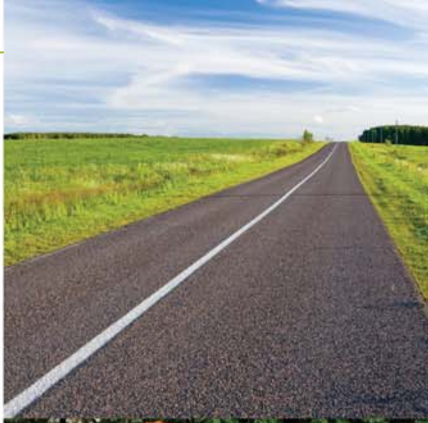
Guide for the

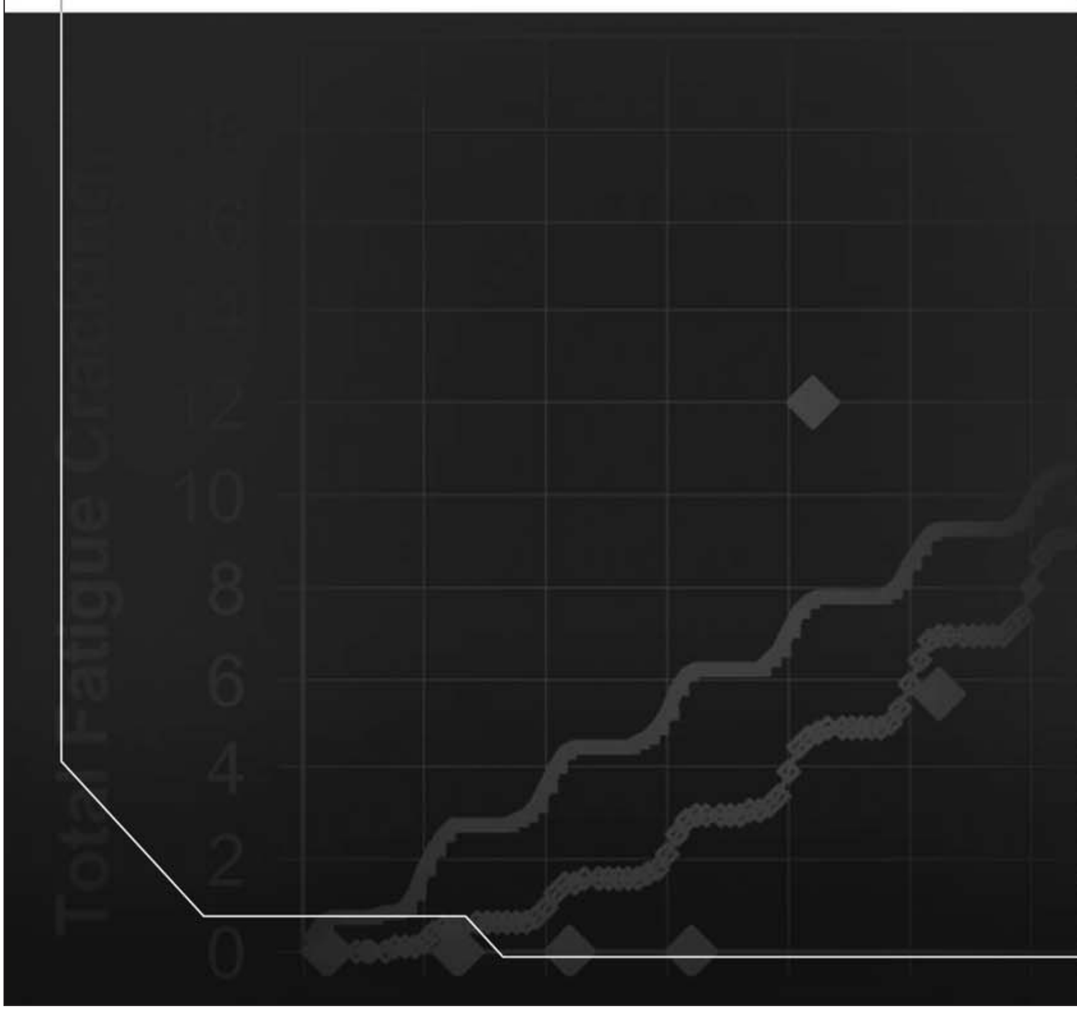
Local Calibration of the Mechanistic-Empirical Pavement Design Guide

November 2010



Guide for the
Local Calibration of the Mechanistic-Empirical Pavement Design Guide

November 2010



Publication Code: LCG-1
ISBN: 978-1-56051-449-7

American Association of State Highway and Transportation Officials

Executive Committee 2009/2010

President: Larry L. “Butch” Brown, Sr., Mississippi
Vice President: Susan Martinovich, Nevada
Secretary-Treasurer: Carlos Braceras, Utah

REGIONAL REPRESENTATIVES

REGION I

Joseph Marie, Connecticut, One-Year Term
Gabe Klein, District of Columbia, Two-Year Term

REGION II

Dan Flowers, Arkansas, One-Year Term
Mike Hancock, Kentucky, Two-Year Term

REGION III

Nancy J. Richardson, Iowa, One-Year Term
Thomas K. Sorel, Minnesota, Two-Year Term

REGION IV

Paula Hammond, Washington, One-Year Term
Amadeo Saenz, Jr., Texas, Two-Year Term

NON-VOTING MEMBERS

Immediate Past President: Allen Biehler, Pennsylvania
AASHTO Executive Director: John Horsley, Washington, DC

Joint Technical Committee on Pavements 2008/2009

Chair: David Nichols, Missouri
Vice Chair: Judith Corley-Lay, North Carolina
Secretary: Pete Stephanos, FHWA

REGION I
Delaware
Robin Davis (Design)

Maryland
Tim Smith (Materials)

New York
Wes Yang (Design)
Vacant (Design)
Vacant Design)

REGION II
Alabama
Larry Lockett (Materials)

Arkansas
Phillip McConnell (Design)

Louisiana
Jeff Lambert (Design)

North Carolina
Judith Corley-Lay (Vice Chair)

South Carolina
Andy Johnson (Design)
Kentucky
Paul Looney (Design)

REGION III
Kansas
Andy Gisi (Design)

Minnesota
Curt Turgeon (Materials)

Missouri
Jay F. Bledsoe (Design)

Missouri
David Nichols (Chair)

Ohio
Aric Morse (Design)

Iowa
Chris Brakke (Design)

REGION IV
California
Bill Farnbach (Design)

Colorado
Richard Zamora (Design)

Oklahoma
Jeff Dean (Design)

Wyoming
Rick Harvey (Materials)
Vacant (Design)

Preface

This guide is to provide guidance to calibrate the *Mechanistic-Empirical Pavement Design Guide* (MEPDG) software to local conditions, policies, and materials and to conduct the local calibration process. The guide does not provide guidance for determining the inputs and running the MEPDG software. A separate document, the *Mechanistic-Empirical Pavement Design Guide—A Manual of Practice*, provides guidance for using the MEPDG software to analyze and design new pavements and rehabilitation strategies. The *Manual of Practice* is referenced throughout this guide.

Version 1.0 of the MEPDG software is currently available. It should be noted that version 2.0 of the MEPDG software is in the process of being developed. Version 2.0 may include different transfer functions for selected distresses based on the results and recommendations from other on-going NCHRP projects. If any of the transfer functions are revised, the *Guide for Local Calibration* and the *Mechanistic-Empirical Pavement Design Guide—A Manual of Practice* for the MEPDG software may need to be revised accordingly.

Table of Contents

List of Figures

Attachments

Attachments

List of Tables

1.0 Introduction

The overall objective of the *Mechanistic-Empirical Pavement Design Guide* (MEPDG) is to provide the highway community with a state-of-the-practice tool for the design of new and rehabilitated pavement structures, based on mechanistic-empirical (M-E) principles. This means that the design procedure calculates pavement responses (stresses, strains, and deflections) and uses those responses to compute incremental damage over time. The procedure empirically relates the cumulative damage to observed pavement distresses. This M-E based procedure is shown in flowchart form in Figure 1-1. "MEPDG," as used in this guide, refers to the documentation and software package (NCHRP 2007).

Pavement distress prediction models, or transfer functions, are the key components of any M-E design and analysis procedure. The accuracy of performance prediction models depends on an effective process of calibration and subsequent validation with independent data sets. Pavement engineers gain confidence in the procedure by seeing an acceptable correlation between observed levels of distress in the field and those levels predicted with the performance model or transfer function. The validation of the performance prediction model is a mandatory step in their development to establish confidence in the design and analysis procedure and facilitate its acceptance and use. It is also necessary to establish the design reliability procedure. It is essential that distress prediction models be properly calibrated prior to adopting and using them for design purposes.

The term calibration refers to the mathematical process through which the total error (often termed residual) or difference between observed and predicted values of distress is minimized. The term validation refers to the process to confirm that the calibrated model can produce robust and accurate predictions for cases other than those used for model calibration. A successful validation process requires that the bias and precision statistics of the model for the validation data set be similar to those obtained during calibration. This calibration-validation process is critical for potential users to have confidence in the design procedure.

All performance models in the MEPDG were calibrated on a global level to observed field performance over a representative sample of pavement test sites throughout North America. The Long Term Pavement Performance (LTPP) test sections were used extensively in the calibration process, because of the consistency in the monitored data over time and the diversity of test sections spread throughout North America. Other experimental test sections were also included such as