MEPDG : Where are We Now?

Louisiana Transportation Engineering Conference

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Common Denominator

BEAT
BAMA
!!!!!

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Objectives

State Implementation Activities
Status of MEPDG

General Overview of ME Design
Benefits and Issues of Implementation

Current State of the Practice

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What else happened in 1958?

Construction finished on the AASHO Road Test
What’s Being Used (2003 survey)

<table>
<thead>
<tr>
<th>Design Procedures</th>
<th>DOTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972 AASHTO Guide</td>
<td>3</td>
</tr>
<tr>
<td>1986 AASHTO Guide</td>
<td>2</td>
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<tr>
<td>1993 AASHTO Guide</td>
<td>26</td>
</tr>
<tr>
<td>Agency’s own pavement design guide or combination of AASHTO/Agency design procedures</td>
<td>17</td>
</tr>
</tbody>
</table>
1950s Construction Methods...

(AASHO, 1961)
Question?

- Why was the original AASHO Road Test conducted?

How much did it cost?
The Big Picture

Climate Inputs → EICM → Material Properties → Predicted Performance

Mechanistic Analysis

Traffic

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Strain Calculations at Critical Locations

$E = \frac{\sigma}{\varepsilon}$
Empirical Portion of MEPDG

$\beta = \text{Empirical Shift Factor}$

Why?
Test Section Performance

Local Performance Data

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Local Calibration Benefits

Test Section Observations

Local Data Set

National Data Set

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Traffic

- Improved traffic characterization
- Ability to deal with changing load types

Why?

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1950s Vehicle Loads...

Who drove these trucks?

"Extrapolations beyond these total load applications should be used with caution."

Pg 7: AASHTO ‘72

Where?
Materials

- Enhanced definition of material properties
- Relate material properties to performance
- Material Aging
Aging

Dynamic Modulus (psi)

Pavement Age (month)

- AC at 1/2" Depth
- AC at 5" Depth
- AC at 10" depth

Dynamic Modulus increases with age for all depths.
What happened here??

Granular Base
AASHTO Materials Characterization

- How do you Characterize your materials??
  - SMA
  - Superpave HMA
  - Hveem HMA
  - Polymer Modified
  - Warm Mix Asphalt
  - RAP

Are they all $a_i = 0.44$?
Climate

- Site specific climate considerations
  - Material properties effected by climate
  - PCC Joint openings, Curl / Warping

Extrapolated from Ottawa, IL

800 Weather Sites

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Major Advantages

- Modular system that allows for incremental enhancement
- Produces a more reliable design
- No longer dependent on the extrapolation of empirical relationships
- Excellent for forensic analysis
  - Answers “What if….” questions
- Calibrate to Local Materials, Traffic, Climate….

Why?

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Reasons for Change

- Reduce Over-and-Under Design Costs
- Legislative Mandate
- Consider Alternative Designs/Unique Conditions
- Rational Basis for Warranties, LCCA, PRS, QA/QC, Pay Factors
- Forensic Investigations
- Impact of Management Decisions on Pavement System
- Tie Design to Construction
LCCA

Initial Construction

First Rehab

Pavement Performance

Time

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PRS Example

Contractor Builds 12% $V_a$

8% Air Void Spec Limit

Bottom Up Cracking (%)

Air Voids (%)

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Integration

Pavement Design

Materials Selection

Communication

Pavement Management

Construction

Why?
Objectives

How?
Implementation Team

Develop a Team and Plan

- Include In-House Experts; Pavements Materials and Traffic, PMS
- Consider Regional or Multi-State Effort; PFS
- Contract with Consultant or University
- Include Upper management Personnel

How?

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Data Collection - Traffic

- Most States Have Inadequate Data
- Some are Planning Regional Weight Data by Roadway Classification (TRB Session 283)
- Share Collection and Storage Efforts with Other Offices Using Traffic Data
- Enhance WIM Quality and Magnitude
- Integrate with PMS

How?

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Data Collection - Materials

- Most States Need Additional Equipment
- Several are Determining Mr, FWD, DCP and CBR Relationships for Catalog
- Testing Equipment for CTE and E*
- Predictive Equations for E*

How?

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Practical Considerations

- You have to design before you build
- MEPDG is used for Design and Forensic Evaluation
- Don’t need to use all distress predictions for design
- Do not need Level 1 for all Inputs
- Do not throw out past experience
Using MEPDG for Design

State specific guidance is necessary

- Pavement Design Manual
- Distress criteria and limits
- Design parameters to change

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Implementation Timeframe

- Some DOT’s Already Underway
- Others are Awaiting Other Efforts:
  - NCHRP Projects
  - FHWA Research Projects
  - Copy Other State Approaches
  - AASHTO Adoption
  - Windfall from Gas Tax Revenues
  - Hell Frozen

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Who will use the MEPDG?

- State DOT’s Main User
  - Pavement Designers
  - Upper Management
    - Remaining Service Life, “What if” questions
- Academia
- Industry
- Consultant Designers
  - Warranty, Design Build, PRS, PWL etc.....
Things to remember

- All pavement design systems need:
  - Quality Materials Characterization
  - Quality Traffic Data
  - Calibrated to local conditions

- The MEPDG is one tool for a designer
  - Focused on the structural design aspects
  - Has limitations
Version 1.0 Changes

- State DOT’s will receive 2 copies soon
- Batch Mode
- Model Recalibration
- Use of Volumetrics in rutting model
- Computer Program Stability
- Perpetual Pavement Concept
- Calculation of ESAL’s

NCHRP Draft Research Results Digest

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More Information

- www.trb.org/mepdg
- www.fhwa.dot.gov/pavement/dgit
  - Webcast Workshops
    - Traffic, Climate, Materials, Introduction
- ARA bugtracker website
- NHI Course: Hands on Application of MEPDG

- Read the book !!!

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Help Wanted

● Contact the DGIT
  ● Research Proposal Review
  ● Training
  ● Technical Assistance

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AASHTO Implementation

April 10-11, 2007
MEPDG Roll Out Workshop
Irvine, CA

Joint Technical Committee on Pavements

Subcommittee of Design & Materials

Full AASHTO Balloting

Interim Guide – Spring 2008?
Perspective

• 1960 – Completion of Road Test Experiment

• 1961-62 AASHO Interim Guide for the Design of Rigid and Flexible Pavements

• 1972 AASHTO Interim Guide for the Design of Pavements

• 1981 Revised Chapter III on Portland Cement Concrete Pavement Design

• 1986 Guide for the Design of Pavement Structures

• 1993 Revised Overlay Design Procedures

• 1998 Supplement to Concrete Design Procedures
"We can't solve problems by using the same kind of thinking we used when we created them."

Perspective

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Questions ??

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