WHAT IS AASHTOWare PAVEMENT ME – VDOT’s New Pavement Design Software?

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Outline

I. Introduction and background of MEPDG
II. Overview of MEPDG design process
III. VDOT MEPDG Implementation Overview
IV. Impact of MEPDG Implementation
I. INTRODUCTION AND BACKGROUND OF MEPDG PROCEDURE
What is AASHTOWare PavementME?

- VODT’s New Pavement Design Software
  - From 1/1/2018
- Developed by AASHTO
- Software for a totally different method of pavement design: MEPDG
Where does VDOT plan to use MEPDG?

- Interstate and Primary routes.
  - New alignment, reconstruction, and lane widening
  - Rehab design: sometime in the future
- Continue to use VDOT’s Secondary & Subdivision Pavement Design Guide & Procedures on Secondary & Subdivision streets
  - Some high volume secondary roads with AADT > 10,000 maybe designed using MEPDG at discretion of Districts Material Engineer.
What is **Mechanistic Empirical Pavement Design Guide (MEPDG)**?

- Design based on measurable performance (e.g., rutting, cracking etc.)
- Based on Mechanistic-Empirical principles

**Mechanistically:**
It calculates pavement responses (stresses, strains, and deflections) due to loading and environment and uses those responses to compute incremental damage overtime.

**Empirically:**
It relates the cumulative damage to observed pavement distresses (i.e. IRI, rutting, cracking, faulting, and punchout etc.)
Why Do We Need a New Pavement Design Procedures/Software?

- Current practice is 1993 AASHTO pavement design guide
  - Developed between late 50s and late 90s
  - Based on AASHO Road test
- VDOT adopts 1993 process in early 2000
- AASHTO declared sun set on 1993 design software (e.g., Darwin)
- 1993 design has lot of limitations (one location, one subgrade, < 2 Million ESALs, and 1950s construction)
MEPDG Development

• 1993 pavement design method paved the way for MEPDG
  ▪ Developed based on the LTPP performance data
    ▪ Across USA and Canada
    ▪ Various NCHRP studies
  ▪ Balloted and accepted in 2007
  ▪ Enhancements ongoing
How many states are adopting MEPDG?

- Implemented (Asphalt pavement and/or overlays): 14 states
- Planning to implement (Asphalt pavement and/or overlays): 31 states

Source: MEPDG National User Group Meeting, December 2016
II. OVERVIEW OF MEPDG DESIGN PROCESS
MEPDG Design Process

Climate

Materials

Traffic

Layer Properties

Stress, Strain, or Deflection

Performance Threshold

Adjustment

Compare

Distress

TRANSFER FUNCTION
Benefits of MEPDG Design

- Minimizes the limitations of the 1993 process
- Improved handling of climatic effects and traffic loadings
- Various hierarchical Input Levels
  - Depending on availability and importance
- Relating between design and performance
- Ability to calibrate and set threshold limits to local conditions
- It is not all about thickness
MEPDG: It’s Not All About Thickness (all the time)

Figure 3.4.15. Sensitivity of JPCP transverse cracking to slab thickness and joint spacing.
Other Potential Benefits of MEPDG

- Ability to analytically assess impact of specification changes (ex. Binder content, air void, and gradation).

Effect of Binder Content on Bottom-up Cracking and Rutting

![Graph showing the effect of binder content on bottom-up cracking and rutting.](Image)
Other Potential Benefits of MEPDG

Effect of Increased Density on Performance

![Graph showing the relationship between Bottom-up Cracking (%) and Air Void (%). The graph indicates an increasing trend.]
Other Potential Benefits of MEPDG

<table>
<thead>
<tr>
<th>Study</th>
<th>Average Reduction in Fatigue Life for 1% Air Void Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC Berkeley (1969)</td>
<td>27.20%</td>
</tr>
<tr>
<td>UCB (1996)</td>
<td>15.10%</td>
</tr>
<tr>
<td>WesTrack (2002)</td>
<td>11.90%</td>
</tr>
<tr>
<td>Al (2010)</td>
<td>9.20%</td>
</tr>
</tbody>
</table>
III. VDOT MEPDG IMPLEMENTATION OVERVIEW
VDOT’s MEPDG Implementation at a Glance

- VDOT planned MEPDG implementation in mid 2000
- VDOT was one of the 15 lead agencies to implement MEPDG
- Significant works were deemed needed
  - Materials, traffic, local calibration, training etc.
- Started ‘shadow’ design from 2014
- Official implementation date set at **January 1, 2018**
VDOT’s MEPDG Implementation Plan/Status

Current status

Develop Inputs
- Materials
- Traffic
- Climate

Training
- Staff
- Software

Review Models
- Local Calibration
- Understanding output

Policy
- Connect with VDOT business practices

Current status
Objective: “No Surprise”

Technical Working Group (TWG)
- Members (VDOT, VTRC, Industry, FHWA)
- Work on technical issues
  (user manual, modelling, and input values)
- Meets once a month to discuss on technical issues

Stakeholder Group
- Consists of VDOT, FHWA, VTRC and Industry
- Periodic updates on progress & timeline
How Does All These Incorporated into Practice?

- VDOT has developed MEPDG User Manual. Available in VDOT external site for downloading:
- VDOT will change the User Manual periodically
- Updates on MOI Chapter III and VI were included in regards to MEPDG
- All VDOT specific inputs files are available in VDOT external site for downloading:
IV. IMPACT OF MEPDG IMPLEMENTATION
What Will MEPDG Change for Contractors, Consultant & DBer?

- **Different input parameters**
  - Good News - Input parameters were developed and available for VDOT and external users.

- **Traffic**
  - No change in data collection
  - ADT, truck %, growth rate etc.

- **Subgrade investigation & testing**
  - Some changes in the investigation/reporting
    - AASHTO soil classification
    - Estimation of Resilient Modulus (RM) from unconfined compressive strength test
    - No CBR – Resilient Modulus correlation to determine (RM)
**What Will MEPDG Change for Contractors, Consultant & DBer?**

- **Materials input**
  - Designer does not need to gather additional data (AC, PCC, and aggregate).
    - (http://www.virginiadot.org/business/materials-download-docs.asp)

- **Environmental Input**
  - Designer does not need to gather additional data.
    - (http://www.virginiadot.org/business/materials-download-docs.asp)

- **Personnel Training**

- **Different Software - AASHTOWare Pavement ME version 2.2.6**
  - $5,500 per license/year
  - Can be procured through AASHTO
    - http://www.aashtoware.org/Pavement/Pages/default.aspx
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Thank You

Any Questions?

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