Overview of Mechanistic-Empirical Pavement Design Guide Implementation Activities

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NESMEA, Burlington VT
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PURPOSE of DGIT

To **support & educate** State highway agencies and industry in development & implementation of Mechanistic-Empirical Pavement Design

*Facilitating Implementation of Mechanistic-Empirical Pavement Design*
Design Guide Implementation Team
DGIT

- Office of Pavement Technology
  - Gary Crawford – Concrete Team – *Group Leader*
  - Leslie Myers – Asphalt Team

- Resource Center
  - Chris Wagner – TST Team

- Division Office
  - John Sullivan – Division Administrator – NC

- Turner-Fairbank Highway Research Center
  - Jim Sherwood – Advanced Models Team
  - Eric Weaver – LTPP Team
Team Objectives

- Support AASHTO & NCHRP 1-40 activities
- Increase understanding of mechanistic-empirical pavement design & direct resources for guide modifications
- To establish support approach for implementation (e.g., pooled-fund, Lead States, etc.)
- To provide a forum in which to discuss issues related to successfully utilizing & adopting new mechanistic-empirical Pavement Design concepts
- To raise awareness of what benefits result from using M-E Pavement Design
How are we meeting these objectives?
Educating State DOT and Industry on M-E Pavement Design

1-day workshop on
Facilitating Implementation of Mechanistic-Empirical Pavement Design

Approximately 1000 people attended

2-day workshops on
Materials Characterization of Inputs to M-E Pavement Design

Participants from:
42 States
24 FHWA Division Offices
5 Local highway agencies
30 universities
HMA and PCC industry
Consultants
**FHWA DGIT Workshops**

**Past Workshops**
- Introduction to the DG – 8*
- Traffic – 2

**Current**
- Materials – 11*
- Traffic – 2

**Future**
- Climatic Inputs – 4
- Local Calibration

*Webcast available
Objective: Educate M/D engineers on what is required for obtaining Level 1 materials inputs to design guide

- Asphalt materials inputs
- Concrete materials inputs
- Soils/Unbound Granular materials inputs

Workshop, Laboratory and Software Modules

Webcast in March 2005 at CT workshop
<table>
<thead>
<tr>
<th>Month</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>Turner-Fairbank (Pilot)</td>
</tr>
<tr>
<td>February</td>
<td>Salt Lake City, UT</td>
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<tr>
<td>March</td>
<td>Rocky Hill, CT &amp; Webcast</td>
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<tr>
<td>April</td>
<td>Thornburg, VA</td>
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<tr>
<td>April</td>
<td>Jefferson City, MO</td>
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<tr>
<td>May</td>
<td>Atlanta, GA</td>
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<tr>
<td>May</td>
<td>Austin, TX</td>
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<tr>
<td>May</td>
<td>New Brunswick, NJ (state sponsored)</td>
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<tr>
<td>July</td>
<td>Lincoln, NE</td>
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<tr>
<td>October</td>
<td>Gainesville, FL (state sponsored)</td>
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<tr>
<td>October 25-26</td>
<td>Fayetteville, AR (state sponsored)</td>
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Additional Workshops

Traffic Inputs for M-E PDG

- Two presented in 2005 by FHWA Resource Center
- **Purpose**: educate Pavt Designers & Traffic Engineers in same forum on obtaining traffic inputs

Biloxi, Mississippi  May 4-5

Milwaukee, Wisconsin  August 23-24
Additional Workshops Planned

1-Day Climatic Inputs for M-E Pavt Design
- Under development by DGIT
- Pilot: February 2006
- Purpose: educate Pavt Designers on obtaining climatic inputs through EICM

Local Calibration for M-E PDG models
- Awaiting deliverables from NCHRP 1-40 A,B
- Planned for Winter 2007
- Purpose: discuss Sensitivity of inputs & calibration, educate Pavt Designers & Pavement Managers
FHWA Internal Cooperation

DGIT & Travel Monitoring & Surveys Division of Office of Highway Policy Information

- Developed a Traffic Monitoring Data Webinar for M-E Pavement Design
- Pilot webinar held August 1, 2005
- 6 to 8 additional webinars anticipated over next year
FHWA Internal Cooperation

DGIT & Office of Freight Management / Operations

Meetings & internal workshops
• Models in M-E PD that deal with truck size & weight
• Assessing impacts of raising weight limits

DGIT & Office of Asset Management

Participate in interviewing State highway agencies on use of pavement management data to calibrate/validate M-E PD models (e.g. PA, FL, MS, WA, NC, AZ)
Videoconference with all FHWA division offices

- Planned for early October 2005
- **Purpose**: bring the FHWA Division Offices up to date on the status of M-E PD in US
- FHWA, Lead States, NCHRP, AASHTO activities
- FHWA D.O. engineers’ role in implementation process
Analysis of New and Rehabilitated Pavement Performance with Mechanistic-Empirical Pavement Design Software

- Hands-on format with computers loaded with software
- Focus on user, not theory
- Objective is for audience to be capable of performing flexible, rigid, rehab designs

STATUS: awarded to Fugro BRE, University of Arkansas, & team
NHI Course

Analysis of New and Rehabilitated Pavement Performance with Mechanistic-Empirical Pavement Design Software

• Determine sensitivity of various factors on pavement distress

• Customize example data to host agency

• Examples based on real Level 1 data in addition to typical Level 3

PLAN: Pilot Course planned May 2006
16 Courses held over 2.5 years
Educating State DOT and Industry on M-E Pavement Design

Advanced Technology for Workshops

DGIT webcast from Connecticut DOT URL server

1-day Intro workshop:
http://www.ct.gov/dot/pavement101

2-day Materials Inputs workshop:
http://www.ct.gov/dot/cwp/view.asp?a=1617&Q=300236&PM=1
CEO/Chief Engineers

- Brief presentation on the Guide (~ 20 minutes)
  - First presentation to Connecticut DOT upper management officials on July 28, 2005

- FHWA working to identify support materials to provide to DOT engineers
  - Video for CEOs (similar in format to 1-37A video)
  - “Success Stories” employing M-E pavement design
  - Technical Briefs (Lead States group, documented cost benefits)
Traffic Interface Software

- Convert Trafload files into MEPDG compatible files
- Estimate of ESAL’s from Axle Load tables
DGIT Active Projects

Climatic Database Extension

Modify *Anytime Weather* (Caltrans / FHWA)

Include additional weather data

Concept of Virtual Weather Stations

Weather Data QC capabilities
FHWA Active Projects Related to M-E Pavement Design

- Coefficient of Thermal Expansion (CTE) of Concrete: Equipment Development & Manufacture
- Determination of Factors Contributing to Roughness in Asphalt Pavements
- Evaluation of the NCHRP 1-37A Rigid Pavement Design Procedure
- Statistical Analyses of Mobile Asphalt Mix Testing Laboratory Performance Data
- LTPP Database Enhancement with E* Data (December 2006)
- PCC Pavement Response Models (August 2005)
FHWA Active Projects Related to M-E Pavement Design

- **Cooperative Agreement with NCAT**
  - Field sections with both unmodified and polymer mixes
    - PG 67-22 and PG 76-22
  - Two sections failed (5-inch) in fatigue cracking & rutting, more structural sections
  - Section with 7-inch starting to show some cracking

Go to NCAT track website for detail on any section: [http://www.pavetrack.com/](http://www.pavetrack.com/)
Field & Laboratory Studies Related to M-E Design

Long-term Pavement Program (LTPP)
- Database Enhancement with E* Data

Sensitivity Analysis of HMA E*
- Field data from Mobile Asphalt Laboratory (MATL)
  - Testing both neat & polymer-modified Mix from 18 State projects
  - Evaluating both lab-blended mix design replicates & production samples
- Relationship between volumetric/mix properties & E*

2005: Kansas, Maine, Nebraska, Mississippi
Evaluation Studies Related to M-E Design

- **Coefficient of Thermal Expansion**
  - TFHRC
    - Working on ruggedness and development of commercially available equipment
  - Mobile Concrete Laboratory
    - Continuing to collect CTE lab data from field State projects

- **TFHRC Models Team**
  - Investigating IRI models
  - Sensitivity Analysis: Concrete
    - Suggestions from Panel, Lead States group
Technical Assistance

Mobile Labs/TFHRC

- Local Materials Characterization
  - Enables use of higher level inputs

- Equipment
  - Specification, Calibration, Use
Provide forum for discussion on M-E Pavement Design

- **FHWA Community of Practice website**
  - Established NCHRP 1-40 User Comments Database
  - Maintained by DGIT
    - Questions, technical issues raised forwarded to NCHRP
    - Success Stories – also need positive feedback

- **Supports AASHTO Joint Task Force on Pavements**
  - Solicit seed topics for discussion from Panel
Forum Information
Chat Website

Community of Practice NCHRP 1-40 User Comments Online Discussion Site

http://www.fhwa.dot.gov/pavement/dgit/dgitdata.cfm
Support Lead States Group

Lead States Group webpage:


Partially-security protected: every LSG member has password


LSG Implementation Plans: plans already received posted on website
Lead States Group for the Implementation of Mechanistic-Empirical Pavement Design

Our mission is to promote and facilitate the refinement, implementation, and evolution of Mechanistic-Empirical Pavement Design procedures in conjunction with AASHTO, NCHRP, and FHWA activities.


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The Role of a Lead State
Each Lead State will further Mechanistic-Empirical Pavement Design by demonstrating the following attributes:
- Leads by example, as one of the first States to pursue implementation of the design guide and obtain upper management support.
- Champions implementation. Becomes an expert in the implementation process.
- Knows the political, funding, and internal hurdles that need to be addressed.
- Compares pavement design/analysis technologies to determine which is most advantageous for a given project.
- Focuses on advanced technologies and refinements.
- Shares results—both successes and challenges—with highway community.
- Shares funding success stories.
- Develops short- and long-term plans for implementation.

The Role of FHWA
FHWA, through its Design Guide Implementation Team (DGIT), will provide:
- Full partnership with state members.
- Funding (including meeting and member travel) and technical support.
- Division office sponsorship of training and committee activities in the lead states.
- Central data repository.
- Newsletter and information posting on the web.
- Committee secretariat.
- Coordination with LTPP and other research efforts.

Focus of the Lead States Group
The Lead States will work together to:
- Provide an example of successful implementation and develop a model implementation plan.
- Serve as a liaison for NCHRP, AASHTO, FHWA, and industry activities.
- Identify gaps in the knowledge base and new research needs.
- Share information, utilize national lessons learned, and avoid duplication of effort.
- Provide a vehicle for working in cooperation across State lines.
- Serve as a resource for States at any stage of implementation.

Lead States and Points of Contact
FHWA DGit, Leslie Myers, Gary Crawford, Chris Wegner, Jim Sherwood - digit@fhwa.dot.gov
NCHRP Liaison, Ed Harrigan - 202-334-3232
Arizona, Paul Burch - 602-712-8086
Florida, Bruce Clerich - 850-414-4371
Kentucky, Clark Graves - 859-257-4513, Paul Looney - 502-564-3280
Maryland, Peter Varhelyi - 301-314-3100, Tim Smith - 410-332-3110
Minnesota, Dave Van Duren - 651-779-5564
Mississippi, Bill Bartos - 601-359-7849
Missouri, Jay Bedsoe - 314-751-3824, John Donahue - 573-751-3002
Montana, Dan Hill - 406-444-3430, Jon Watson - 406-444-7360
New Jersey, Robert Sauter - 609-480-3881, Tom Bennett - 732-445-2485
New Mexico, John Turlington - 505-827-8811, Bryson Solorz - 505-827-5191
Pennsylvania, Dan Daicesco - 717-777-4240, Clint Beck - 717-785-8460
Utah, Tim Britt - 801-588-4859
Virginia, Mohamed El-F tiny - 804-338-3173, Thomas Tate - 804-338-3129
Washington, Linda Pierce (Chair) 360-709-6474, Jeff Uithuysen - 360-709-5485
Wisconsin, Laura Fentay (Co-Chair) 608-244-3456
4 Stages of Implementation

1. Inform & Obtain Buy-In from Small Group
2. Build Consensus Among Organizations
3. Mass Implementation Effort
4. Planning for Future Change & Improvements
National Implementation Timeframe

---|---|---|---|---|---|---|---|---|---|---|---
NCHRP 1-37a
MEPDG Delivered
NCHRP 1-40
MEPDG Enhancements: AASHTOWare, NCHRP
AASHTO Balloting
Implementation Activities by Several States
NHI Hands-on Courses
What Can States Do Now?

Sensitivity Studies
- Universities (e.g. University of Arkansas, KSU)
- Industry (e.g. NCAT, ACPA)
- State DOTs (e.g. Missouri, Pennsylvania, N.C.)

Forensic Analysis
- State DOTs (e.g. “reconstruct” failed pavement cases, overweight truck impacts)
Summary

Partnership for Implementation

- Lead States Group, AASHTO JTC
  - Consensus, Specification, Use, Lead-by-Example

- NCHRP
  - Coordinated research efforts to enhance M-E Pavement Design software and supporting tests

FHWA
- Training, Coordination, Technical Support
How Do We Get Started?

- Get Educated
- Get Involved
- Allocate Resources
- Encourage Cross Discipline Communication
- Maintain Cross State DOT Communication?
Design Guide Implementation Team
dgit@fhwa.dot.gov
http://www.fhwa.dot.gov/pavement/dgit/index.cfm
Any Questions??