NCHRP 9-43
Mix Design Practices for Warm Mix Asphalt

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Objective

- To develop a laboratory mixture design and analysis procedure for WMA
  - Compatible with HMA procedures
  - Address wide range of warm mix processes
    - Current
    - Future

Research Team

- Advanced Asphalt Technologies, LLC
- UMass, Dartmouth
- Western Research Institute
- Quality Engineering Solutions, Inc.

NCHRP 9-43 Tasks

- Phase I
  - Task 1. Evaluate WMA Design and Analysis
  - Task 2. Develop Design Procedure for WMA
  - Task 3. Select Performance Tests
  - Task 4. Prepare Phase I Report

NCHRP 9-43 Tasks

- Phase II
  - Task 5. Conduct Laboratory Sensitivity Experiments
  - Task 6. Field Validation
  - Task 7. Prepare Warm Mix Design Workshop
  - Task 8. Prepare Final Report

Status

- About 3 months behind
- Phase I nearing completion
- Phase I Report to Panel in February, 2008

WMA Mix Design & Analysis

- Design Mixture Based on AASHTO M323 Requirements
  - Materials Selection
  - Volumetric Design
- Standard Practice for WMA
  - Similar to AASHTO R35 for Volumetric Design
    - Modifications to address WMA
  - Optional Performance Tests
    - Modulus
    - Fatigue Cracking
    - Thermal Cracking

Key Differences Material Selection

Item	HMA AASHTO R35	WMA Proposed
WMA Process	NA	Producer Selected
Gradation	AASHTO M323	AASHTO M323
Aggregate	AASHTO M323	AASHTO M323
Binder Selection	PG Grade	Modified PG Grade
RAP	AASHTO M323	Under Study

Key Differences Volumetric Design

Item	HMA AASHTO R35	WMA Proposed
Mixing & Compaction Temperatures	Viscosity	Coating Workability Compactability
Specimen Preparation	Standard	Process specific Short-term aging
Optimum Binder Content	AASHTO M323 Volumetrics	AASHTO M323 Volumetrics
Moisture Sensitivity	AASHTO T283	AASHTO T283
Rutting Resistance	None	Flow Number Test

Performance Testing

- Moisture Sensitivity
  - AASHTO T283
- Rutting Resistance
  - Flow Number Standard Proposed
- Mixture Stiffness
  - Dynamic Modulus AASHTO TP62
- Fatigue Cracking
  - Cyclic Tension-Compression (Under Development)
- Thermal Cracking
  - IDT Creep and Strength AASHTO T322

Simple Performance Test System

- Servo-Hydraulic Machine
- HMA Testing
  - Modulus
  - Repeated Load
  - Fatigue
- Temperature Control
  - 4 to 60 °C
- Confinement
  - 0 to 210 kPa

Suggestions/Questions

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