



# Update FHWA Asphalt Program

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# Program Focus Areas

- Pavement Design and Analysis
- **Materials and Construction Technology**
- Pavement Management and Preservation
- Pavement Surface Characteristics
- **Construction and Materials Quality Assurance**
- **Environmental Stewardship**

# Materials and Construction Technology

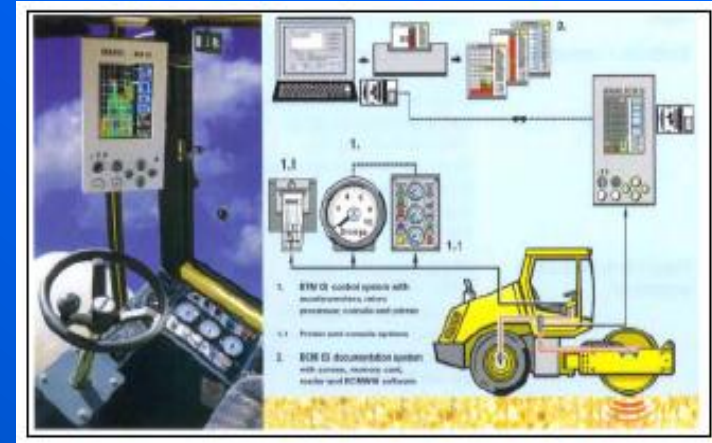
- Provide Mobile Asphalt Lab
- Support National Asphalt R&D Programs
- Advance New Design Methods
  - Asphalt Mixture Performance Tester
    - Field validation & mix quality verification
  - Binder Testing Equipment
    - Effects of modified binders on mix
  - Aggregate Imaging System
    - Testing program & implementation



# Materials and Construction Technology

## Example Asphalt Initiatives:

- Automated Plant Controls
- Intelligent Compaction
- Warm Mix Asphalt



## R&D Accelerated Load Facility

- Specialized research
- Performance prediction







# Construction & Materials Quality Assurance

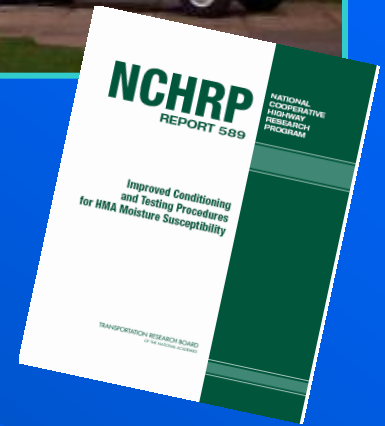
## Initiatives:

- Guidance on 23 CFR 637
- Use of Contractor Test Results & Sampling Plans
- State Process Reviews (to date in 28 States)
- Develop Training Materials & Sponsor Workshops
- Develop Analysis Tools
- Promote Advanced Quality Systems
  - Quality Assurance Specs
  - Performance Based Specs
  - Warranty Specs



# Testing Assistance

- Mobile Laboratories
  - On site field testing
    - 4-6 States/year
  - Hands on training
  - Showcase equipment
    - Superpave, AAPT, MSCR, etc.
  - Support research with field data
    - Provide data to efforts within FHWA and also to NCHRP projects



# Environmental Stewardship

*Improve sustainability of pavement materials*

## Initiatives:

- Participate on RAP and WMA Expert Task Groups
- Support AASHTO Recycling Initiatives
- Development of Applications to Reuse Materials
- Develop Publications and Workshops
- Develop Tools (Recycling Took Kit)
- Support Development of Specs
- Support Green Highways Programs





# Use of Recycled Materials

- Increased RAP Usage

[www.moreRAP.us](http://www.moreRAP.us)

- Effective Utilization of RAS

[http://shinglerecycling.org/images/stories/shingle\\_PDF/ShingleBPG%2010-07.pdf](http://shinglerecycling.org/images/stories/shingle_PDF/ShingleBPG%2010-07.pdf)

<http://store.hotmix.org/index.php?productID=624>

- Recycled Materials Resource Center

<http://www.rmrc.unh.edu/>

- FHWA Policy on use of Recycled Materials



# Technology Partnerships

- Expert Task Groups
  - Asphalt Mixture & Asphalt Binder
  - Asphalt Modeling
  - Warm Mix Asphalt
  - RAP
- Cooperative Agreements
  - National Center for Asphalt Technology
  - Asphalt Institute
  - National Asphalt Pavement Association





# Asphalt Mix ETG – Key Activities

- AASHTO SOM Input (Harvey)
- SGC Operational Issues (Dukatz/D'Angelo)
- AMPT Flow Number, NCHRP 9-29 (Bonaquist)
- Specific Gravity Task Force (West)
- Mix Design Manual, NCHRP 9-33 (Christensen)
- IDT E\* Ruggedness (Kim)
- Longitudinal Joint Construction (LaFleur)  
National Survey Results (Harman)

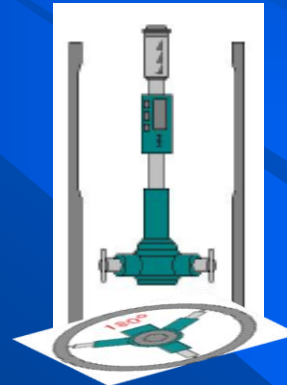
# Subcommittee on Materials Standards Update – ETG Input

- T 312 – 08 Preparing and Determining the Density of HMA Specimens by SGC
  - Internal Angle Only ( $1.16 \pm 0.02^\circ$ )
  - Only TP 71 Simulated Loading
  - Precision and Bias Based on External Angle
- Asphalt Mixture Performance Tester Asphalt
  - End Note Reference to NCHRP 9-29 and the Simple Performance Tester
  - Published as TP 79, PP 60, PP 61, and PP 62



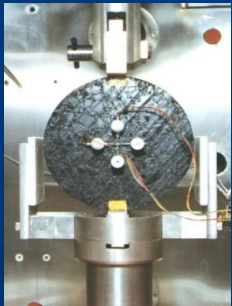
# Superpave Gyratory Compactor Operational Issues

- Guidance document, publication as a TRB Circular through subcommittee AFK50 provide background information on the development of internal angle measurements.
- T312 Proposed Annex for Evaluating Molds



# Superpave Gyrotory Compactor Operational Issues

- $N_{design}$  adjustments
- Latest study 9-9(1) recommendations
- 9-33 maintain existing  $N_{design}$  criteria
- Performance Testing Evaluation





# Asphalt Mix Performance Tester




- NCHRP 9-29
- Evaluate mixture rutting ( $F_n$ ) and fatigue response ( $E^*$ )
- Relatively inexpensive and easy to use
- Provides MEPDG input





# Asphalt Mix Performance Tester (2009/2010)

- Develop pooled fund for training and equipment purchase of the equipment
- Technician training for operation of the equipment (AAT contractor/NCAT Lab)
- Remaining issue with determination Flow Number



# Asphalt Mix Performance Tester Flow Number (Fn)

- Developed as indicator of rutting potential
- 9-33 relationship flow number/maximum traffic with lab mixes (field mix issue-age)
- Issues
  - High temperature 50% reliability PG LTPPBind 3.1
  - Confined/unconfined
  - Load - various levels have been used



# Flow Number -- What's Next

- Too early to prepare standard criteria
- Continue to monitor work in progress
- Encourage investigation of
  - Relationship to rutting performance
  - Sensitivity to mix design factors
  - Use of both confined and unconfined tests on the same materials



# Specific Gravity Task Group

## Task Group Objectives:

- Identify issues with current AASHTO standards - Recommendations regarding changes and/or new methods
- Evaluate alternate methods
- Guidance document, publication as a TRB Circular





# Specific Gravity Task Group SOM Recommendations.....

- T166 (Bulk Specific Gravity)
  - Changes sent to replace reference to paraffin method with vacuum sealing method
  - Change water absorption limit to 1.0%
  - Precision estimates from NCHRP 9-26
- Effects on Volumetrics - possible:
  - Design VMA measurement increases by 0.5%
  - In-place density measurement (%Gmm) increases by 1.0% for mixes





# 9-33: Mix Design Manual for HMA

Final report January 2010 (AAT)

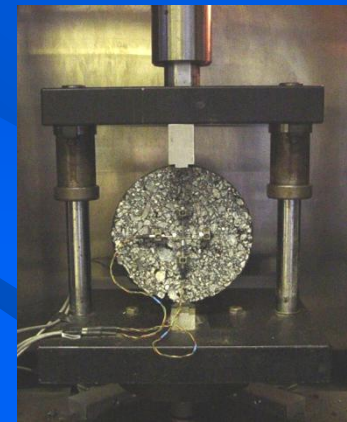
- Test procedures for dense, gap and open graded mixes
- HMA performance tests
- Criteria developed with M-E Design Guide
- Final critical issues being evaluated:
  - FAA values and CAA values
  - Flat & elongated requirements
  - Performance Tests
  - Design VMA values
  - Design gyration levels
  - RAP



NCHRP

# IDT Testing for $E^*$

- Current  $E^*$  test protocol not adequate for testing field cores for forensic studies and rehabilitation design
- Need for  $E^*$  test protocol using IDT
- NC State developed IDT testing mode
- Draft specifications developed
  - Specimen fabrication
  - Master curve generation
  - IDT  $E^*$  testing/procedural ruggedness





# Binder ETG - Key Activities

- Low Temperature Task Group
  - ABCD Low Temperature (Sang Soo Kim)
- Fatigue Task Group
  - Response of PMA (Bahia)
- High Temperature Task Group
  - MSCR Test Method(D'Angelo/Anderson)
- Polyphosphoric Acid (D'Angelo)
- Other Topics
  - Recovered Motor Oil (Youtcheff)
  - DSR Sample Preparation (VanFrank)
  - Temperature Equilibrium (Anderson)

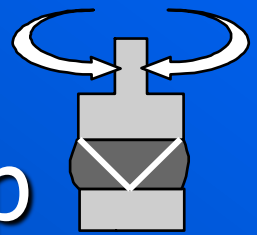
# Advances in Binder Tests

- **Low Temperature Cracking**
  - ABCD Device
  - Sang Soo Kim (Ohio University)
  - Status: Initial Shakedown and Round Robin Underway



# Binder Fatigue Testing

- Binder Yield Energy Test (BYET)
- Draft of an AASHTO Procedure
- Multiple labs to test for validation
- Modeling challenges remain
- ETG review by Fatigue Task Group





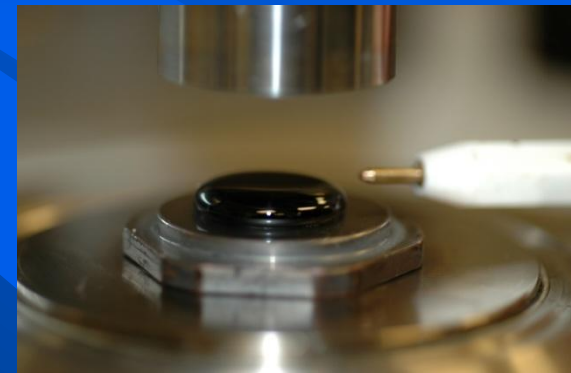
# Fatigue Testing – another approach



- Fatigue testing on HMA samples in the DSR
- How does polymer modification effect fatigue properties of binders.
- Does the percentage of PM significantly change the fatigue response of binders.

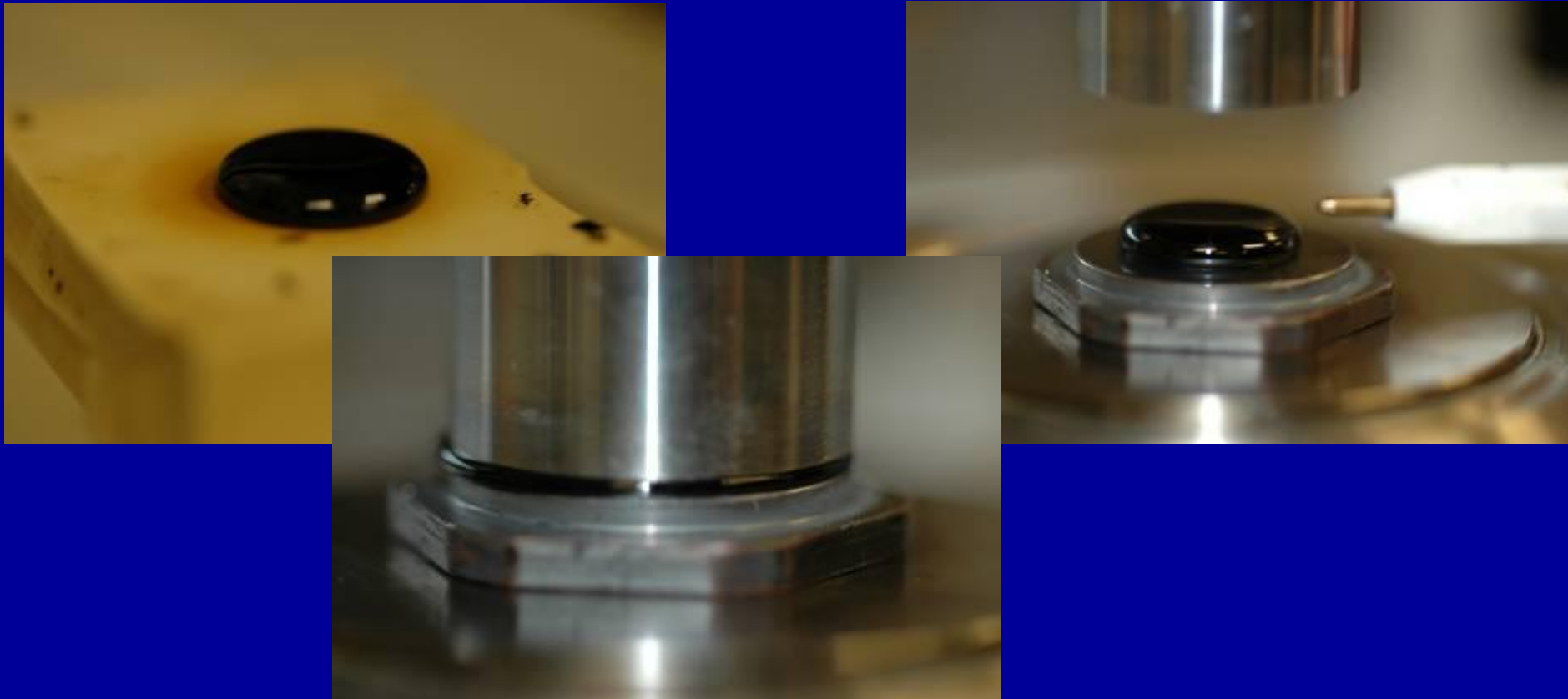
# Multi-Stress Creep and Recovery Test Method

- Inadequacy of Superpave high temp  $G^*/\sin\delta$  to predict modifier behavior
- Testing is done at actual pavement temperatures
- New MSCR High Temperature Spec (M320 Table 3) correlates to rutting for both neat and polymer modified binders
- Various implementation efforts and specification refinement

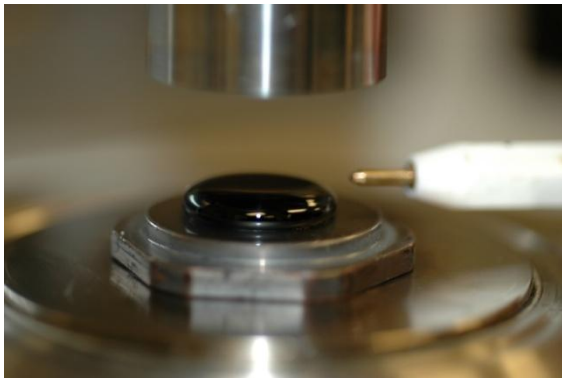


# Multi Stress Creep and Recovery

- Sample prep is exactly the same as the existing rolling thin film oven test and dynamic shear rheometer (RTFOT DSR).



**•Standard Test  
Procedure developed for  
AASHTO TP70-08**



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**Standard Method of Test for**

**Multiple Stress Creep Recovery  
(MSCR) Test of Asphalt Binder  
Using a Dynamic Shear Rheometer  
(DSR)**

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AASHTO Designation: TP 70-08



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**•Developed as Table 3 for  
ASSHTO M 320-09**

Original					
DSR G*/sinδ Min 1.0	64				
RTFOT					
64 Standard MSCR3.2 <4.0	[(MSCR3.2 – MSCR 0.1)/ MSCR 0.1] < .75	64			
64 Heavy MSCR 3.2<2.0		64			
64 Very heavy MSCR3.2 <1.0		64			
PAV					
S grade DSR G* Max 5000	28	25	22	19	16
H & V grade DSR G* Max 6000	28	25	22	19	16

**Standard Specification for  
Performance-Graded  
Asphalt Binder**


**AASHTO Designation: M 320-09**



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# Status

- 
- Currently Table 3, SOM balloting as stand alone
  - Regional workshops Asphalt Institute and FHWA
  - Asphalt Institute and FHWA efforts on testing Precision and Bias
  - Developing user literature
  - User Producer Groups “round robin” repeatability testing
  - Provide users with alternatives to the empirical Superpave Plus tests



# Technology Partnerships

- Current Pooled Funds
  - AMPT Procurement/Training (TPF5-178)
  - RAS Performance Information (TPF5-213)
  - Intelligent Compaction Equipment Loan/  
Demo (TPF5-128)
  - 2009 NCAT Test Track (TPF5-508)
  - RMRC (TPF5-199)



# Technology Partnerships

- Some Specification Recommendations .....
- T 312 Preparing and Determining the Density of HMA Specimens by SGC
- TP 62 Determining Dynamic Modulus of HMA
- TP 79 Determining the Dynamic Modulus and Flow Number for HMA Using the AMPT
- PP 60 Preparation of Cylindrical Performance Test Specimens Using the SGC
- PP 61 Developing Dynamic Modulus Master Curves for HMA Using the AMPT
- PP 62 Developing Dynamic Modulus Master Curves for HMA Using TP62 Procedure
- T166 (Bulk Specific Gravity) and T 331 (Corelok)
- M320 PG Asphalt Binder



**Thank You!**

**<http://www.fhwa.dot.gov/pavement>**

Download ETG Presentations at:

**<ftp://fhwaftp.fhwa.dot.gov>**

**User ID: hiptguest**

**Password: hiptguest**