FHWA Asphalt Pavement Program

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PAVEMENT MATERIALS TEAM LEADER
OFFICE OF ASSET MANAGEMENT, PAVEMENTS, AND CONSTRUCTION

Office of Infrastructure

Who We Are

Richard Duval - program coordination for Performance Engineered Mixtures and Design and Performance Related Specifications
Tim Aschenbrener - asphalt pavements, Asphalt QA, increased density, asphalt recycling
Vacant - asphalt engineer, Mobile Asphalt Testing Trailer
Mike Prouj - concrete pavements and materials, concrete QA, Mobile Concrete Trailer
Sam Tyson - long-life concrete pavement strategies (CRCP, PCP), concrete repair strategies, concrete recycling and industrial byproducts, concrete overlays

What We Do

All things Asphalt Materials
All things Concrete Materials
Technologies for pavements and materials
Movement toward Performance Engineered Mixture Design - Asphalt and Concrete
Accelerated Implementation and Deployment of Pavement Technologies Program (under FAST Act)
Our Main Programmatic Focus

**PERFORMANCE ENGINEERED MIXTURE DESIGN**

Motivation for PEMD

- Increase in premature deterioration
- MAP-21 and FAST ACT legislation focus on performance
- Desire by public agencies and industry to move toward performance
  - Optimize mixture designs for traffic, climate, environment
  - Improved durability
  - Sustainability - recycled materials, reducing footprint, etc.
  - Innovative materials
- SHRP-SUPERPAVE original program intent – focus on performance and not fully realized
- Testing technology advancements
- Changes in agency and industry skills and personnel levels

Performance Engineered Mixture Design (PEMD)- ASPHALT

Key characteristics:
- Design and field control of mixtures around engineering properties related to performance
- Move from index based approaches and towards a more fundamental engineered approach
- Develop performance test procedures
- Develop performance specifications
- Starting point – Asphalt Mixture Performance Tester (AMPT) index testing approach and/or Performance Volumetric relationship (PVR) acceptance program.

The End Goal

- Design and field control of mixtures around engineering properties related to performance.
- Performance Related Specifications (PRS)
- Performance testing in the field
- Validate models and refine mixtures via construction QA and asset performance monitoring

The Journey to PEMD - Asphalt

2002
- NCHRP-9-18, Task C Simple Performance Test for Superpave Mix Design Developed

2006-10
- FHWA Development of Asphalt Mixture Performance-Related Specifications Model
- 2008-10 AMPT Pooled Fund

2017-20
- FHWA Suggested and Interlaboratory Studies for Asphalt Mixture Performance Tester (AMPT) Cyclic Fatigue Test

1988-97
- Superpave

2003-11
- NCHRP-526, Simple Performance Tension for Superpave Mix Design Implementable

2010-11
- NCHRP-526 Made the Simple Performance Tension for Superpave Mix Design Implementable

2013-19
- FHWA Development and Deployment Performance-Related Specifications Model

2015-17
- AASHTO TP 5-178 AMPT Pooled Fund

Cyclic Fatigue (small specimen)

- Hamburg Wheel Tracking
- Empirical/Index
- Fundamental/Performance Model
- Bending Beam Fatigue
- Dynamic Modulus
- Stress Sweeps
- Flow Number

- Shanghai Compact Tension
- Illinois iFit
- SCB
- IDEAL CT
- Hamburg
- APA
- Texas Overlay
- Marshal Stability
- Hveem Stability

August 2010
- AASHTO TP 5-178 Submitted for AMPT Small Specimen Cyclic Fatigue & Stress Sweeps Bending Tests
Asphalt Mixture Performance Tester (AMPT)

- Servo-hydraulic loading machine
- Temperature range from 4° to 70°C
- Computer-controlled device
  - Software built-in for various test procedures
- Fundamental tests
  - Stress and strain modeling
  - "Bulk testing"
  - PASSPave™ and Pavement ME Design

Why Performance Related Specifications?

- Improved Design-to-Construction Relationship
- Rational and Defendable Pay Factors
- Improved and Fundamental Focused Testing
- Improved Tradeoff Analyses
- Improved Understanding of Performance
- Improved Quality Focus
- Improved Distinction in Roles and Responsibilities
- More Innovation

Current QA Specification

Acceptable Quality Characteristics → Pay Adjustments

- Strength, Air Voids, VMA, Density, Thickness, Smoothness, etc.
- Pay Factors

Performance Based Specifications

Fundamental Engineering Properties → Predicted Life → Pay Adjustments

- Strength Modulus, Cracking Property, Rutting Property
- As-Designed vs. As-Constructed
- Incentive or Dis-incentive

Performance Related Specifications

Acceptable Quality Characteristics → Fundamental Engineering Properties → Predicted Life → Pay Adjustments

- Air Voids, Density, Thickness, Mixture Properties, etc.
- Strength Modulus, Cracking Property, Rutting Property
- As-Designed vs. As-Constructed
- Incentive or Dis-incentive

Planned Technical Resources

PEMD
- Outline
- Relationship to QA

Tests
- Fundamental/Index
- Performance
- Guidelines on use

PRS
- Asphalt
- Concrete
Need approved pictures with source - ask Richard
Ahlstrom, Gina (FHWA), 10/24/2018
FHWA Mobile Asphalt Testing Trailer

- Field visits
  - Kickoff meeting
  - Open house
  - Hands-on training
  - Mix design replication
  - Shadow QA testing
  - AMPT testing
  - Binder grading
  - Binder performance testing
- Training
- Workshops & Conferences

What’s Next?
- Implement shadow testing on field projects to:
  - Increase State and industry familiarity with PEMD/AMPT/PRS concepts and new tests
  - Gather field data to refine new tests and continue to develop testing technologies that support PEMD/AMPT/PRS concepts
  - Provide actual experience to help develop practical specifications
- Training for both engineers and technicians on new tests
- Develop performance specifications
- Provide guidance on addressing problems today
- Pooled Fund Projects Ongoing- AMPT

Performance Engineering
Mixing Design

3-5 yrs

Link to Performance Modeling (PRS)
Performance Engineered Mixtures Design (PEMD)
Volumetrics (ACC)

A Coordinated Approach to Implementation

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