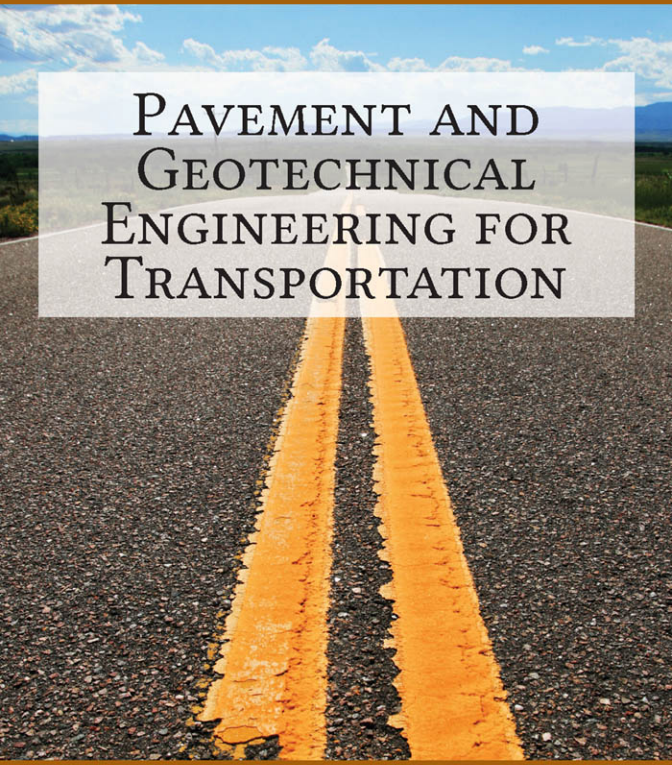
GEOTECHNICAL PRACTICE PUBLICATION NO. 8

# Pavement and Geotechnical Engineering for Transportation



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*and Zhongjie Zhang, Ph.D.*

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# PAVEMENT AND GEOTECHNICAL ENGINEERING FOR TRANSPORTATION

PROCEEDINGS OF SESSIONS OF THE FIRST INTERNATIONAL SYMPOSIUM ON PAVEMENT AND GEOTECHNICAL ENGINEERING FOR TRANSPORTATION INFRASTRUCTURE

June 5–7, 2011
Nanchang, Jiangxi Province, China

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Nanchang Hangkong University
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The Geo-Institute of the American Society of Civil Engineers

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# Preface

*Pavement and Geotechnical Engineering for Transportation* selects 20 papers that represent the latest developments in the application of soil, rock, and paving materials to the study and application of geomechanics and transportation geotechnology.

Many of the selected papers were presented at the 1st International Symposium on Pavement and Geotechnical Engineering for Transportation Infrastructure sponsored by the Nanchang Hangkong University and the International Association of Chinese Infrastructure Professionals (IACIP) in co-operation with ASCE, which occurred from June 5–7, 2011 in Nanchang, Jiangxi Province, China. The papers were selected based on their relevance to the geotechnical and transportation geotechnology.

Presented within the *Pavement and Geotechnical Engineering for Transportation* Geotechnical Practice Publication (GPP) are papers that examine the use of waste in pavement structures, thus attracting one of the many sustainable elements of pavement design. Studies of the pavement structure beginning with the inclusion of chemical additives in soil subgrade, the use of geogrid reinforcement in unpaved and paved roads, to the surface roughness of asphalt mixtures and the freeze-thaw performance of concrete are reported. Also showcased herein are mathematical models that simulate various geotechnical problems. Various soil types are evaluated and discussed for common problems and design inputs used in practice such as slope failure, consolidation, and embankment behavior. An early warning system for subway construction is also exhibited.

One or more reviewers along with the editors evaluated each paper published in this ASCE Geotechnical Practice Publication. All published papers are eligible for discussion in the *Journal of Geotechnical and Geoenvironmental Engineering* and the *Journal of Materials in Civil Engineering*, and are eligible for ASCE awards.

The editors would like to thank Mr. Ken Fishman and the Geo-Institute for their vast assistance with this publication. Due thanks is also given to Ms. Donna Dickert from ASCE publications. Appreciation is given to those who helped assist in the editing duties of this publication. Without their assistance this publication would not be possible.

Jason Moore, University of Tennessee, USA
Jie Han, University of Kansas, USA
Qiao Dong, University of Tennessee, USA
Sheng Zhao, University of Tennessee, USA
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We would like to acknowledge the peer reviewers who spent their time and efforts in ensuring the exceptional quality of the papers presented within this GPP. Without their contributions this publication would not be possible.

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# STRUCTURAL PERFORMANCE OF THIN ASPHALT PAVEMENT UNDER ACCELERATED PAVEMENT TESTING

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**ABSTRACT:** Three thin asphalt pavement sections containing different chemically stabilized base and subbase materials were tested under the accelerated pavement testing (APT) at the Louisiana Accelerated Pavement Research Facility. Each pavement section consisted of different base and subbase materials, but having a common configuration of layer thicknesses. APT results generally indicated that both stabilized Blended Calcium Sulfate (BCS) bases outperformed a foamed asphalt treated base by a significantly large margin while a cement-treated soil subbase layer proved to have better load bearing capacity than a lime-treated soil layer. The structural performance of test sections was further analyzed using the non destructive test results and instrumentation measured pavement responses. The newly developed Mechanistic-Empirical Pavement Design Guide (M-E PDG) software was also used in predicting the rutting development on tested sections. Finally, a simple rut depth prediction model, which relates flexible pavement rutting development to the in-situ surface deflection characteristics, was proposed.

**KEY WORDS***:* Thin asphalt pavement, rutting, stabilized base, treated soil, accelerated loading, NDT, instrumentation

## INTRODUCTION

The Louisiana Pavement Research Facility (PRF) is an outdoor, full-scale accelerated pavement testing laboratory located on a six-acre site in Port Allen, Louisiana. It has space available for the construction of ten full-scale test pavement lanes, each having a size of 65-m (215-ft) long by 4-m (13-ft) wide. Traffic loading is provided by a machine called the Accelerated Loading Facility (ALF). The ALF device is a 33-m (100 ft) long accelerated loading device originally developed in Australia. The ALF wheel assembly models one half of a single axle with dual tires and the load is adjustable from 43.4 kN (9,750 lb) to 84.4 kN (18,950 lb) per load application. With a computer-controlled load trolley, the weight and movement of traffic is simulated repetitively in one direction at a speed of 16.8 km/hr (10.5 mph).