



# **WHAT IS AASHTOWare PAVEMENT ME – VDOT's New Pavement Design Software?**

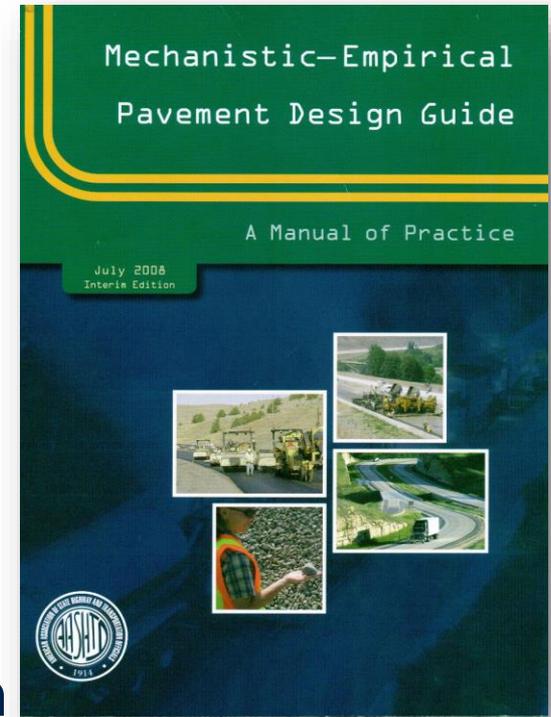
October 3, 2017 - Richmond, VA

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**VDOT Materials Division**

# 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**

# VDOT's MEDG Implementation Plan At a Glance

- **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?

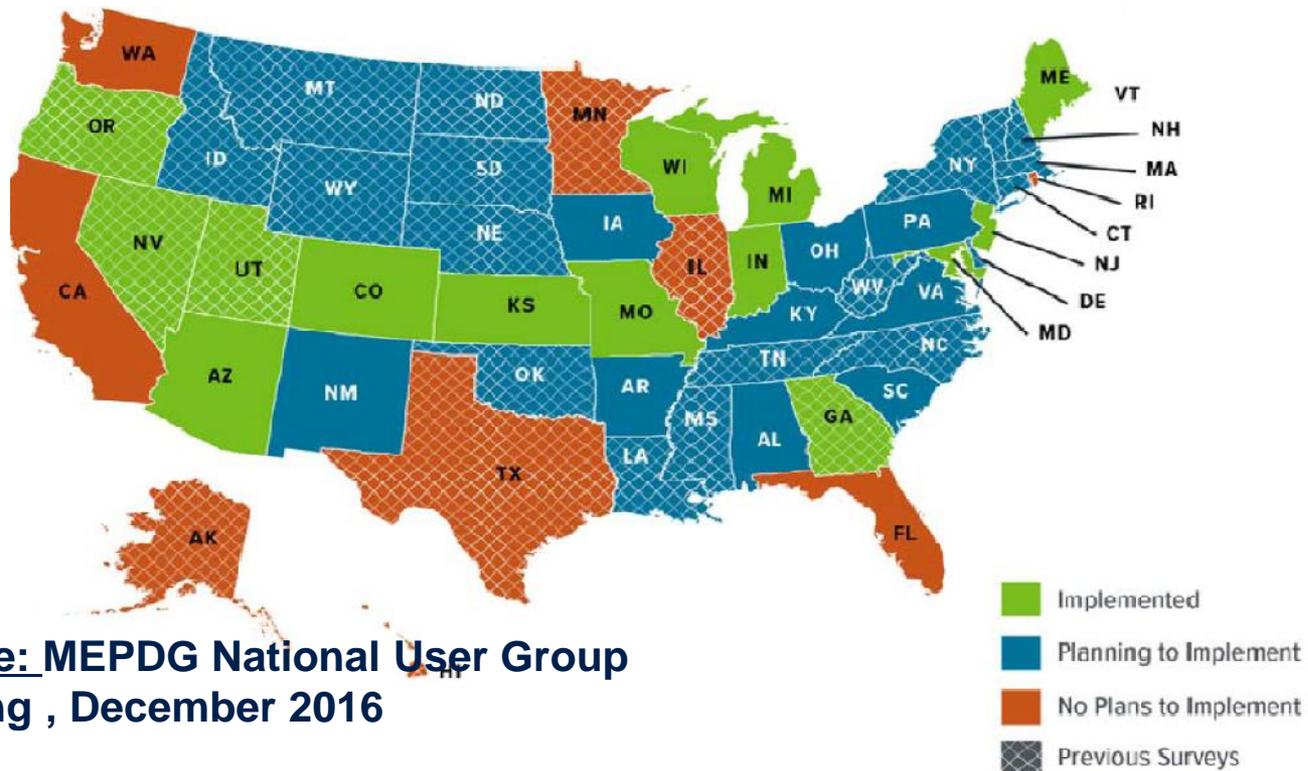
- **Current practice is 1993 AASHTO pavement design guide**
  - **Developed between late 50s and late 90s**
  - **Based on AASHO Road test**
- **VDOT adopts 1993 process in early 2000**
- **AASHTO declared sun set on 1993 design software (e.g., Darwin)**
- **1993 design has lot of limitations (one location,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



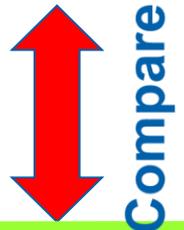
Performance Threshold



Layer Properties



Adjustment



Compare



Stress,  
Strain, or  
Deflection

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)

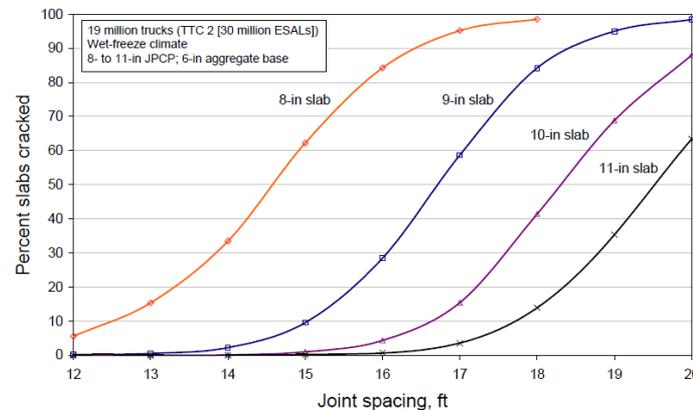
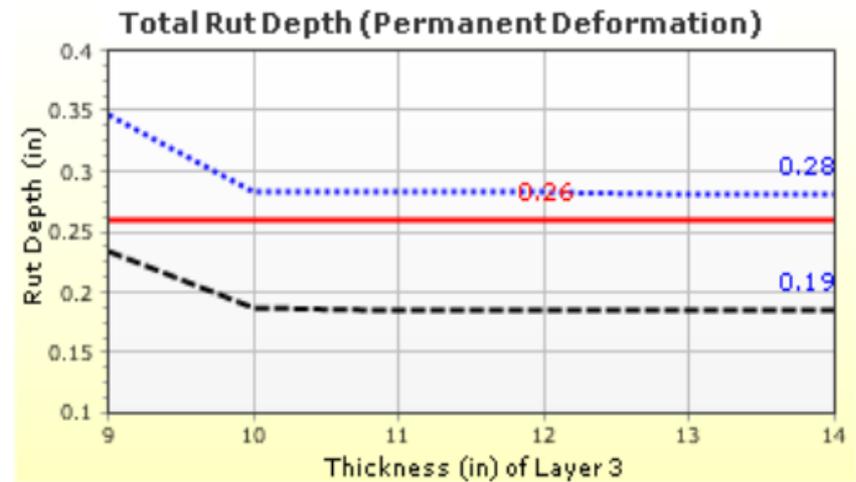
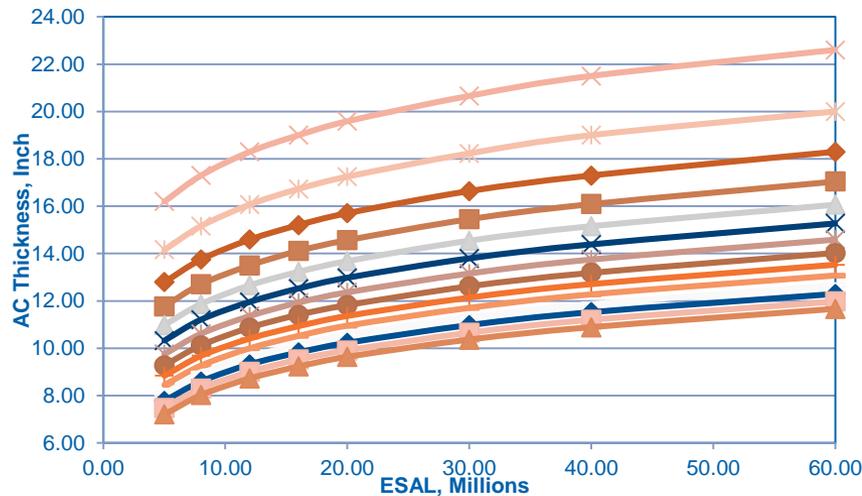
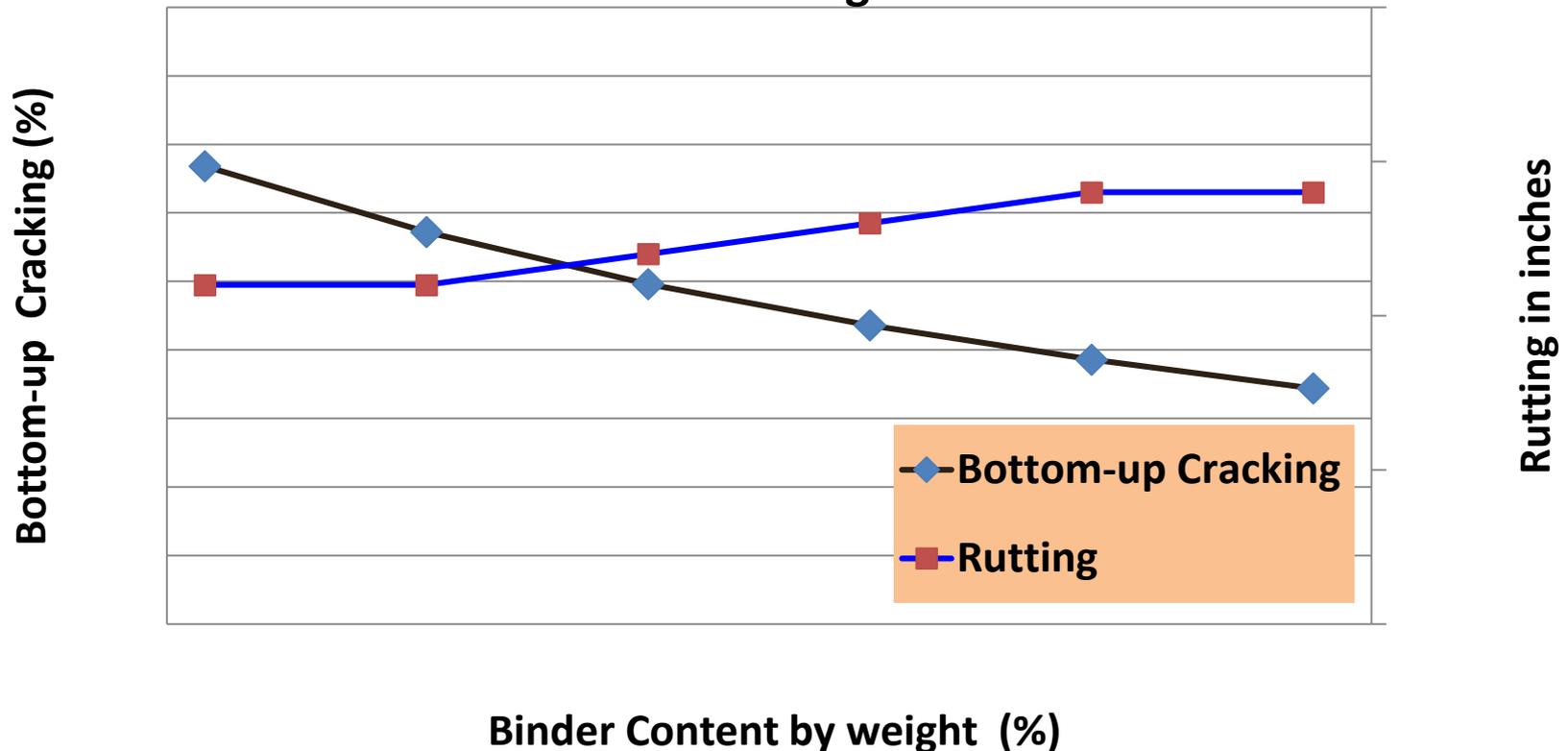


Figure 3.4.15. Sensitivity of JPCP transverse cracking to slab thickness and joint spacing.

# Other Potential Benefits of MEPDG

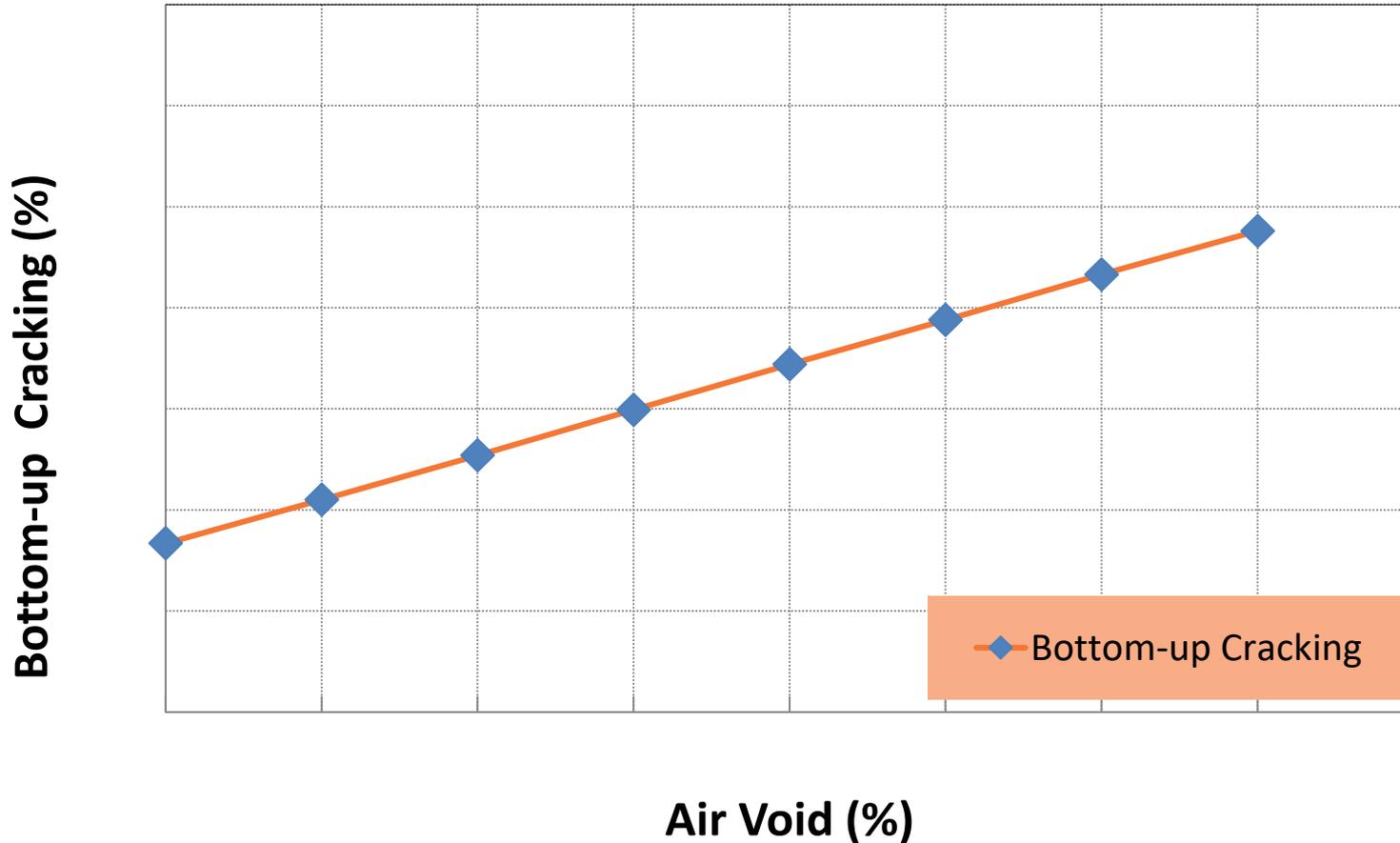
- Ability to analytically assess impact of specification changes (ex. Binder content, air void, and gradation).

**Effect of Binder Content on Bottom-up Cracking and Rutting**

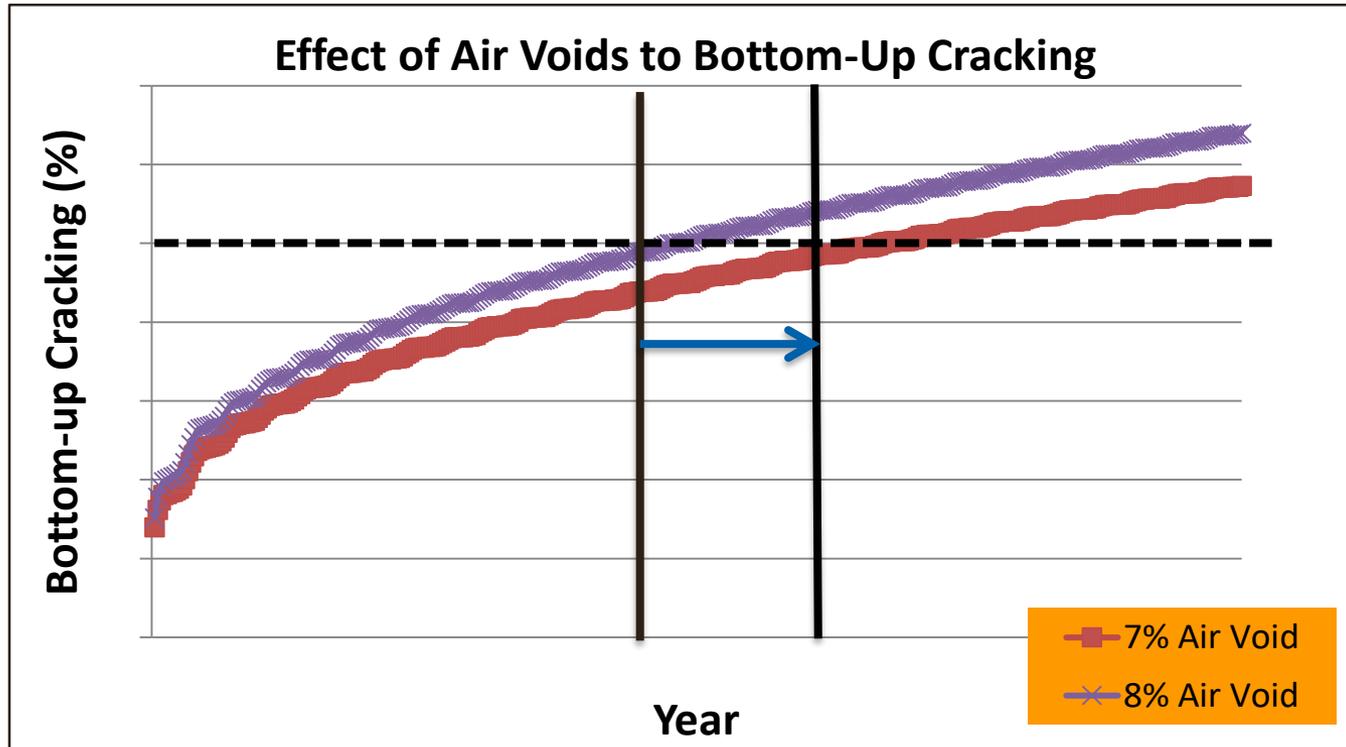


# Other Potential Benefits of MEPDG

## Effect of Increased Density on Performance



# Other Potential Benefits of MEPDG



Study	Average Reduction in Fatigue Life for 1% Air Void Increase
UC Berkeley (1969)	27.20%
UCB (1996)	15.10%
WesTrack (2002)	11.90%
AI (2010)	9.20%

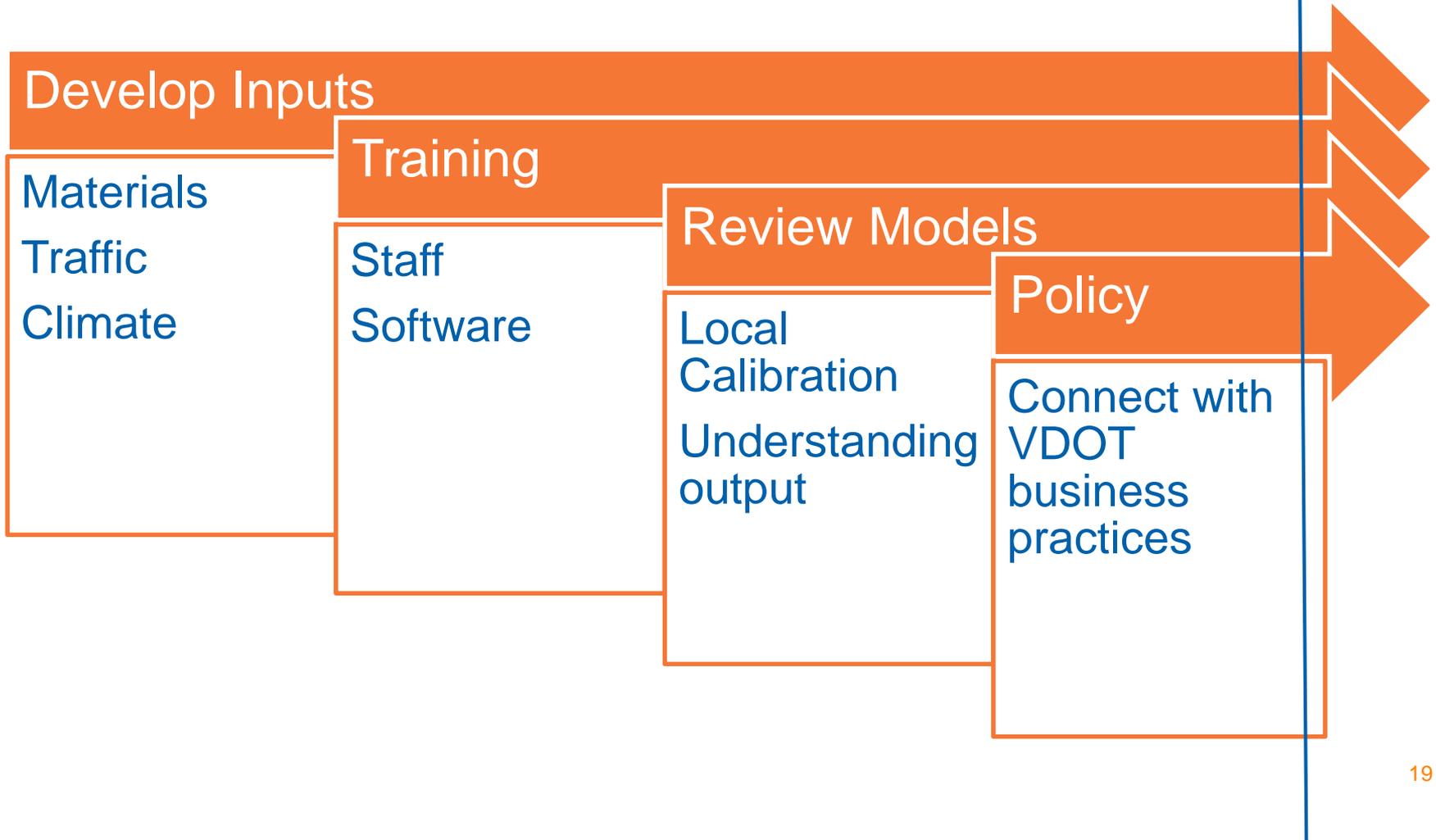
# **III. VDOT MEPDG IMPLEMENTATION OVERVIEW**

# 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



# MEPDG Implementation: Extensive Outreach

- **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:  
<http://www.virginiadot.org/business/materials-download-docs.asp>
  - 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:  
<http://www.virginiadot.org/business/materials-download-docs.asp>

## **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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