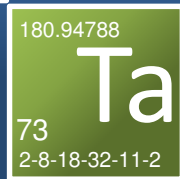


# Asphalt Expert



# Task Group Update

Matthew Corrigan, P.E.

Mobile Asphalt Testing Trailer Technical Manager  
U.S. DOT – Federal Highway Administration

October 2013



U.S. Department of Transportation  
**Federal Highway Administration**

**NEAUPG**

North East Asphalt  
User/Producer Group

# Asphalt Expert Task Groups

Provide a forum for Government, Industry, and Academia in the discussion of ongoing asphalt binder and mixture technology and to provide technical input for current and future research, development, and specifications.



# Asphalt Expert Task Groups

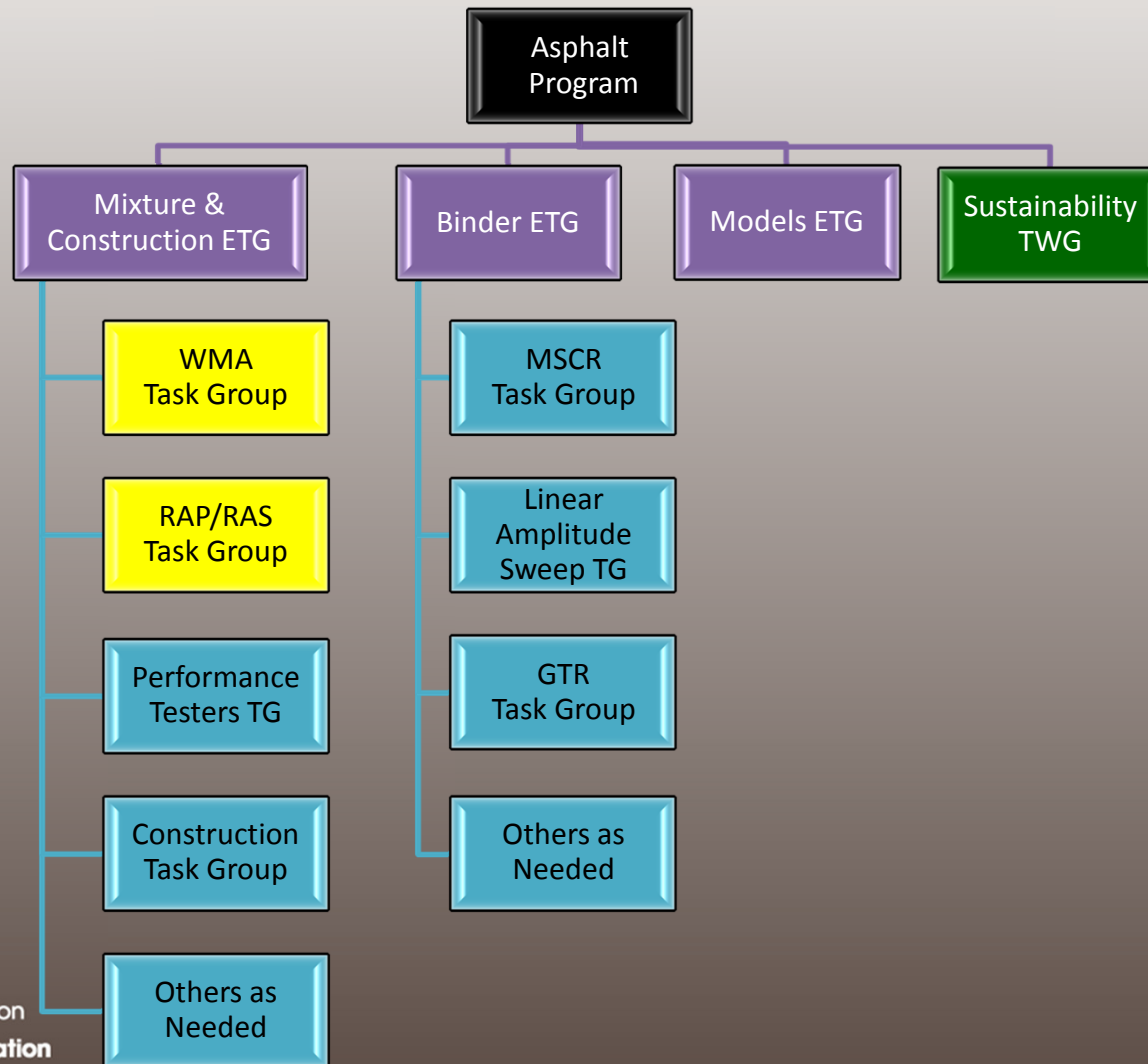
- Asphalt Mixture & Construction ETG
  - Next meeting April 2014
- Asphalt Binder ETG
  - Next meeting April 2014
- Warm Mix Asphalt TWG (complete)
- High RAP/RAS ETG (complete)
- Pavement Sustainability TWG



Open Meetings  
All are Welcome!



# Technical Discussion & Input



# Asphalt Mixture ETG - Activities

- Asphalt Mixture Performance Tester
- Mix Design Manual NCHRP 9-33
- RAP & RAS
- WMA
- Revise & Update AASHTO Test Standards
- AASHTO Subcommittee on Materials (SOM) Technical Input



# Asphalt Mix Performance Tester (AMPT)

- Refined under NCHRP 9-29
- Results used for PavementME Design inputs
- Dynamic Modulus  $|E^*|$  and Flow (Fn)
- AASHTO Standards: PP 60, TP 79, PP 61
- New: Flow number standardization
- Specimen air void tolerance
- New: Fatigue testing protocols



# AMPT Flow Number standardization

Published  
as Appendix  
within  
AASHTO  
TP 79-13

## X1. EVALUATE RUTTING RESISTANCE USING THE FLOW NUMBER TEST

### X1.1 Scope:

X1.1.1 This procedure establishes a method to evaluate the rutting resistance of asphalt paving mixtures using the TP 79, Flow Number test in the AMPT.

### X1.2 Procedure:

X1.2.1 Input the test parameters listed in Table X1.2.1 to the AMPT control software for the Flow Number test.

Table X1.2.1 – TP 79 Flow Number Test Conditions

Test Parameter	HMA	WMA
Test Temperature	1-	1-
Deviator Stress	87 psi (600 kPa)	87 psi (600 kPa)
Contact Stress	5% of deviator stress	5% of deviator stress
Confining Stress	0 psi (0 kPa)	0 psi (0 kPa)

1- Determine the project design temperature using LTTPBind version 3.1; computed using 50% reliability, at a 20 mm depth for surface courses and the top of the pavement layer for intermediate and base courses.

X1.2.2 Determine the flow number for each specimen, and average the results. Compare the average flow number with the criteria in Table X1.2.2.

Table X1.2.2 – Minimum Flow Number Requirements

Traffic Level, million ESAL's	HMA, minimum Flow Number	WMA, minimum Flow Number
< 3	---	---
3 to < 10	50	30
10 to < 30	190	105
> 30	740	415



# Mix Design Manual

## NCHRP 9-33 (AAT) & 9-33A (ASU)

- Report:  
<http://www.trb.org/Main/Blurbs/165467.aspx>
  - *A Manual for Design of Hot-Mix Asphalt with Commentary*
  - *Adapting Specification Criteria for Simple Performance Tests to HMA Mix Design*
- Performance Test Criteria
- 9-33 maintain existing  $N_{\text{design}}$  criteria
- Proposed Specification: to be used as a preliminary selection of mix parameters as a starting point for mix testing...



# Recycled Asphalt Pavement (RAP)

- NCHRP 9-46 “Mix Design and Evaluation Procedure for High Reclaimed Asphalt Pavement Content in HMA”
- completed
  - published as NCHRP Report No. 752
- Report recommendations are under review by ETG
  - Potential changes to M323 and R35?



# Information Series 138

## *2nd Annual Asphalt Pavement Industry Survey on Reclaimed Asphalt Pavement, Reclaimed Asphalt Shingles, and Warm-Mix Asphalt Usage: 2009–2011*

Information Series 138

### **2<sup>nd</sup> Annual Asphalt Pavement Industry Survey on Reclaimed Asphalt Pavement, Reclaimed Asphalt Shingles, and Warm-Mix Asphalt Usage: 2009–2011**



1

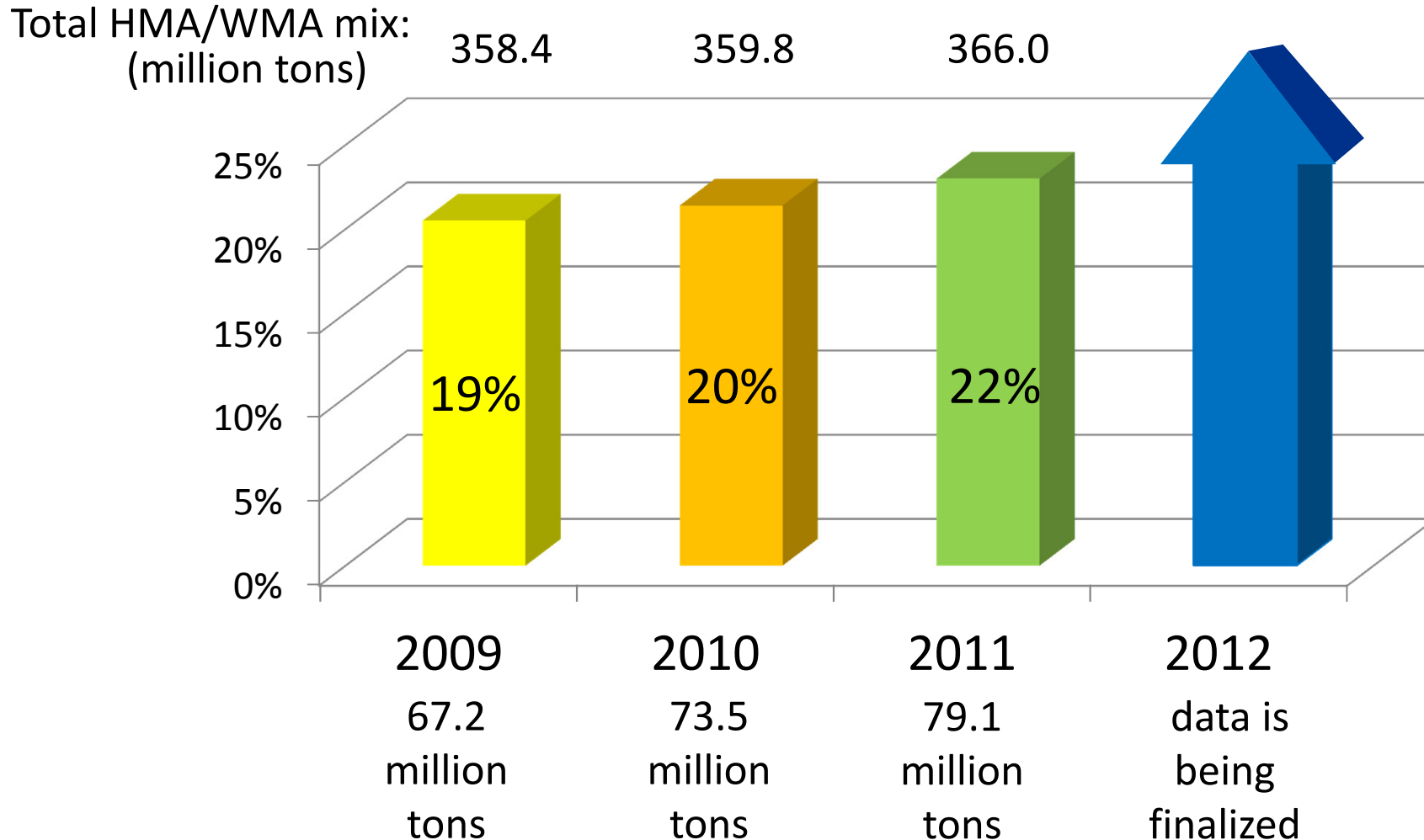


U.S. Department of Transportation  
Federal Highway Administration

[www.asphaltpavement.org/index.php?option=com\\_content&view=article&id=872&Itemid=45](http://www.asphaltpavement.org/index.php?option=com_content&view=article&id=872&Itemid=45)

# RAP Usage in HMA/WMA

## *Percentage of **Total** Mix Production in USA*



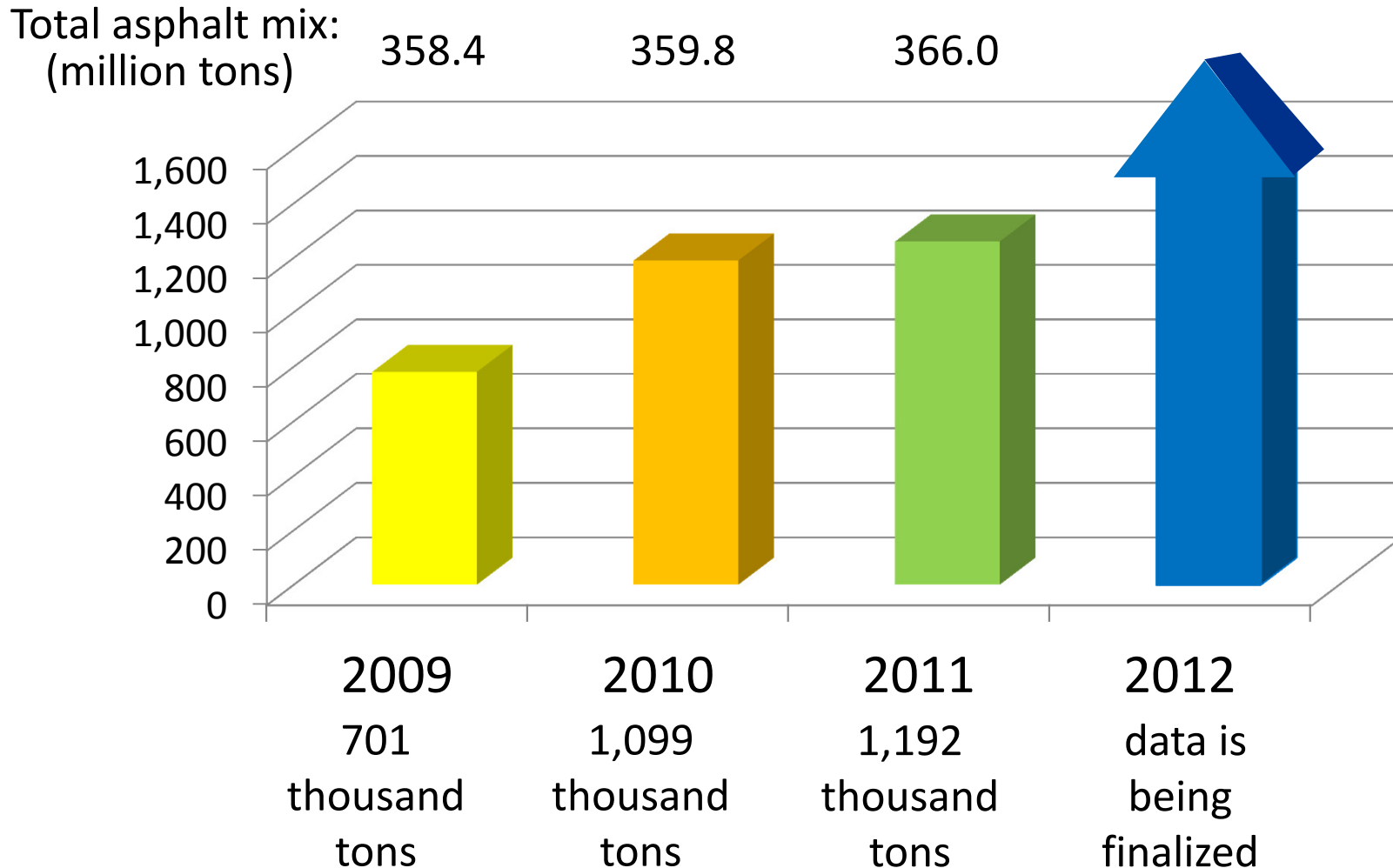
# Recycled Asphalt Shingles (RAS)

- Current AASHTO PP 53 and MP 15 Standards about to “expire”
- ETG Taskforce recommendations for draft revisions to AASHTO Standards PP 53 and MP 15
- Revisions forwarded on to AASHTO Sub. on Materials (SOM) for their consideration and balloting



# RAS Usage in HMA/WMA

## ***Total RAS tons used for mix production in USA***





## NCHRP Projects funded as a result of WMA TWG efforts:

9-43	-Mix Design Practices for WMA	\$522,501	completed
9-47	-Engineering Properties, Emissions, and Field Performance of WMA Technologies	\$79,000	completed
9-47A	-Properties and Performance of WMA Technologies	\$1,121,000	Jun 2013
9-49	-Performance of WMA Technologies: Stage I--Moisture Susceptibility	\$450,000	completed
9-49A	-Performance of WMA Technologies: Stage II--Long-Term Field Performance	\$900,000	Jul 2016
9-52	-Short-Term Laboratory Conditioning of Asphalt Mixtures	\$800,000	Nov 2014
9-53	-Properties of Foamed Asphalt for Warm Mix Asphalt Applications	\$700,000	Dec 2014
9-54	-Long-Term Aging of Asphalt Mixtures for Performance Testing and Prediction	\$800,000	May 2016
9-55	-Recycled Asphalt Shingles in Asphalt Mixtures with WMA Technologies	\$600,000	Sept 2016
9-58	-Effects of Recycling Agents on Asphalt Mixtures w/High RAS & RAP Binder Ratios	\$1,500,000	July 2017 <sup>est.</sup>
20-07 (311)	-Development of a WMA Tech. Evaluation Program	\$50,000	completed



## NCHRP Projects funded as a result of WMA TWG efforts:

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**Total \$7,522,501**

# NCHRP Project 09-58 (2014)

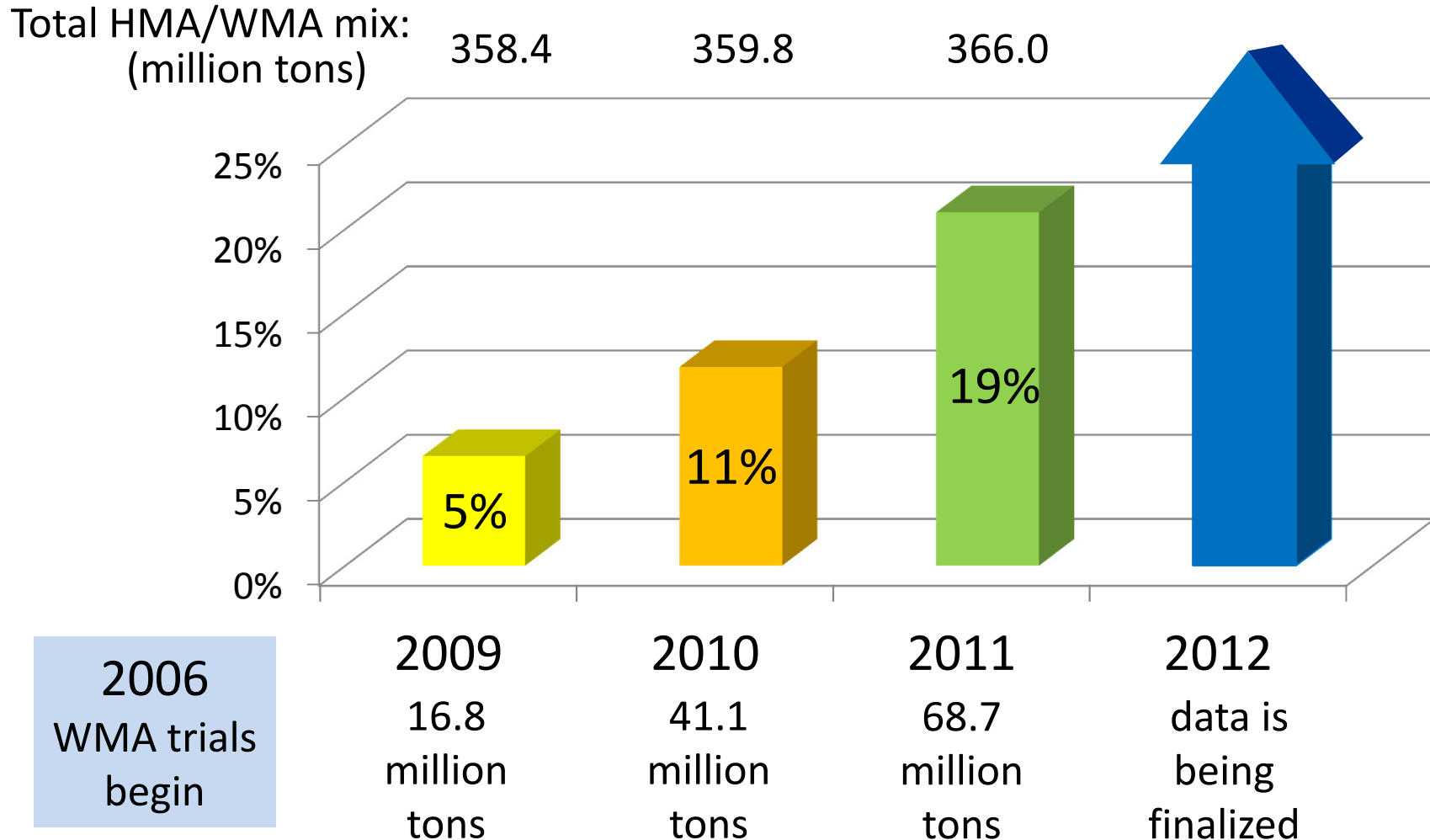
## Objectives:

- (1) evaluate the effectiveness of recycling agents in HMA and WMA mixtures with high RAS, RAP, or combined RAS/RAP binder ratios through a coordinated program of laboratory and field experiments;
- (2) propose revisions to several relevant AASHTO specifications and test methods;
- (3) develop training and workshop materials and deliver one workshop.



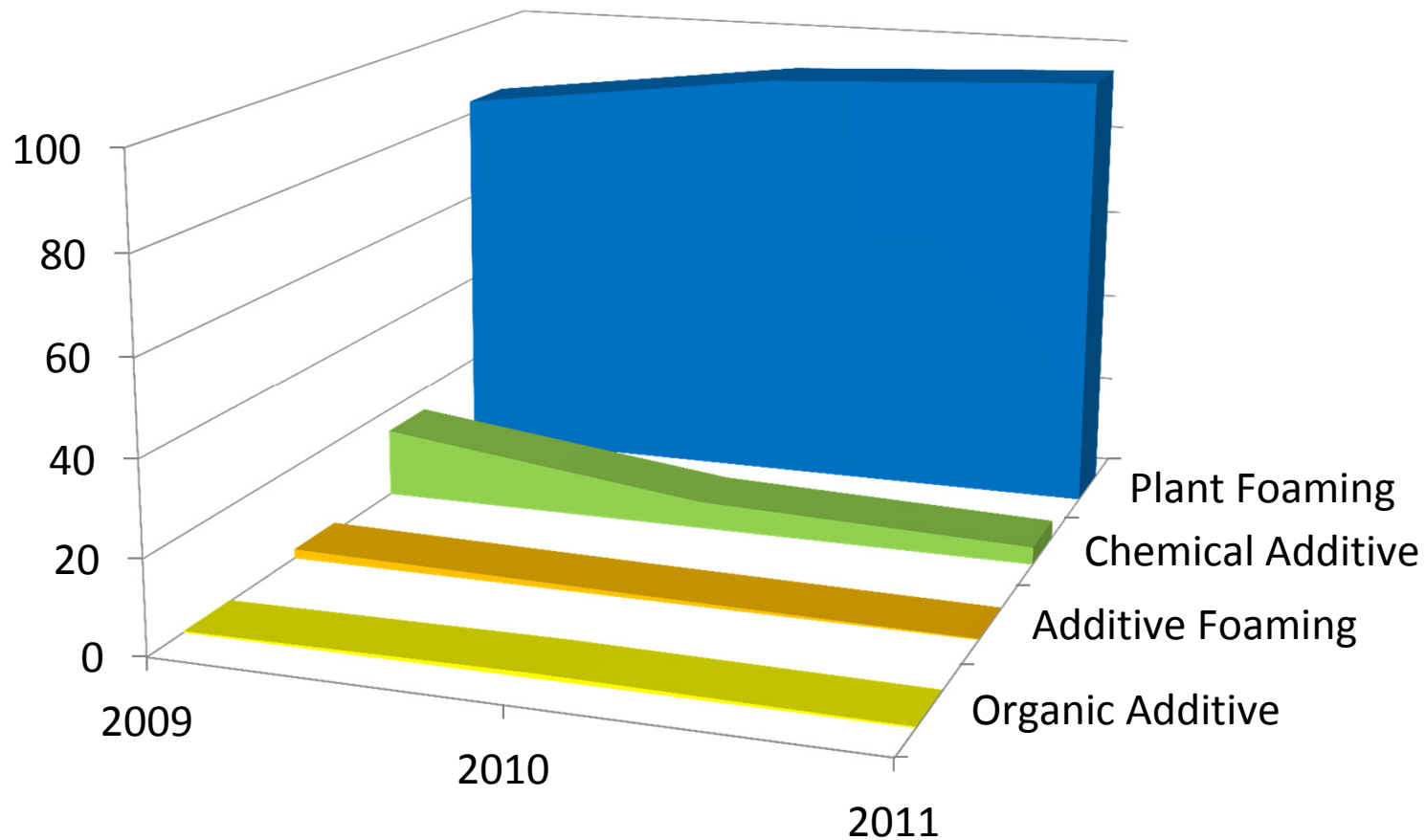
# WMA Usage in HMA/WMA

## *Percentage of **Total** Mix Production in USA*



# WMA Usage by Technology

**Percent** of market for WMA production in USA



## ... additional WMA products getting press

- Road Science™ division of ArrMaz
  - AD-here® with CECABASE™ RT 945\*
- Engineered Additives LLC
  - BituTech RAP, BituTech PER, BituTech WA1, BituTech VPW (products also listed as recycling/rejuvenating agents)
- GreenMantra Technologies\*\*
  - Synthetic wax derived from recycled plastics

\*CECA, a subsidiary of the Arkema Group in France, through its affiliate, Arkema Inc., and Road Science, a division of ArrMaz, Inc., announced they have signed a distribution agreement in which Road Science will be the exclusive USA distributor of CECA's warm mix asphalt additive, CECABASE™ RT.

\*\*GreenMantra Technologies announced that Paul Veillette, former President & CEO of Sasol Wax Americas, has joined GreenMantra as Vice President of Sales.

# Expansion of NCHRP 9-43 Mix Design Study to Higher Absorption Mixtures

- Original Project 9-43
  - Binder Absorption limited to 0.5 - 1.0 %
- ETG Work Item: Expansion to Higher Absorption Mixtures  $\geq 2.0\%$ 
  - Includes High Absorption Laboratory Foamed Mixtures
- Dr. Ray Bonaquist, AAT
  - Scheduled for completion Jan – Feb 2014



# Asphalt Binder ETG - Activities

- Multiple Stress Creep Recovery
  - TP 70 MSCR Test of Asphalt Binder Using DSR
  - MP 19 MSCR Performance Graded Asphalt Binder
- PAV Testing Temperature
- Ground Tire Rubber
- Revise & Update AASHTO Test Standards
- AASHTO Subcommittee on Materials (SOM)  
Technical Input



# Asphalt Institute and FHWA

FHWA is working with the Asphalt Institute to assist States to effectively understand and implement MSCR & also better understand successful GTR utilization.

- Technical Brief FHWA-HIF-11-038
  - [www.fhwa.dot.gov/pavement/asphalt/index.cfm](http://www.fhwa.dot.gov/pavement/asphalt/index.cfm)
- Resources posted on AI's website
  - [www.asphaltinstitute.org/public/engineering/mscr-information.dot](http://www.asphaltinstitute.org/public/engineering/mscr-information.dot)



# AASHTO SOM TS2b “Binder”

- MSCR – AASHTO TP 70 Revisions
  - Recommendations from ETG (May 2013 Corrigan & D’Angelo) on equipment tolerance for extrapolating creep and recovery data at 1 sec and 10 sec for each cycle local time within TP 70
  - Revise section 7.3 and add 7.4 to clarify wording and ensure critical data are obtained. Also add a note regarding negative percent recovery
  - SOM TS2b motion was made to move these changes to concurrent ballot



# AASHTO SOM TS2b “Binder”

- MSCR – AASHTO MP 19
  - Recommendations from ETG on maximum Jnr for Standard Grade moved from 4.0 to 4.5 kPa<sup>-1</sup>
  - SOM TS2b motion was made to move these changes to concurrent ballot



# AASHTO SOM TS2b “Binder”

- MSCR – AASHTO TP 70 & MP 19
  - NEAUPG asked the TS to consider moving TP 70 and MP 19 to full standards.
    - Plans to adopt MP 19 for specifying modified binders starting in 2014
    - recommended changes
      - “PG 64-22, Grade V” to “PG 64V-22” designation
      - Move Elastic Response Appendix X2 from TP 70 to MP 19 Appendix X1
  - SOM TS2b motion was made to send these changes to concurrent ballot and also ballot to move TP 70 and MP 19 to “full standards”



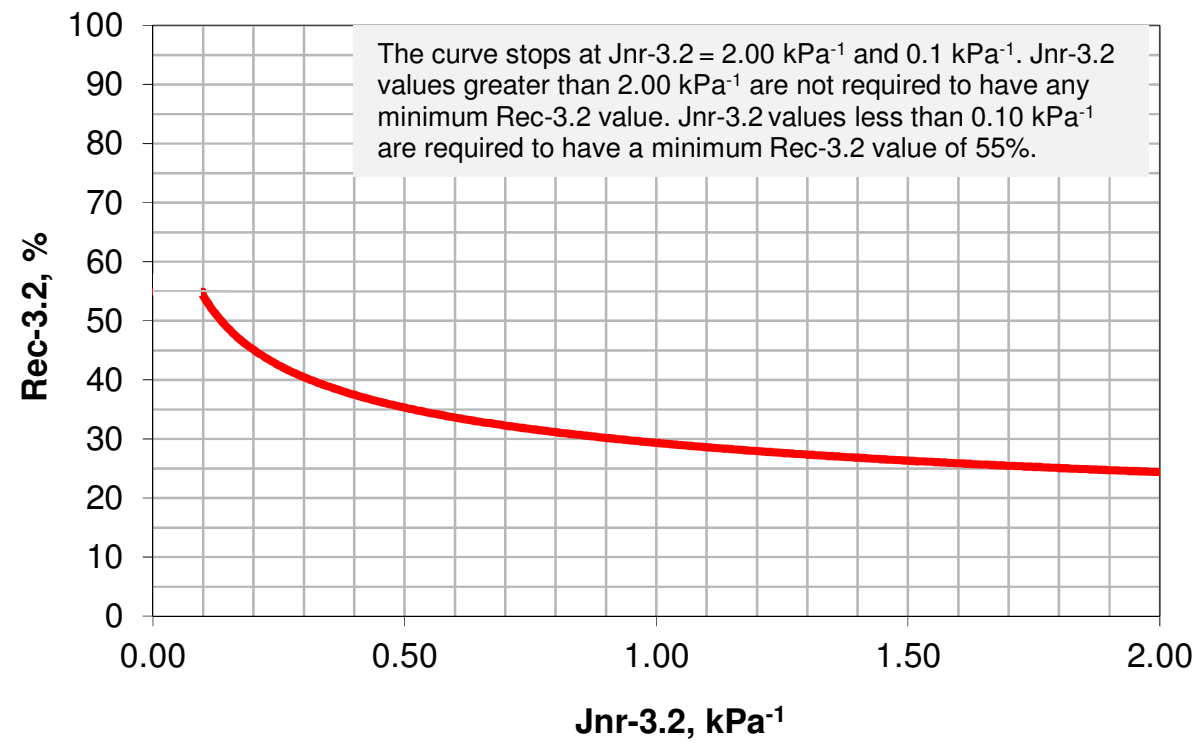
# ETG Draft Standard Practice

- **“Standard Practice for Evaluating the Elastic Behavior of Asphalt Binders Using the Multiple Stress Creep Recovery (MSCR) Test”**
- Background and work elements provided by Mike Anderson (May 2013 & Sept 2013 ETG)



# ETG Draft Standard Practice

- Includes FIGURE 1: Comparison of MSCR Jnr-3.2 and Rec-3.2 to Assess Elastic Response



# AASHTO SOM TS2b “Binder”

- New Task Force
  - MSCR Temperature task force consisting of Matthew Corrigan- FHWA (lead), John D’Angelo, Darren Hazlett (TX), Lyndi Blackburn (Alabama), Mike Anderson (Asphalt Institute), Chris Abadie (LA), and Eileen Sheehy (NJ) was put together to develop further guidance on temperature selection for TP 70



# Ground Tire Rubber

Can it fit within existing PG grading system?

- RTFO limitations
  - Can not achieve coating at higher GTR concentrations
  - In order to mainstream GTR in PG system, we may need to use softer base binders or target a lower percent GTR needed in order to achieve a reacted PG 70, 76 or 82?



# Ground Tire Rubber

Can it fit within existing PG grading system?

- Impact of binder crude source compatibility with GTR source?
  - Some binder/GTR source combinations react well, while others do not react
  - Impact on percent GTR required/allowed to meet PG grade or rotational viscosity requirements



# Ground Tire Rubber

Can it fit within existing PG grading system?

- DSR Parallel Plate Geometry
  - 2 mm, 3 mm, & 4 mm gap considered
  - GTR particle size & concentration limitations
    - DSR currently limited to a max. of 25% of gap size
    - Size of non-reacted GTR vs reacted GTR in binder
      - GTR particle size increases with reaction (it can double)
    - Particle influence with increased concentrations
      - Non-homogenous or mastic behavior?



# Ground Tire Rubber

- DSR Cup & Bob Geometry is being explored
- GTR blending study – size, source, %
- Evaluate GTR modified binders to PG and MSCR specifications
- Potential crude source dependency
- GTR size will effect test results
- Careful formulation is needed to meet all MSCR  $J_{nr}$  specifications



# FHWA Field Support Mobile Asphalt Testing Trailer (MATT)

- Mobile Asphalt Pavement Materials Lab
  - Site Visit
  - Field Data/Testing
  - Use/Demo Emerging Test Devices
  - POC: Matthew Corrigan, P.E.



# FHWA Pavement Website

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

### Pavements

[Research](#)[Design](#)[Construction](#)[Preservation](#)[Maintenance](#)[Management](#)[Rehabilitation](#)[FHWA](#) > [Engineering](#) > [Pavements](#) > [Asphalt](#)

#### Design and Analysis

[Materials and Construction Technology](#)[Management and Preservation](#)[Surface Characteristics](#)[Construction and Materials Quality Assurance](#)[Environmental Stewardship](#)

### Asphalt Pavements

#### Current Projects and Activities

- [Asphalt Pavement Recycling with Reclaimed Asphalt Pavement \(RAP\)](#)
- [Asphalt Mixture Performance Tester \(AMPT\)](#)
- [Expert Task Group on Asphalt Mixtures & Construction: Asphalt Binders; and Models Technology](#)
- [Mobile Asphalt Pavement Mixture Laboratory](#)
- [Foamed Recycled Asphalt Pavement The Louisiana Experience](#)
- [Slurry/Micro-Surface Mix Design Procedure Project](#)
- [Superpave Regional Centers](#)
- [Superpave Implementation Update](#)
- [Recycling Team activities](#)
- [RD&T Recycling Information](#)
- [Warm Mix Asphalt Technologies and Research](#)
- [Crumb Rubber](#)
- [NIOSH Activities](#)

#### Research

- [Asphalt Research](#)

#### Techbriefs

- [TechBrief: Asphalt Mixture Performance Tester \(AMPT\), FHWA-HIF-13-005 2013](#)
- [Construction Quality Assurance for Design-Build Highway Projects, FHWA-HIF-13-006 2013](#)

#### More Information

- [Pavement Materials](#)
- [Pavement Publications](#)
- [Percent Within Limits](#)

#### Contacts

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**Tom Harman**  
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[E-mail Tom](#)

**Katherine Petros**  
[Turner Fairbank \(Modeling\)](#)  
202-493-3154  
[E-mail Katherine](#)

# FHWA Technical Advisories

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

- [TechBrief: Asphalt Mixture Performance Tester \(AMPT\)](#), FHWA-HIF-13-005 2013
- [Construction Quality Assurance for Design-Build Highway Projects](#), FHWA-HRT-12-039 2012
- [TechBrief: An Alternative Asphalt Binder, Sulfur-Extended Asphalt \(SEA\)](#), FHWA-HIF-12-037 2012
- [The Use and Performance of Asphalt Binder Modified with Polyphosphoric Acid \(PPA\)](#), FHWA-HIF-12-030 2012
- [Techbrief: Independent Assurance Program](#), FHWA-HIF-12-001 2012
- [Identifying Existing/Emerging Technologies in the Area of Intelligent Construction](#), FHWA-HIF-12-014 2011



# FHWA Technical Advisories

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

- [The Multiple Stress Creep Recovery \(MSCR\) Procedure](#), FHWA-HIF-11-038 2011
- [A Review of Aggregate and Asphalt Mixture Specific Gravity Measurements and Their Impacts on Asphalt Mix Design Properties and Mix Acceptance](#), FHWA-HIF-11-033 2011
- [Superpave Gyratory Compactors](#), FHWA-HIF-11-032 2011
- [Superpave Mix Design and Gyratory Compaction Levels](#), FHWA-HIF-11-031 2011
- [TechBrief: Intelligent Compaction for Asphalt Materials](#), 2010
- [TechBrief: Phosphoric Acid as an Asphalt Modifier Guidelines for Use: Acid Type](#), FHWA-HRT-08-061 2008
- ... and many more!!



# University of Iowa's Laboratory for Advanced Construction Technologies

## *“Global Warm Mix Asphalt Workshop”*

October 30-31, 2013 at Marriott Hotel in Coralville, Iowa

“The purpose of this workshop is to bring government employees, contractors and manufacturers together to discuss the past and future of WMA technologies. Some states adopted WMA technologies more actively than others and, to move forward, this workshop would serve as a platform to share the pros and cons of the WMA technologies.”

Registration and hotel information is available at

<http://lactiowa.org/events/global-warm-mix-asphalt-workshop>

Direct any inquiries to Dr. Lee

[www.engineering.uiowa.edu/cee/faculty-staff/hosin-david-lee](http://www.engineering.uiowa.edu/cee/faculty-staff/hosin-david-lee)



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You



FHWA's Mobile Asphalt Testing Trailer



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