FHWA Pavement Performance Program

Chris Wagner, P.E.
Technical Director– P&M Technical Service Team
FHWA Resource Center

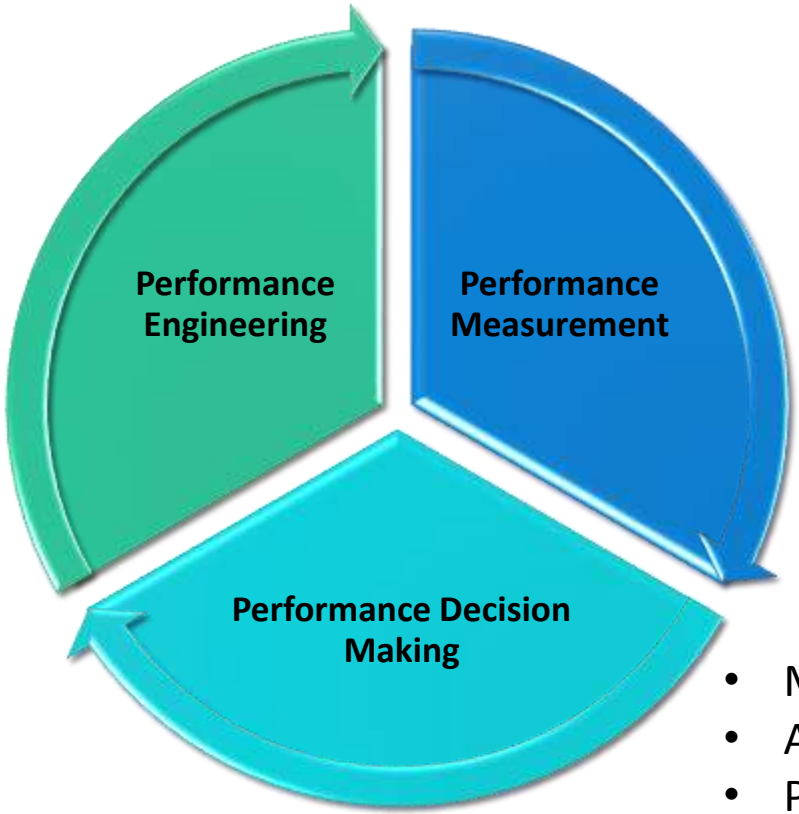
FHWA Pavement Leadership Team

- **Gina Ahlstrom**
  - Asphalt and Concrete Teams, Mobile Trailers
- **LaToya Johnson**
  - Asset Management, TPM, QA, Sustainability
- **Connie Yew**
  - Construction
- **Katherine Petros**
  - Construction
- **Jack Youtcheff**
  - Asphalt and Concrete Materials
- **Jean Nehme**
  - LTIP
- **Chris Wagner**
  - FHWA Resource Center

Source: Chris Wagner (FHWA)

2018 FHWA Pavement Performance Program

- Mixture Design
- Structural Design



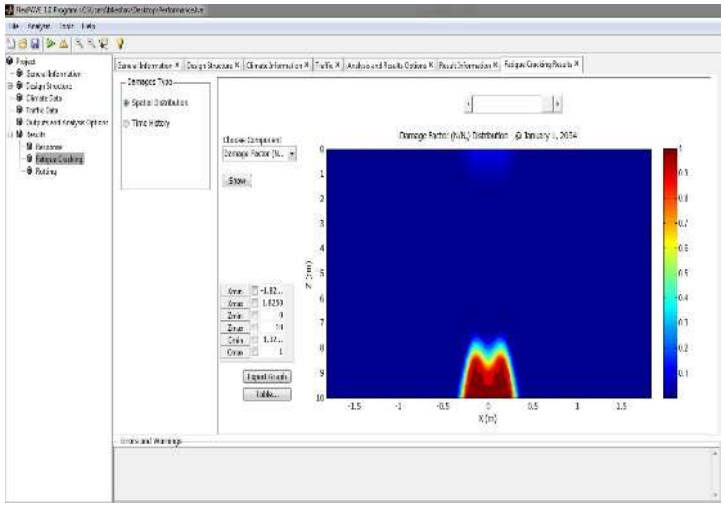
- Pavement Data
  - Collection
  - Analysis
  - Quality

- Materials Acceptance
- Asset Management
- Preservation (When/Where)
- Sustainability / LCA

Performance Engineering

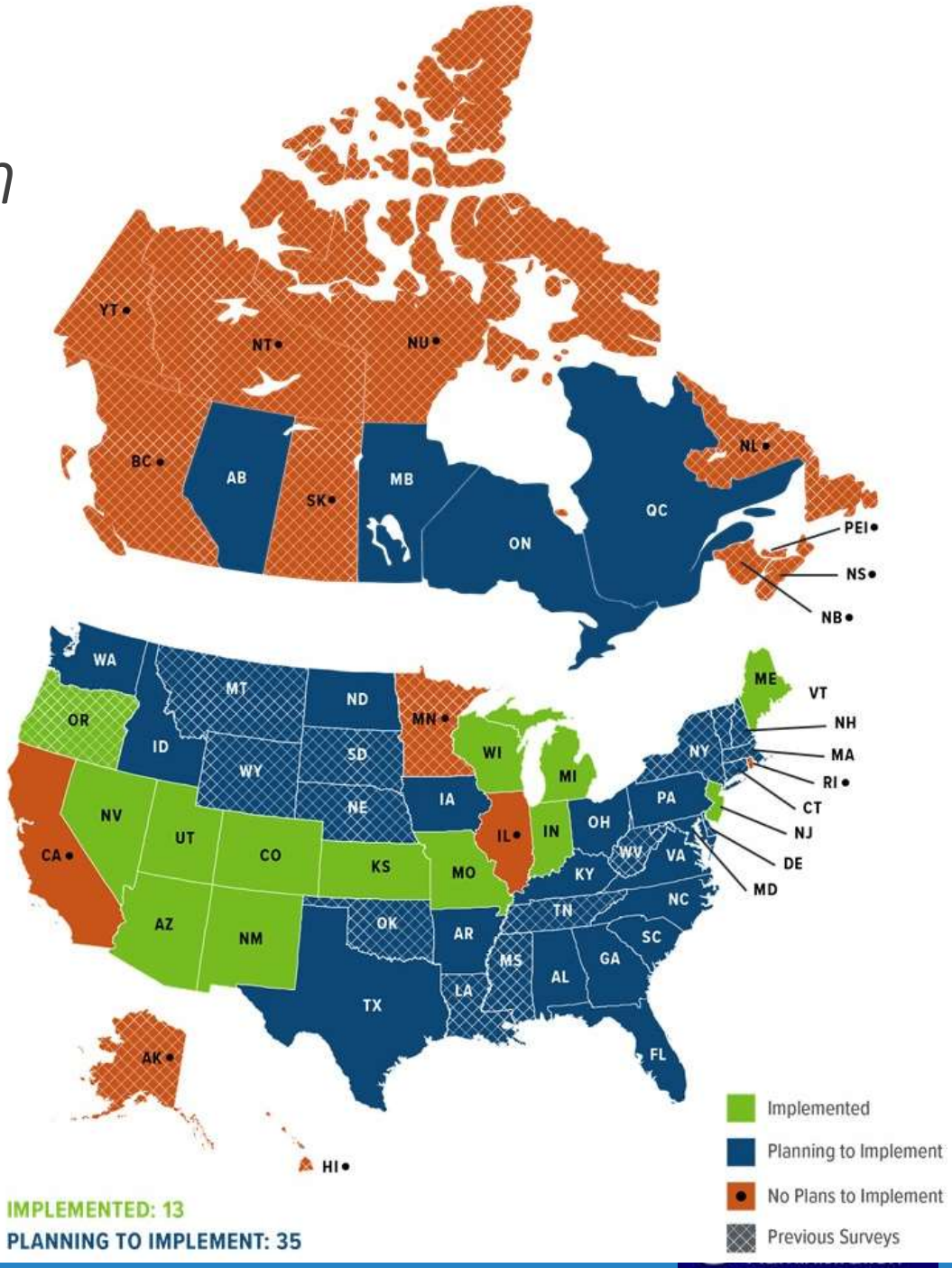
Pavement Design

- TPF 5(305) – AASHTO Pavement ME National Users Group Meeting
  - Nashville, TN November 7-8, 2018
  - "The place to be for all things ME" – 35 agencies participating
  - 2016 and 2017 Annual Report
    - https://www.pooledfund.org/Details/Study/549
- Practitioners Guide for ME Materials Testing (2019)
- Practitioners Guide for ME Design (2019)
- FHWA Research Flex Pave ME design
  - Asphalt ME analysis
  - Links to Performance Related Specs
  - Based on Visco Elastic Continuum Damage
  - October 2020 completion



Pavement ME Design Implementation (Post-2017 Mtg)

Asphalt Pavements and/or Overlays

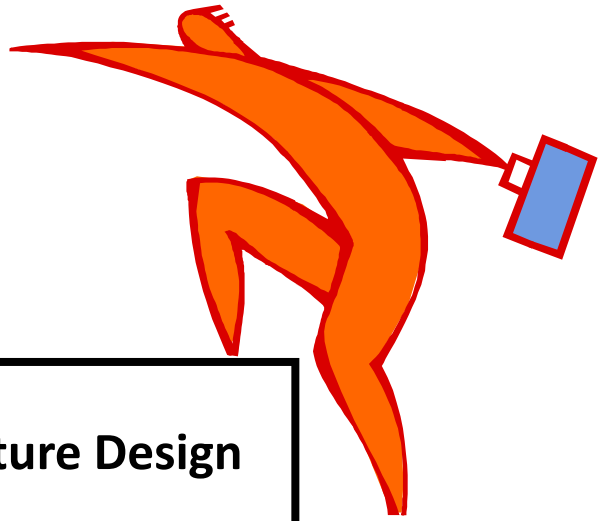


Source: Chris Wagner FHWA

Performance Engineered Mixture Design

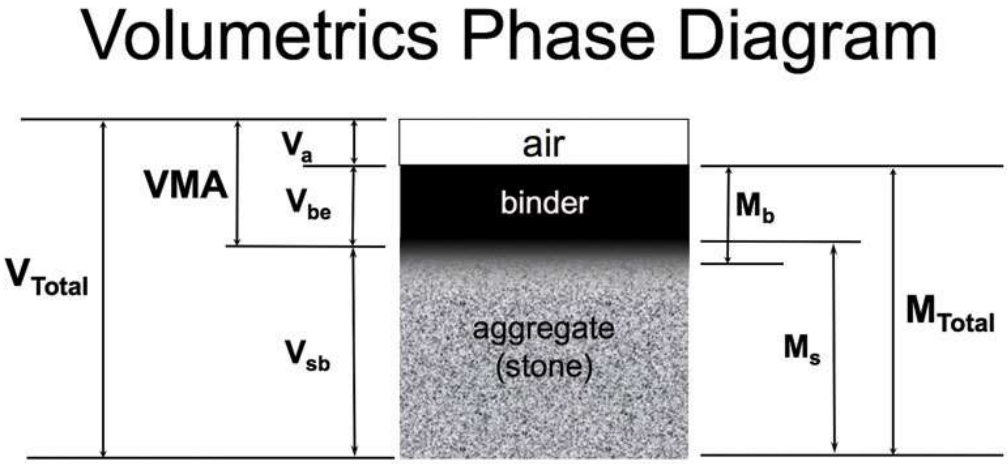
FOR ASPHALT

Performance Engineering



+5 yrs	**Link to Performance Modeling (PRS)**
1-5 years	**Performance Engineered Mixture Design**
Present	**Volumetrics (ACC) / Strength and Slump (PCC)**

Mixture Design
Prevalent current practice:



Source FHWA

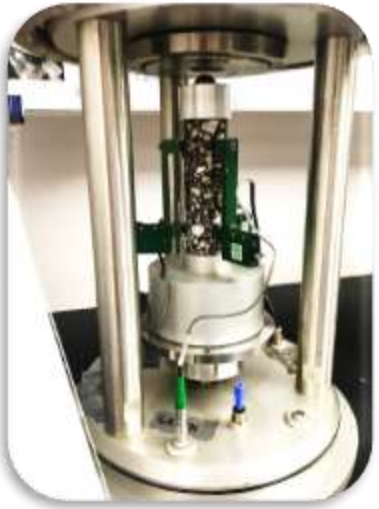
PEMD Goal

- Increased durability and performance of asphalt and concrete pavements
- Incorporate performance test(s) that address prevalent failure
  - Mix design, production, and ultimately acceptance
- Evaluate performance test(s)
  - Project NCHRP 20-07/Task 406 “Development of a Framework for Balanced Mix Design” – Example of test evaluation process
  - Recycled products in the asphalt mixture are of key importance
  - Consider test(s) that can also be used in pavement design modeling and PRS

Source FHWA

Hamburg Wheel Tracking

Cyclic Fatigue (small specimen)



Source FHWA

- Illinois iFit
- SCB
- IDEAL CT

Empirical/Index → **Fundamental/ Performance Model**

- Hamburg
- APA
- Texas Overlay
  - Marshal Stability
  - Hveem Stability

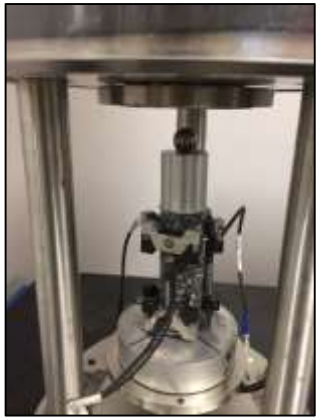
FHWA PRS System Inputs

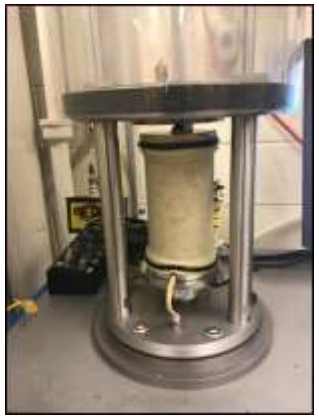
- Bending Beam Fatigue
- Cyclic Fatigue
- Dynamic Modulus
- Stress Sweep
- Disk Shaped Compact Tension
- Flow Number

AMPT Testing Standards (AASHTO)

Small Scale Specimens

- TP xx (2019) *Preparation of Small Cylindrical Performance Test Specimens Using the SGC and Field Cores*
- TP xx (2019) *Test for Determining the Dynamic Modulus for Asphalt Mixtures Using Small Specimens in the AMPT*
- TP xx (2019) *Test for Determining the Damage Characteristic Curve and Failure Criterion Using Small Specimens in the AMPT Cyclic Fatigue Test*
- *TP xx (2019) Test for Stress Sweep Rutting (SSR) Test Using the AMPT*
- *Thermal Cracking test in development*





Source: Chris Wagner

Test Development/Evaluation Process

1. Develop draft test method and prototype equipment
2. Evaluate sensitivity to materials and relationship to other lab properties
3. Establish preliminary field performance relationship
4. Conduct ruggedness experiment to refine its critical aspects
5. Develop commercial equipment specification and pooled fund purchasing
6. Conduct round-robin testing to establish precision and bias information
7. Conduct robust validation of the test to set criteria for specifications
8. Conduct training
9. Implement into engineering practice

Source: NCHRP Project 20-07/Task 406

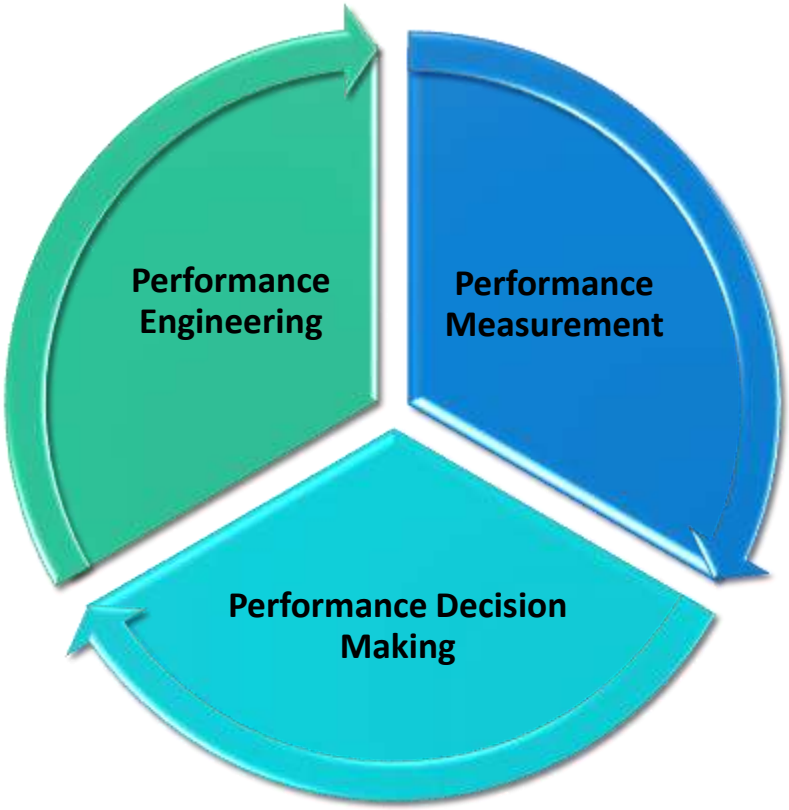
Performance Engineering
Mixture Design

Asphalt PEMD
- FHWA Mobile Asphalt Trailer
- TFHRC Performance Test Rodeo
  - Dave Mensching
- FHWA Asphalt Expert Task Group
  - (December 11th, 2018: Bellevue, WA)
  - Richard Duval

Concrete
- FHWA Mobile Concrete Trailer
- PEM Pooled fund TPF-5(368)
  - Mike Praul, Ahmad Ardani
- AASHTO PP 84

Source: FHWA

Performance Measurement

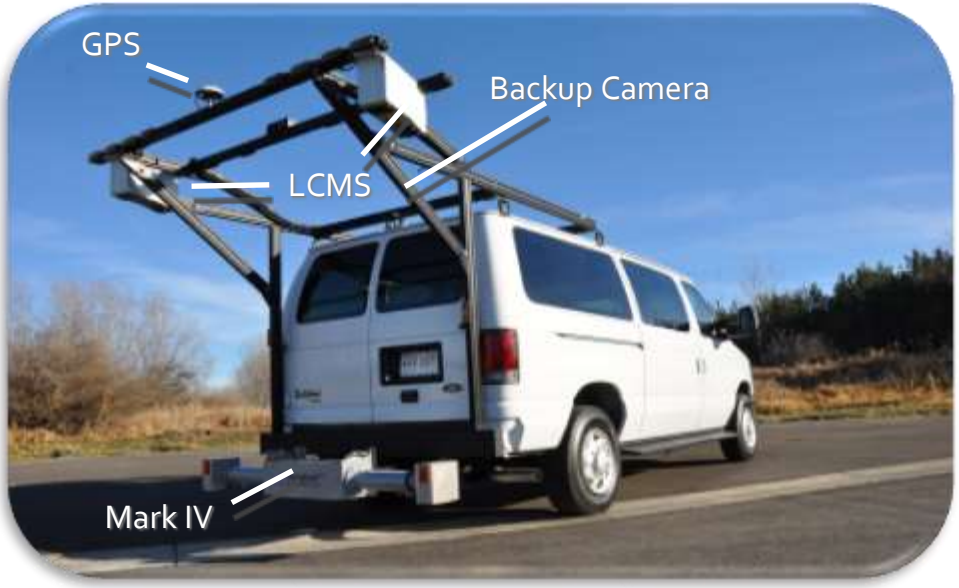


- Pavement Data
  - Collection
  - Quality
  - Analysis

Performance Measurement

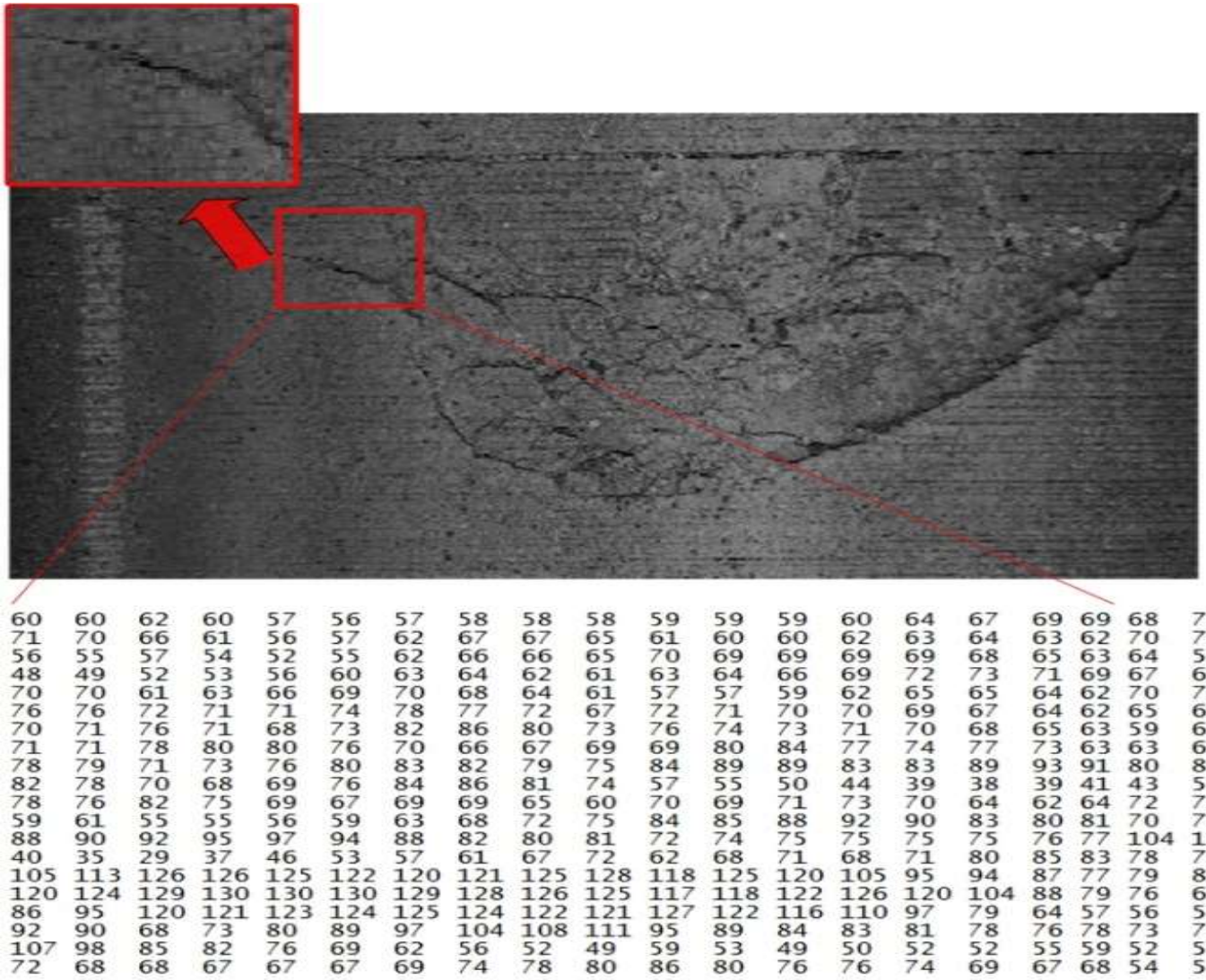
TPF-5(299) Improving the Quality of Pavement Surface Distress and Transverse Profile Data Collection and Analysis – Outline

- Rutting, Cracking, Faulting standardization



Kansas Collection Vehicle: Source FHWA

Methodology	Fast	Safe	Repeatable and Objective
Walking			
Windshield	✓		
Semi-Automated	✓	✓	
Automated	✓	✓	✓



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72	68	68	67	67	67	69	74	78	80	86	80	76	76	74	69	67	68	54	57

2D image with pixel data matrix source Oklahoma State Univ.

Summary of Projects

- TPF 5(299)
  - Development of **Standard Data Format** (2D/3D) Pavement Image Data
  - **Calibration, Certification, and Verification** of Rutting Measurements
  - Developing Guidelines for Cracking Assessment for **Use in Vendor Selection Process** for Pavement Crack Data Collection/Analysis Systems and/or Services
  - Jointed Concrete **Pavement Faulting Collection** and Analysis Standards
  - Guidance for **Quality Management of Pavement Surface Condition** Data Collection and Analysis
  - Managed by **Andy Mergenmeier**
- NCHRP
  - Determining Pavement Deformation Parameters and **Cross-Slope from Collected Transverse Profiles**
  - Measuring the Characteristics of Pavement Surface Images and Developing Standard **Practices for Calibration, Certification, and Verification of Imaging Systems**
  - **Standard Definitions for Comparable Pavement Cracking Data**

TPF 5(299) Participation

21 state DOT agencies & FHWA providing funds

Chairman: Kevin McGhee, VTRC

Pooled Fund Manager: Andrew.Mergenmeier@dot.gov

Pooled Fund Study SharePoint site:

- https://collaboration.fhwa.dot.gov/default.aspx

New Continuation Project:
http://www.pooledfund.org/Details/Solicitation/1471

Performance Reporting

- Fixing America's Surface Transportation (FAST) Act effective May 20, 2017
- January 2018 - State DOTs collect data for Interstate pavements that conform to the final rule (IRI, Rutting, Cracking %, Faulting, and Inventory)
- October 2018 – Baseline report and report 4 year targets for Interstate

Performance Target	Interstate Condition	Non-Interstate NHS Condition
Two-year	% Good	% Good
	% Poor	% Poor
Four-year	% Good	% Good
	% Poor	% Poor

https://www.fhwa.dot.gov/tpm/pubs/PM2PavementFactSheet.pdf

Performance Decision Making

Guidelines for Development and Approval of State Data Quality Management Programs (DQMP)

- Data collection equipment calibration and certification
- Certification process for persons performing manual data collection
- Data quality control measures to be conducted before data collection begins and periodically during the data collection program
- Data sampling, review and checking processes
- Error resolution procedures and data acceptance criteria

Performance Reporting Activities

- States Data Quality Management Plan Reviews
  - 15 States reviewed
- DQMP Peer Exchanges
  - Five regional meetings
- NHI-138009 – TPM for Pavements
  - GA, IN, MN, NJ, SD, SC, MT, WA, IL

Asset Management Plans

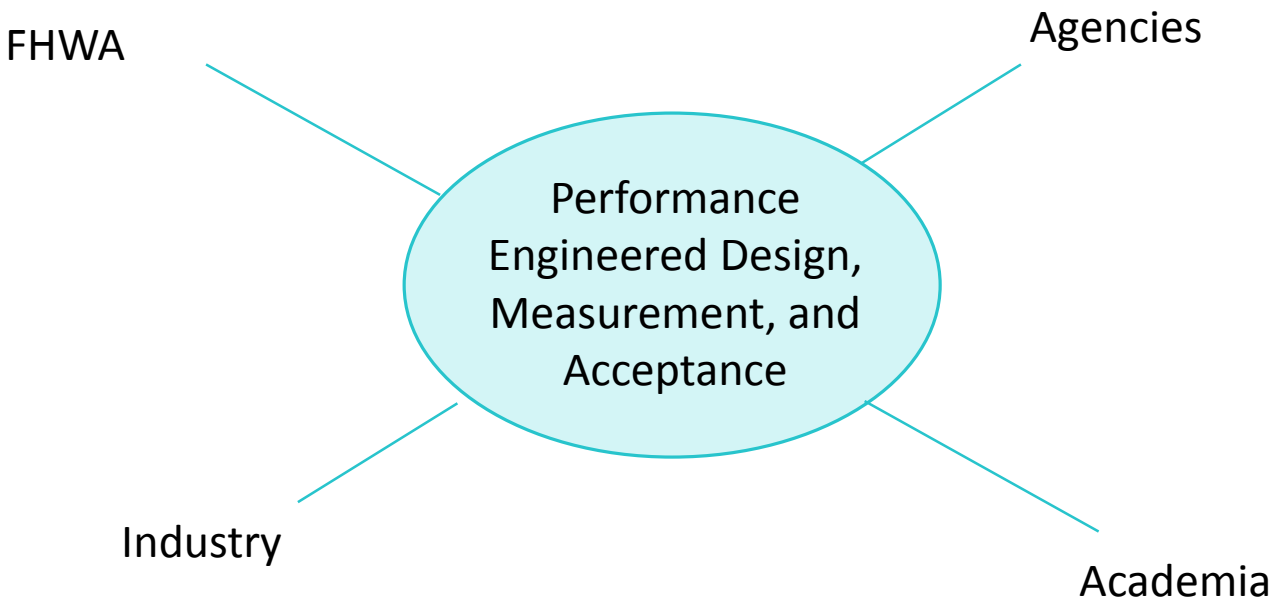
- **April 30, 2018,** the State DOT must submit to FHWA a State-approved initial TAMP
- **June 30, 2019** current "fully compliant" TAMP
- FHWA Division Office review/decision on **August 31st , 2019**
- **FHWA POC:** Division Office

https://www.fhwa.dot.gov/asset/

Resources

- FHWA Pavement Management & Performance
  - https://www.fhwa.dot.gov/pavement/mana.cfm
- Guidelines for Development and Approval of State DQMP
  - https://www.fhwa.dot.gov/pavement/management/pubs/dqmp.pdf
- FHWA Asset Management
  - https://www.fhwa.dot.gov/asset/
- Transportation Performance Management
  - https://www.fhwa.dot.gov/tpm/

A Coordinated Approach to Implementation



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Source: Chris Wagner