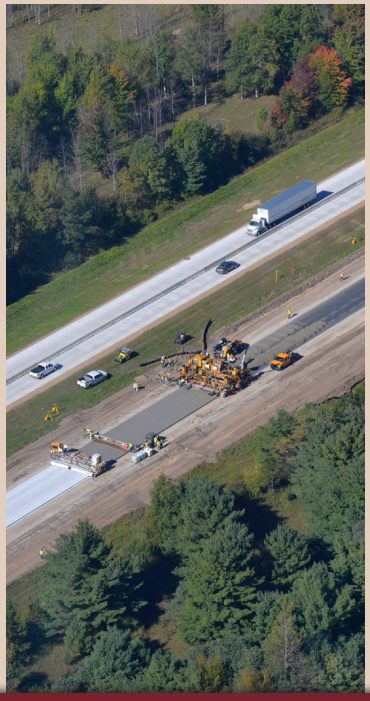

2021
SUPPLEMENT

Mechanistic-Empirical Pavement Design Guide

~ A Manual of Practice ~

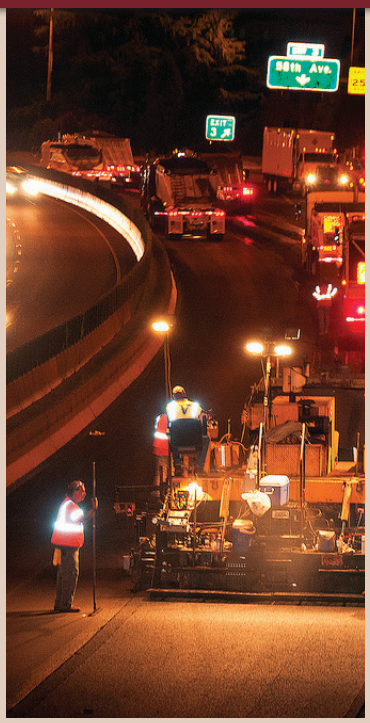

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Table of Contents

CHAPTER 3. Significance and Use of the MEPDG 1
3.1 MEPDG Performance Indicators 1

CHAPTER 4. Terminology and Definition of Terms 3
4.5 Distresses or Performance Indicator Terms—AC-Surfaced Pavements 3

CHAPTER 5. Performance Indicator Prediction Methodologies 5
5.3 Distress Prediction Model for Flexible Pavements and HMA Overlays 5
5.3.3 Load-Related Cracking 5

CHAPTER 7. Selecting Design Criteria and Reliability Level 13
7.1 Recommended Design-Performance Criteria 13

CHAPTER 8, Determining Site Conditions and Factors 15
8.1 Truck Traffic 15
8.1.2 Inputs Extracted from WIM Data 15
8.1.3 Truck Traffic Inputs Not Included in the WIM Data 16
8.2 Climate 17

CHAPTER 10. Determination of Material Properties for New Paving Materials 19
10.2 HMA Mixtures, Including SMA, Asphalt-Treated or Stabilized Base Layers, and Asphalt Permeable Treated Base Mixes 19

CHAPTER 11. Pavement Design Strategies 23
11.1.9 Pavement Structure for Top-Down Cracking Prediction 23

CHAPTER 13, Interpretation and Analysis of the Trial Design 25
13.4 Predicted Performance Values 25
13.5 Judging the Acceptability of the Trial Design **25**

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This document provides supplemental information to the 3rd Edition of the AASHTO *Mechanistic-Empirical Pavement Design Guide—A Manual of Practice*. The information also supports features integrated in the Association's AASHTOWare Pavement ME Design software package. References are provided for informational purposes only and do not constitute endorsement of any websites or other sources.

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Background

Top-down cracking is a load-related distress in asphalt pavements and overlays, where the crack initiates at the pavement surface and propagates downward through the asphalt layer. Top-down cracks were predicted using a transfer function similar to bottom-up (alligator) cracking in the earlier versions of the Pavement ME Design software (version 2.5.5 and earlier). Top-down cracks were calculated using a transfer function where the crack length is a function of damage. The overall damage accumulated in the asphalt layer is the sum of incremental damage due to traffic loads during a specific duration of time, which was calculated using Miner's law, similar to bottom-up alligator cracks. Top-down cracks were reported as longitudinal crack length in feet per mile in version 2.5.5 and earlier versions.

The study conducted as part of NCHRP project 1-42A evaluated two models for prediction of top-down cracking: (a) a viscoelastic continuum damage (VECD)-based model to predict crack initiation at damage zones and effect on pavement response, and (b) a fracture mechanics-based model to predict crack propagation in the presence of macro-cracks. The NCHRP 1-42A study concluded that both VECD- and fracture mechanics-based models can form the basis for a top-down cracking model suitable for use in the Pavement ME Design software.

The fracture mechanics-based cracking model was developed under NCHRP Project 1-52 and added to the Pavement ME design software. The top-down cracking model from NCHRP 1-52 replaces the older bending beam-based model in the Pavement ME software and output. In addition, longitudinal cracks in the wheel paths and/or alligator cracks have been confirmed through the use of cores to initiate at the surface and propagate down through the asphalt layers. The top-down

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cracking transfer function was modified to include both longitudinal cracks in the wheel paths and alligator cracks in terms of percent total lane area cracked. This addendum provides the additions and revisions to the 3rd Edition of the MEPDG *Manual of Practice* regarding the methodology and inputs to the fracture-based top-down cracking model.

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