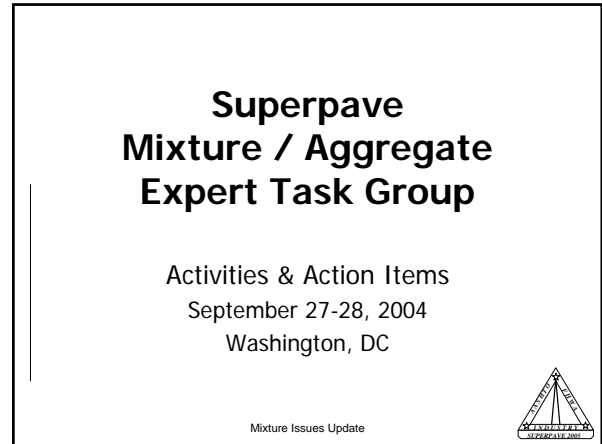


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## Role of ETG

- Provide technical advice on Superpave mixture & aggregate issues;
- Provide technical input to the FHWA on Superpave mixture & aggregate projects;
- Identify potential improvements to mixture & aggregate specification/standard test methods;
- Identify needed standards; and
- Provide a forum for government / industry discussion of emerging issues.

Mixture Issues Update 3

## Superpave (HMA) Mixture Issues

- **Gyratory Compactor Internal Angle Issues**
- **Mix Volumetrics - NCHRP Projects**
- **Simple Performance Testing**
- **Other Performance Testers**

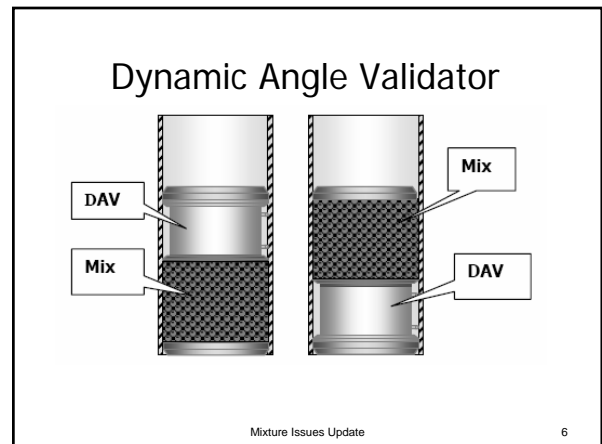
[www.fhwa.dot.gov/pavement](http://www.fhwa.dot.gov/pavement)

Mixture Issues Update 4

## Internal Angle of Gyration

- Currently T312 allows for gyratory calibration using either internal or external angle measurements.
- Internal angle of gyration calibration
  - Potentially time-intensive  
Up to 1 day for a calibration
  - Affected by mixture stiffness?  
Requiring recalibration for different mix types

Mixture Issues Update 5



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## Superpave Gyrotory Compactor

- Study conducted for ETG and FHWA under Asphalt Institute Contract  
Research Team:  
Dr. Kevin Hall, University of Arkansas  
Mike Anderson & Mike Huner, Asphalt Institute
- Determination and Calibration of the Dynamic Internal Angle of Gyration Without Using HMA

Mixture Issues Update

7

## Mechanical Simulation of an Asphalt Mixture – RAM



RAM - Rapid Angle Measurement Device (Pine)

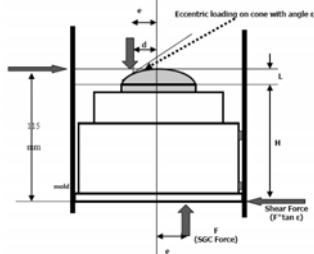
Mixture Issues Update

8

## Mechanical Simulation of an Asphalt Mixture – HMS



HMS - Hot-Mix Simulator (TestQuip)



Mixture Issues Update

9

## Superpave Gyrotory Compactor Calibration

- Determine the relationship between mix stiffness and eccentricity.
- Establish and average mix eccentricity – standard mix stiffness for calibration
- Compare the RAM and the HMS
- Standard mix-less procedures
- Future?? - Only internal angle measurement recommended in T312
- Produce document on gyrotory maintenance



Mixture Issues Update

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## Discussion

- The devices are repeatable
- The devices appear to react different than mix
- The RAM's defined eccentricities do not consistently match that of the PDA



Mixture Issues Update

11

## 2003 SOM Ballot Items Printed in 2004 Standards

- M323-04 Specification for Superpave Mix Design  
– Previously MP2
- R35-04 Practice for Superpave Volumetric Design  
– Previously PP28



Mixture Issues Update

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### 9-25: Requirements for Voids in Mineral Aggregate for Superpave Mixtures

Which volumetric design criterion best ensures adequate durability and performance: VMA, VFA, or calculated binder film thickness?

*Advanced Asphalt Technologies (March 2004)*

Mixture Issues Update

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### 9-31: Air Void Requirements for Superpave Mix Design

Should design air void content vary with traffic loading and climatic conditions?

*Advanced Asphalt Technologies (March 2004)*

Mixture Issues Update

14

### 9-25/9-31 Preliminary Approach to Specification Modification

- Set target VMA as a function of calculated aggregate surface area and allowable range, target  $\pm 1.0$  %.
- Design air voids 3 to 5 %.
- Minimum  $V_{be}$  / VFA requirements:
  - 10% / 70% within 100 mm of surface
  - 8% / 65% otherwise

Mixture Issues Update

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### 9-9(1): Verification of Gyration Levels in the $N_{design}$ Table

Preliminary Findings:

- Current  $N_{design}$  levels slightly too high based on results from 40 field projects and 32 NCAT Track sections.
- Modified binders significantly reduce rate of densification.  
*NCAT (August 2005)*

Mixture Issues Update

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### 9-33: A Mix Design Manual for Hot Mix Asphalt

Update method in AI Manual SP-02:

- Simple performance test(s).
- As-delivered M-E design guide performance models and software.
- New volumetric criteria.
- Framework for integrated mix and structural design.

*Advanced Asphalt Technologies, LLC (August 2006)*

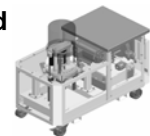
Mixture Issues Update

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### Status of TP 62-03

Method for "Determining Dynamic Modulus of Hot Mix Asphalt Concrete Mixtures"

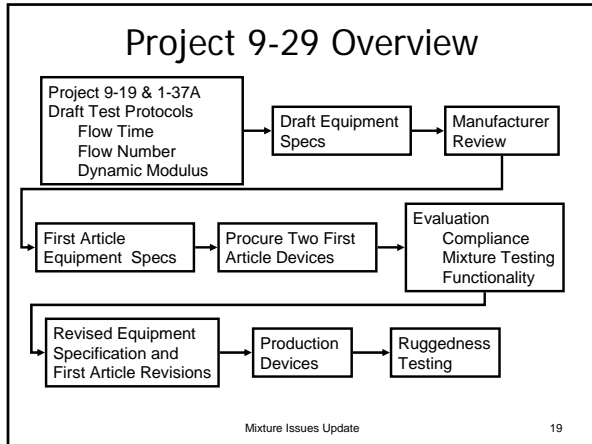
- Coordinate ETG w/ NCHRP 9-29 Simple Performance Tester
- Task Group – Propose Revisions
- Revised Draft Test Method
- Develop Test Criterion



Mixture Issues Update

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### Simple Performance Test System

- Tests
  - Flow Time
  - Flow Number
  - Dynamic Modulus
- Modulus
  - 10,000 psi to 2,500,000 psi
- Temperature
  - 4 to 60 °C
- Confinement
  - to 30 psi

Mixture Issues Update 20

### Simple Performance Test System

- Three Vendors
  - Interlaken (also First Article)
  - Shedworks/Industrial Process Controls (also First Article)
  - EnduraTec
- Production Unit Cost
  - \$45,000 to \$50,000

Mixture Issues Update

### Summary of reviewer comments & recommendations

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Summary of comments from many reviews

- Number of Test Replicates
- Specimen Instrumentation
- Temperature Equilibrium Time
- Computation of E\*
- Master Curve Development

Mixture Issues Update 22

### Revision of Superpave Tests

Task group review ...

**AASHTO T 320 Superpave Shear Tester**  
**AASHTO T 321 Beam Fatigue Test**  
**AASHTO T 322 Indirect Tensile Test**

Mixture Issues Update

### Next ETG Meeting:

Spring 2005

Mixture Issues Update 24

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**Thank You!**

## FHWA Pavements Program

- Optimize Pavement Performance
- Advanced Quality Systems
- Enhanced Surface Characteristics
- Stakeholder Involvement
- Environmental Stewardship



Mixture Issues Update