERIMENTAL CHARACTERIZATION

PROCEEDINGS OF THE R. LYTTON SYMPOSIUM ON MECHANICS OF FLEXIBLE PAVEMENTS

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Preface

This special publication includes papers on simulation, modeling and experimental characterization of asphalt concrete. A number of papers report on micromechanical finite element analysis of asphalt concrete with the purpose of establishing the linkage between the properties of asphalt concrete constituents, microstructure distribution and macroscopic properties and response. In these micromechanical models, asphalt concrete constituents are modeled using elastic, viscoelastic, and/or plastic properties. Also, the discrete element method was used to analyze the micromechanical behavior of asphalt concrete under different loading conditions. A number of papers report on the development and numerical implementation of elasto-visco-plastic constitutive models that address the cyclic response, anisotropic behavior, and permanent deformation of asphalt concrete. Finite element results are also presented in these papers to demonstrate the efficacy of the models in predicting permanent deformation in asphalt pavements. Fatigue behavior of asphalt concrete is addressed in this special publication through the development of a calibrated mechanistic approach that includes the effect of aging. This approach was used to analyze the fatigue life of different asphalt concrete mixtures. On a closely related subject, three papers focus on the mathematical representation of viscoelastic properties of asphalt concrete at a wide range of temperatures and frequencies, and on experimental characterization of healing. Characterization of moisture damage is addressed in this volume through the development of a test protocol that accounts for the interaction of repeated loading with moisture. One of the papers deals with the sensitivity of low temperature cracking models to changes in the coefficient of thermal contraction. Finally, the last paper models the response of asphalt pavements to a slow moving truck while taken into consideration the time-dependent behavior of asphalt concrete, and the non-uniform stress distribution at the tire-pavement interface.

Each paper published in this ASCE Geotechnical Special Publication (GSP) was evaluated by peer reviewers and the editors. The papers that received at least one positive review were sent to the authors to address the review comments. The authors of the papers published here addressed all of the reviewers' comments to the satisfaction of the editors. The ASCE Geo-Institute Pavements Committee acknowledges with appreciation the reviewers' dedication and contribution of their time and effort.

The papers found in this special publication were presented during the two-day R. Lytton Symposium on Mechanics of Flexible Pavements, which was organized as part of the 2005 Joint ASME/ASCE/SES Conference on Mechanics and Materials in Baton Rouge-Louisiana on June 1-3, 2005. The symposium was sponsored by the Inelastic Committee of the Engineering Mechanics Division of ASCE and the

Pavements Committee of the ASCE Geo-Institute. Dr. Robert L. Lytton gave the symposium opening address on the role of mechanics in reducing variability in material characterization and performance prediction. The presentation of Dr. Lytton was followed by a discussion among the symposium participants on the applications of mechanics principles in asphalt pavements.

The editors of this volume would like to thank the Board of Governors of the Geo-Institute for their approval of the symposium and this special publication.

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August 10, 2005

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