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PA Asphalt Pavement Association

# Balanced Mix Design Update

March 18 – 20, 2025

*PAPA Regional Technical Meetings*

Cranberry Township | State College | Allentown

# Balanced Mix Design – The What

- Definition of Balanced Mix Design:  
“asphalt mix design framework using mechanical tests correlated to field performance on appropriately conditioned specimens that addresses multiple modes of asphalt layer distress, taking into consideration mixture aging, traffic, climate and location within the pavement structure.”

~ AASHTO PP 105-24

(<https://www.trb.org/Publications/Blurbs/182871.aspx>)

Design “philosophy” used to optimize the mix performance against distresses pertinent to the climate & traffic specific to where it will be placed

**Source:** Aschenbrener, T., E. Hajj, and D. Nener-Plante, FHWA BMD Case Studies Workshop – PA, Dec. 5-6, 2024



# Balanced Mix Design – The What

- Goals of Balanced Mix Design (BMD)
  - Determine an economical blend of aggregates and asphalt binder to meet design requirements
    - Design requirements: Resist critical distresses



# Balanced Mix Design – The What

Main asphalt pavement distress:

- Rutting



- Reflection cracking



- Low-temperature cracking



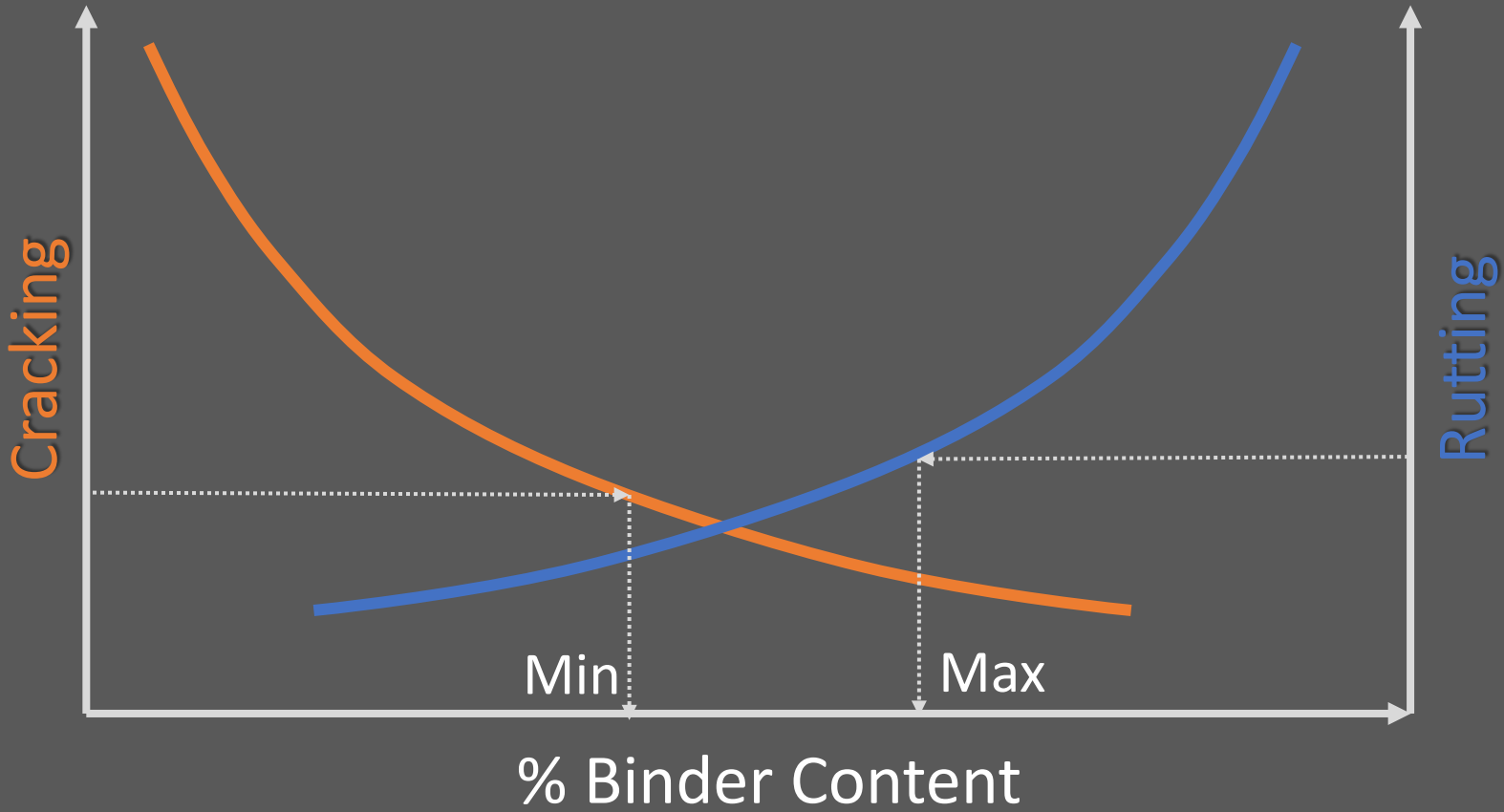
- Fatigue cracking



- Moisture damage (stripping)



# Balanced Mix Design – Initial Concept



**BMD Concept**

Initial concepts of BMD had mix designers altering asphalt content to 'balance' the mixture between rutting and cracking.

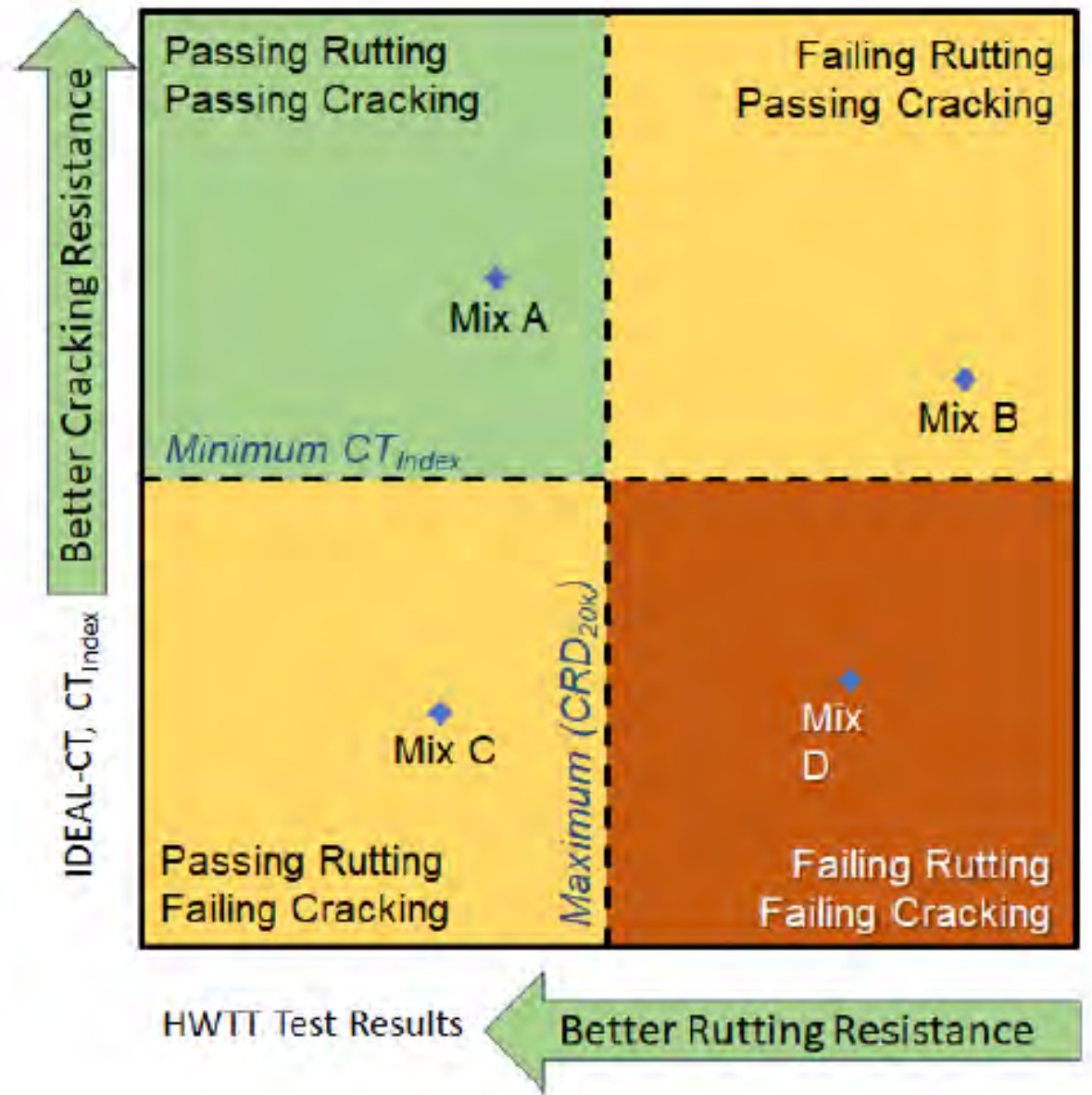
**Source:** Aschenbrener, T., E. Hajj, and D. Nener-Plante, FHWA BMD Case Studies Workshop – PA, Dec. 5-6, 2024

# Balanced Mix Design - Reality

## BMD Concept

Current practice and work recognizes that DOT's will not require a fully 'balanced' mixture – must meet certain criteria for performance. Other strategies available to achieve performance.

**Source:** Aschenbrener, T., E. Hajj, and D. Nener-Plante, FHWA BMD Case Studies Workshop – PA, Dec. 5-6, 2024



**Source:** West et al. (2023), Guidelines and Recommendations for Field Validation of Test Criteria for BMD Implementation

# Balanced Mix Design

*“Teamwork makes the dream work”*



# BMD Workshop

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U.S. Department of Transportation  
**Federal Highway Administration**

## **Welcome to the BMD Case Studies Workshop!**

**PennDOT Materials Testing Laboratory  
81 Lab Ln, Harrisburg, PA 17109**



**Pennsylvania Asphalt  
Pavement Association**  
Pennsylvania Rides on US.



# BMD Workshop

## Case studies from 7 states:

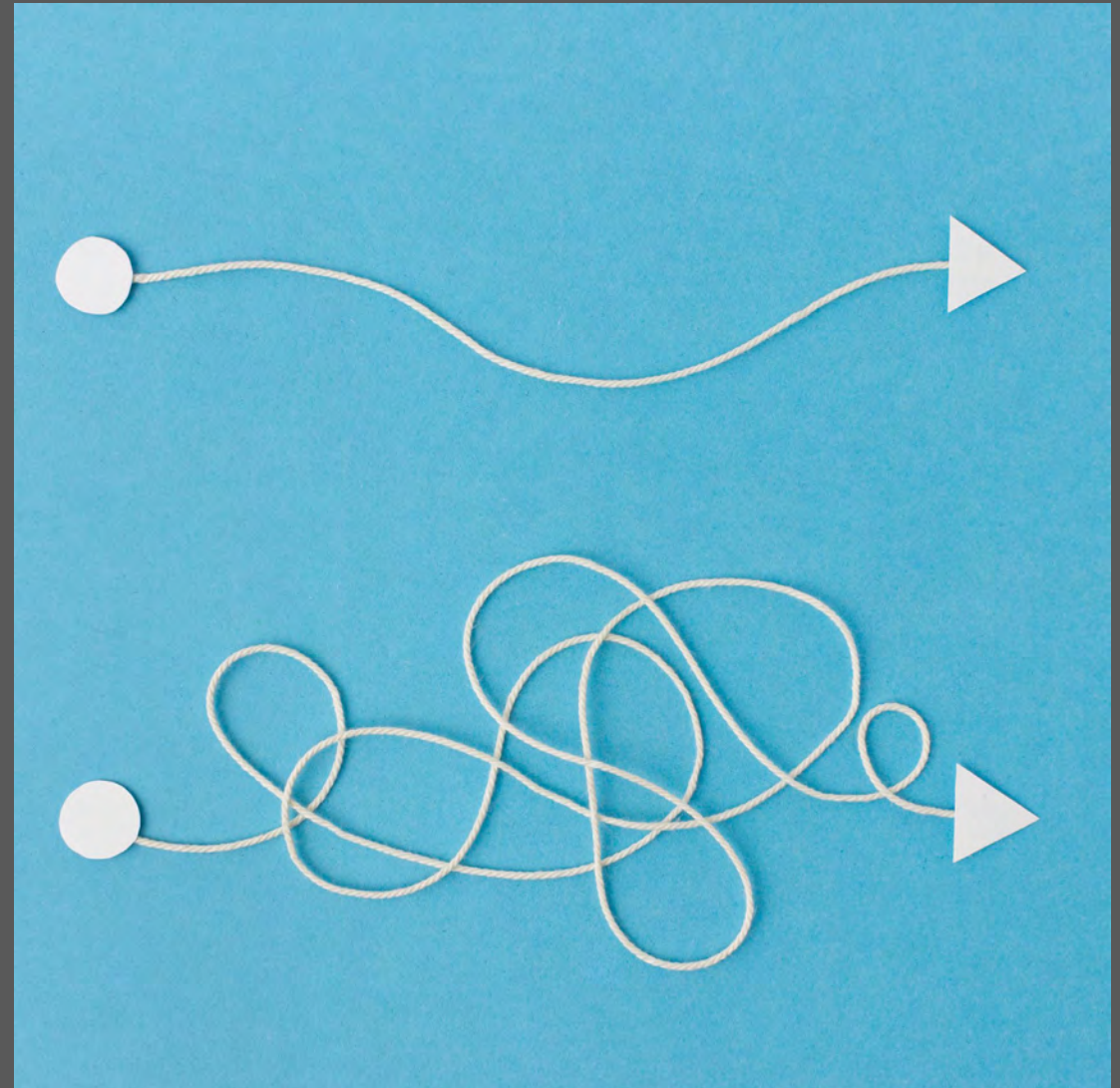
- 1. California
- 2. Illinois
- 3. Louisiana
- 4. Maine
- 5. New Jersey
- 6. Texas
- 7. Virginia

Task	Sub Task	Description
<b>1</b>	<b>Understanding the why and benefits of Performance Specifications</b>	
<b>2</b>	<b>Overall Planning</b>	2.1 Identification of Champions
		2.2 Establishing a Stakeholders Partnership
		2.3 Doing Your Homework
		2.4 Establishing Goals
		2.5 Mapping the Tasks
		2.6 Identifying Available External Technical Information and Support (periodically)
		2.7 Developing an Implementation Timeline
<b>3</b>	<b>Selecting Performance Tests</b>	3.1 Identifying Primary Modes of Distress.
		3.2 Identifying and Assessing Performance Test Appropriateness.
		3.3 Validating the Performance Tests
<b>4</b>	<b>Performance Testing Equipment: Acquiring, Managing Resources, Training, and Evaluating</b>	4.1 Acquiring Equipment
		4.2 Managing Resources
		4.3 Conducting Initial Training
		4.4 Evaluating Performance Tests
		4.5 Conducting Inter-Laboratory Studies
<b>5</b>	<b>Establishing Baseline Data</b>	5.1 Reviewing Historical Data & Information Management System
		5.2 Conducting Benchmarking studies
		5.3 Conducting Shadow Projects
		5.4 Analyzing Production Data
		5.5 Determining How to Adjust Asphalt Mixtures Containing Local Materials
<b>6</b>	<b>Specifications and Program Development</b>	6.1 Sampling and Testing Plans
		6.2 Pay Adjustment Factors (If Part of the Goals)
		6.3 Developing Pilot Specifications and Policies
		6.4 Conducting Pilot Projects
		6.5 Final Analysis and Specification Revisions
<b>7</b>	<b>Training, Certifications, and Accreditations</b>	7.1 Developing and/or Updating Training and Certification Programs
		7.2 Establishing or Updating Laboratory Accreditation Program Requirements
<b>8</b>	<b>Initial Implementation</b>	

# BMD Workshop

## Task 2: Overall Planning

- ✓ • Identifying Champions
- ✓ • Establishing a Stakeholders Partnership
- Doing your Homework
- Establishing Goals
- Mapping the Tasks
- Identifying Available External Technical Information and Support
- Developing an Implementation Timeline

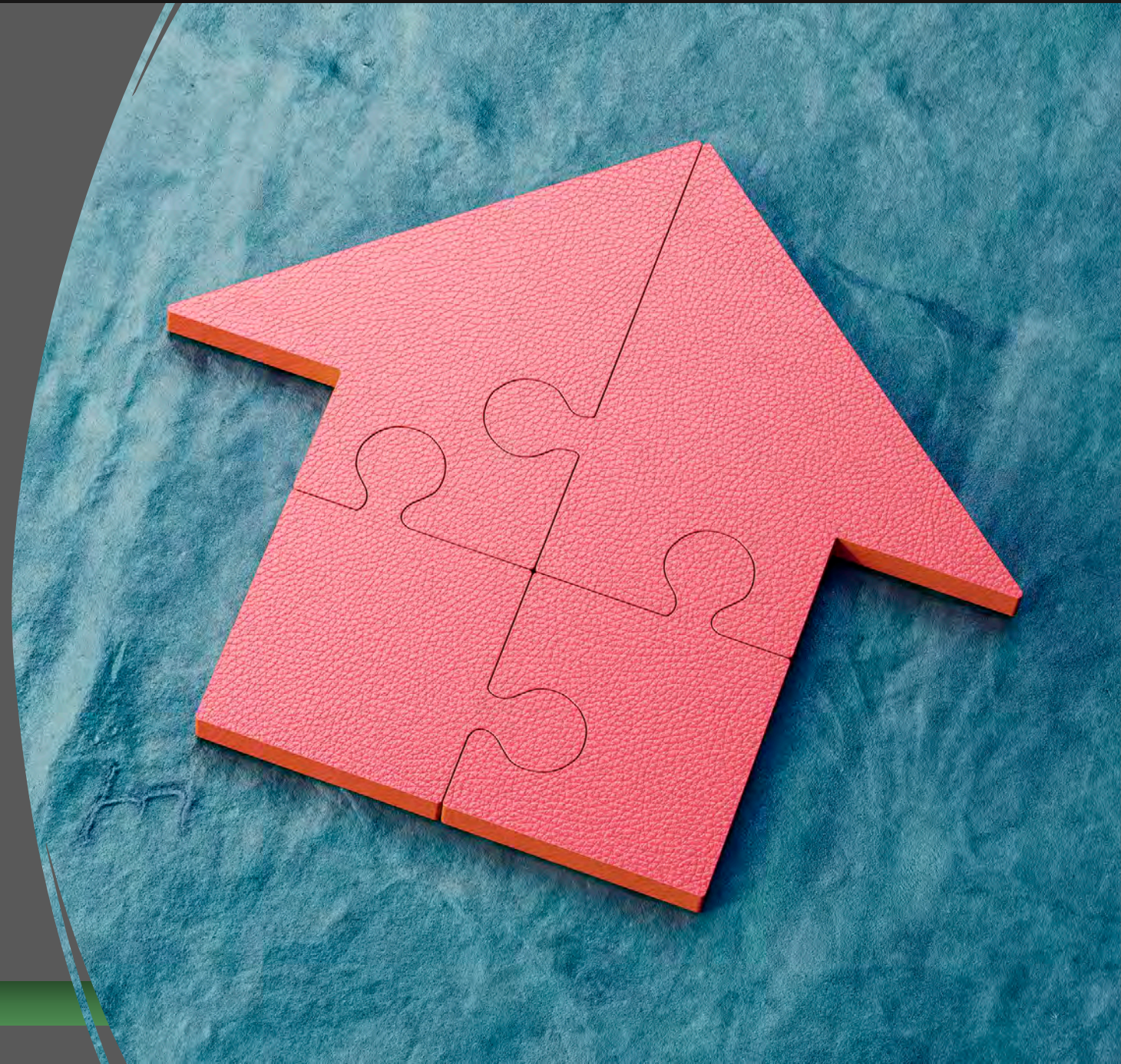


# BMD - Stakeholder Partnership

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Asphalt Pavement Quality  
Improvement Committee

BMD Subcommittee



Pennsylvania Asphalt  
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# BMD - Stakeholder Partnership

## Asphalt Pavement Quality Improvement Committee, est. 2000

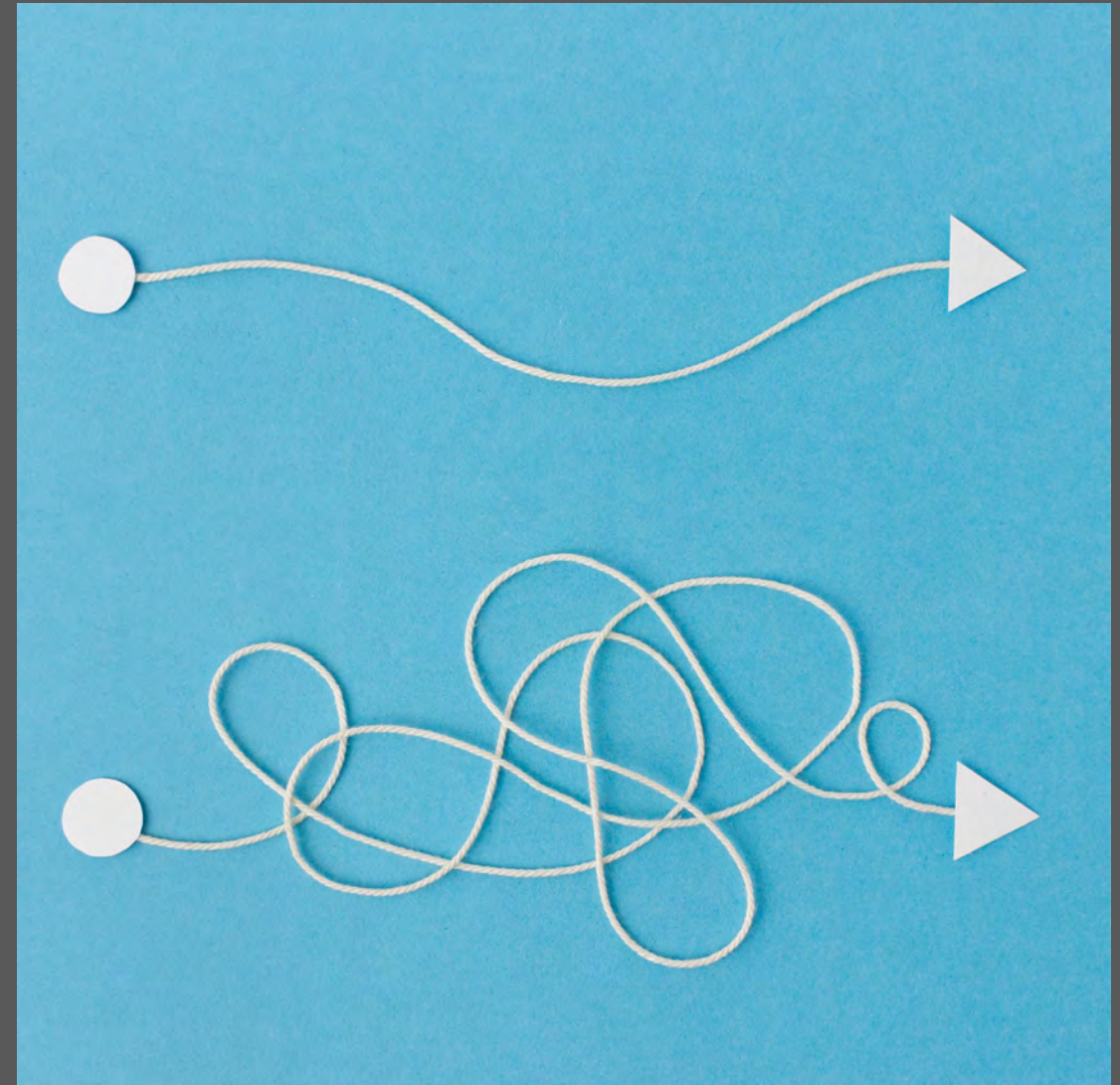
- Continuously improve and enhance the performance of asphalt pavements
- Identify priority topics; provide direction, review, analysis, and implementation
- Resolve other related issues of mutual concern



# BMD Workshop

## Task 2: Overall Planning

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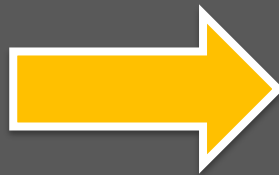
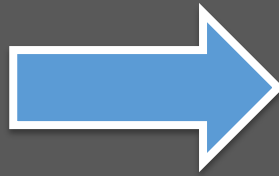
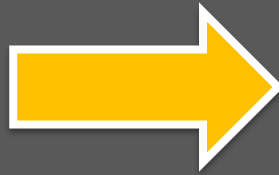


# BMD Workshop: Establishing Goals

- Varies by state:
  - For design
  - For acceptance
  - Mix types
    - Specialty mixes
    - Dense graded surface mixes
  - Scope
    - Interstates
    - High priority/investment projects
    - Long-life asphalt pavements
    - High tonnage (100,000+)



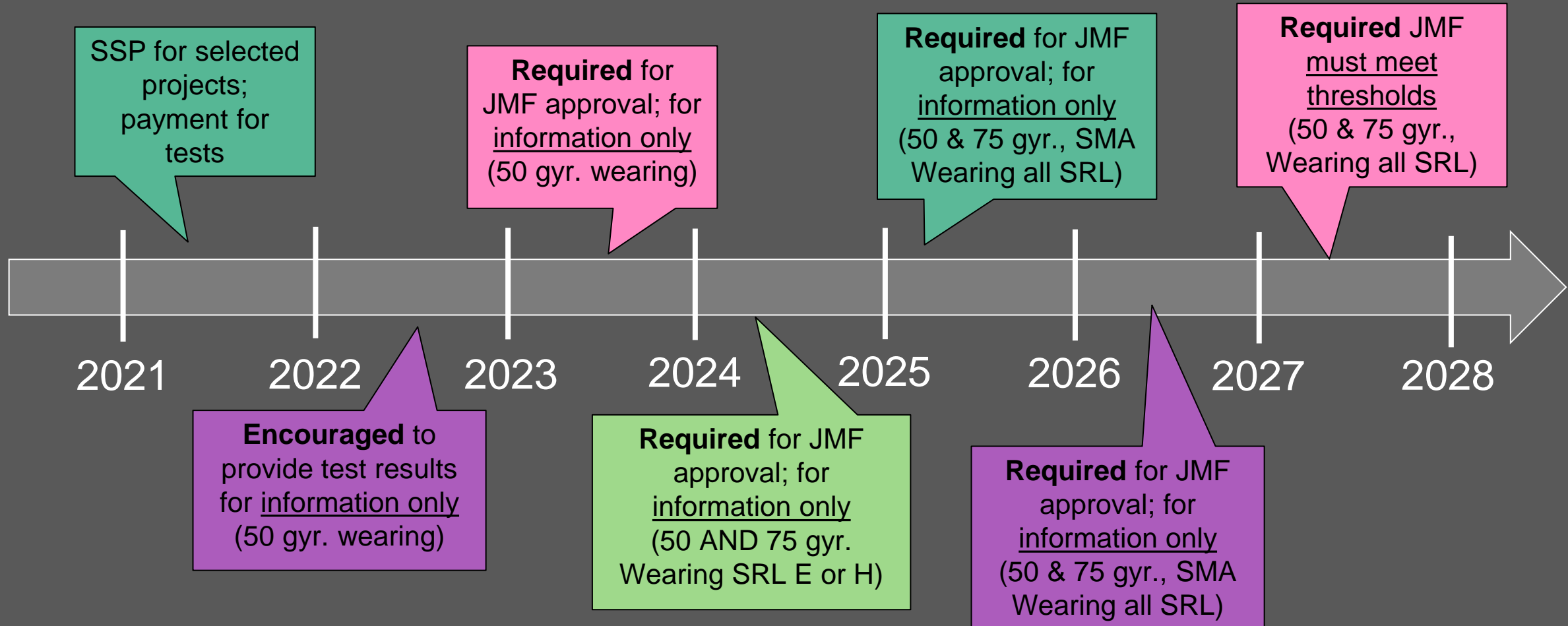
# BMD in PA



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# Balanced Mix Design

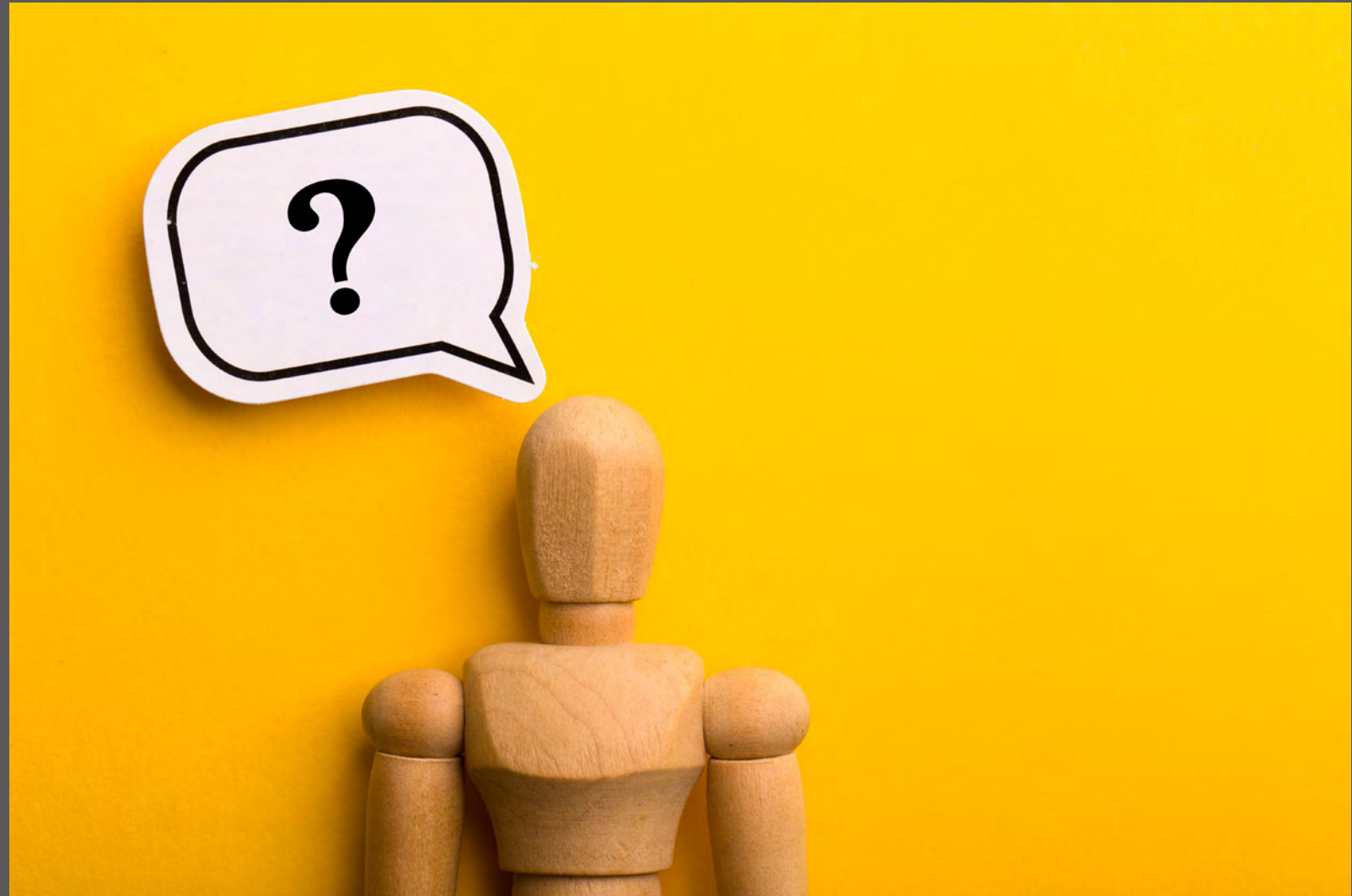
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# Thank you....

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