Mechanistic – Empirical Design Guide:

Status and Implementation

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Overview

• Where have we been
• Where are we now
• Where are we going
• How are we getting there
1972 AASHTO Interim Guide for the Design of Pavement Structures

“While the Guides were under evaluation, AASHO initiated research studies within NCHRP for the purpose of developing a more theoretical or “rational” method for structural design of highway pavements.”
The “Rational Method” gets a push

• Process initiated by Joint Task Force on Pavements
  • Irvine, California: March 1996

• Development of the 2002 Guide for Design of New and Rehabilitated Pavement Structures
  • NCHRP 1-37A
  • Awarded to ARA: February 1998
  • Product Submitted: February 2004
State of Confusion

- M-E Design Guide
- NCHRP 1-37A Guide
- 2002 Design Guide
- New Design Guide
- Guide for M-E Design

*All describe the same product*

*NOT the AASHTO Design Guide!!*
Where do I get it?

http://www.trb.org/mepdg/

- Software and Manual Available
- Need to be online to use
- Manual Cannot be Printed
Major Efforts Underway

- NCHRP Enhancement Projects
- Design Guide Implementation Team (DGIT)
- Lead States Initiative
- NHI courses
- State Implementation Activities
NCHRP Associated Projects

- NCHRP 1-40: Independent Review
- NCHRP 1-42: Top-Down Fatigue Cracking (Active)
- NCHRP 1-41: Reflection Cracking of Hot-Mix Asphalt Overlays (Active)
- NCHRP 9-30a: Calibration of Rutting Models (Pending)
- NCHRP 9-38: Endurance Limit of HMA (Active)

http://www4.trb.org/trb/crp.nsf
DGIT Activities

- Traffic in ME Design Workshop(s)
- Introduction to ME Design Workshop(s)
- Materials Inputs to ME Design Workshop(s)
- EICM (In Development)
- Community of Practice Website
- Evaluation of the Rigid Pavement Design Procedure

www.fhwa.dot.gov/pavement/dgit/htm
www.ct.gov/dot/pavement101
DGIT Activities

- 19 states
- 1,200+ participants
- 300+ web participants
- China
- Canada
- Europe
- India
- South and Central America

www.fhwa.dot.gov/pavement/dgit/htm
NHI Courses

- NHI #131064 – Introduction to Mechanistic Design (Available)
- NHI #132040 – Geotechnical Aspects of Pavements (Available)
- NHI #151018 – Application of Traffic Monitoring Guide (Available)
Lead States Initiative

- 15 states
- Implementation Plans
- Knowledge base
- Expert Task Group
- CEO Involvement/Education
- Status Surveys

www.fhwa.dot.gov/pavement/leadstates/index.cfm
State Implementation Activities

• Sensitivity Analysis
• Materials Characterization
• Local Calibration Efforts
• Education Efforts
Input Requirements

1993 AASHTO Design Guide
- 5 flexible inputs
- 10 rigid inputs

M-E Design Guide
- 100+ Total Inputs
- 35+ Flexible
- 25+ PCC
What’s Sensitive?

It Depends!!

- Pavement Thickness
- Your Climate
- Distress Type

50 + Variables

CTE
MR
Air Voids

E*
Sensitivity Analysis

Dependent Variables vs. Independent Variables

- University of Arkansas
- DGIT
- State DOT’s
- NCHRP 1-37a documentation

Batch Mode Coming Soon!!
Materials Characterization

Project Level
In-House

Materials Catalog
Contracted Out
National Calibration

\[
\frac{\varepsilon_p}{\varepsilon_r} = k_1 \times 10^{-3.4488} T^{1.5606} N^{0.479244}
\]

\[R^2 = 0.648 \quad N = 387\]

National LTPP Data
Local Calibration

\[
\frac{\epsilon_p}{\epsilon_r} = \beta_{r1} k_1 \times 10^{-3.4488} T^{1.5606} \beta_{r2} N^{0.479244} \beta_{r3}
\]

\[ R^2 = 0.85 \]
\[ N = 12 \]

Local Data
Local Calibration

- Accelerated Testing facilities
  - NCAT Test Track
  - MN Road
- LTPP SPS Sections
- Experimental Sections
  - SISSI
- Pavement Management Systems
Perspective

- 1960 – Completion of Road Test Experiment
- 1972 AASHTO Interim Guide
- 1981 Revised Chapter III on Portland Cement Concrete Pavement Design
- 1993 Revised Overlay Design Procedures
- 1998 Supplement to Concrete Design Procedures
Working Together

Implement
Enhance
Educate

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