

Warm Mix Asphalt *“National Overview”*

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A child's view...

Courtesy of Dr. Ray Bonaquist's Daughter



Hi I'm Hot Mix.



Hi I'm WMA.





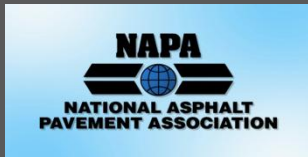
“The collective efforts from highway agencies and industry partners to advance warm mix asphalt technologies as a standard practice has been tremendous.”

-Office of Pavement Technology, FHWA

“[We] support the development and implementation of warm-mix asphalt ... this will inevitably become the standard practice for asphalt mixture production.”



- Global Asphalt Pavement Alliance



“WMA is the future of flexible pavements in the U.S. ... lowering our production and paving temperatures promises improved energy consumption, operations, and quality.”

-Mike Acott, President, NAPA

“WMA technology provides an important tool to the pavement engineer ... designers and contractors alike now have a great opportunity to learn more about this promising practice which is revolutionizing the paving industry in North America.”

-Pete Grass, President, Asphalt Institute





The Every Day Counts Initiative



INGENUITY IMAGINATION

INVENTION INNOVATION

- www.fhwa.dot.gov/everydaycounts
- EDC is designed to identify and deploy innovation aimed at shortening project delivery, enhancing the safety of our roadways, and protecting the environment.
- Accelerating Technology Deployment





Selected Innovations (Round 1)



Warm Mix Asphalt (WMA)



The Safety Edge



Geo-synthetic Reinforced Structures (GRS)



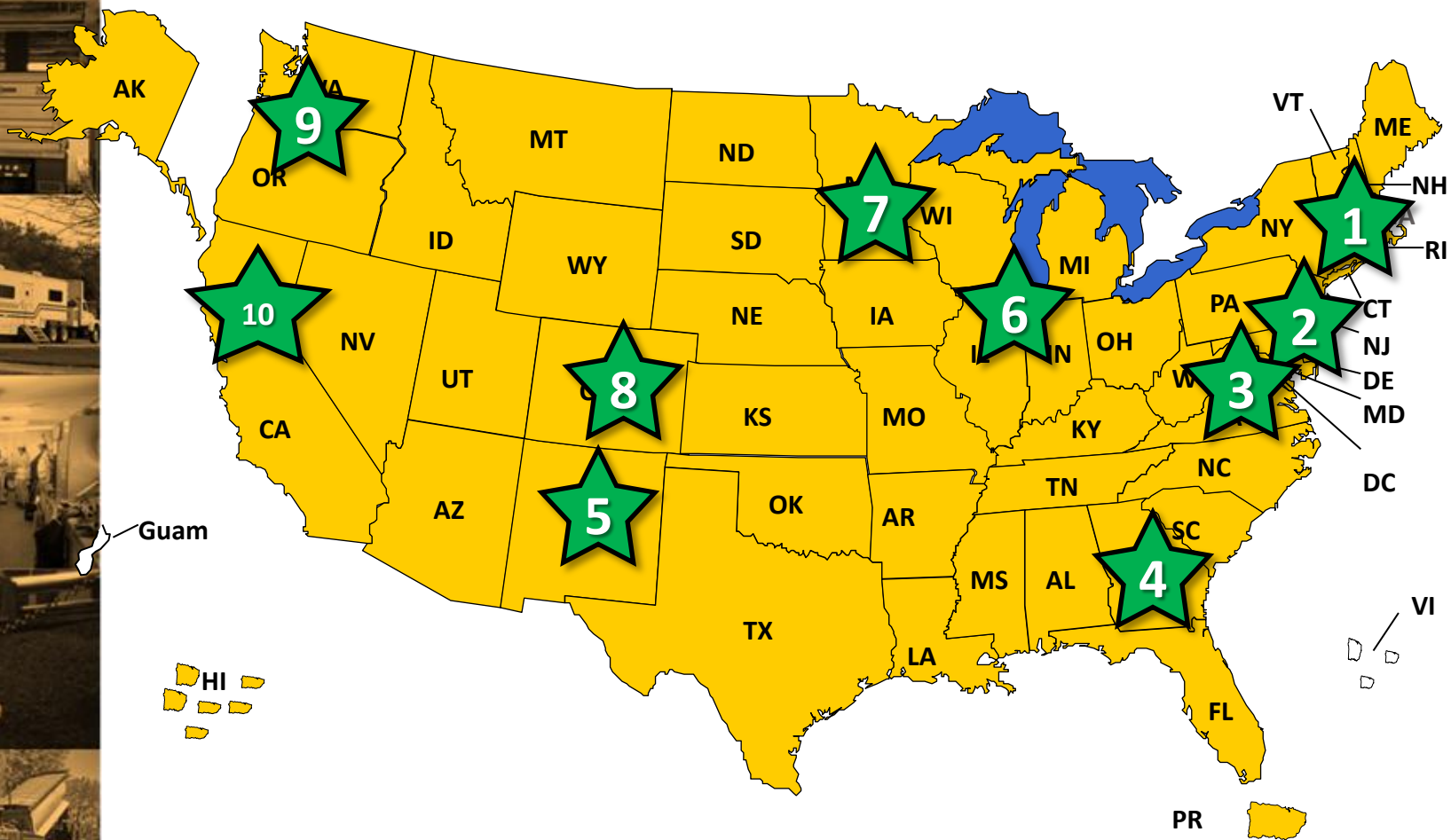
Prefabricated Bridge Elements & Systems (PBES)



Adaptive Traffic Control Systems



10 Regional EDC Summits Fall 2010





Performance Metrics

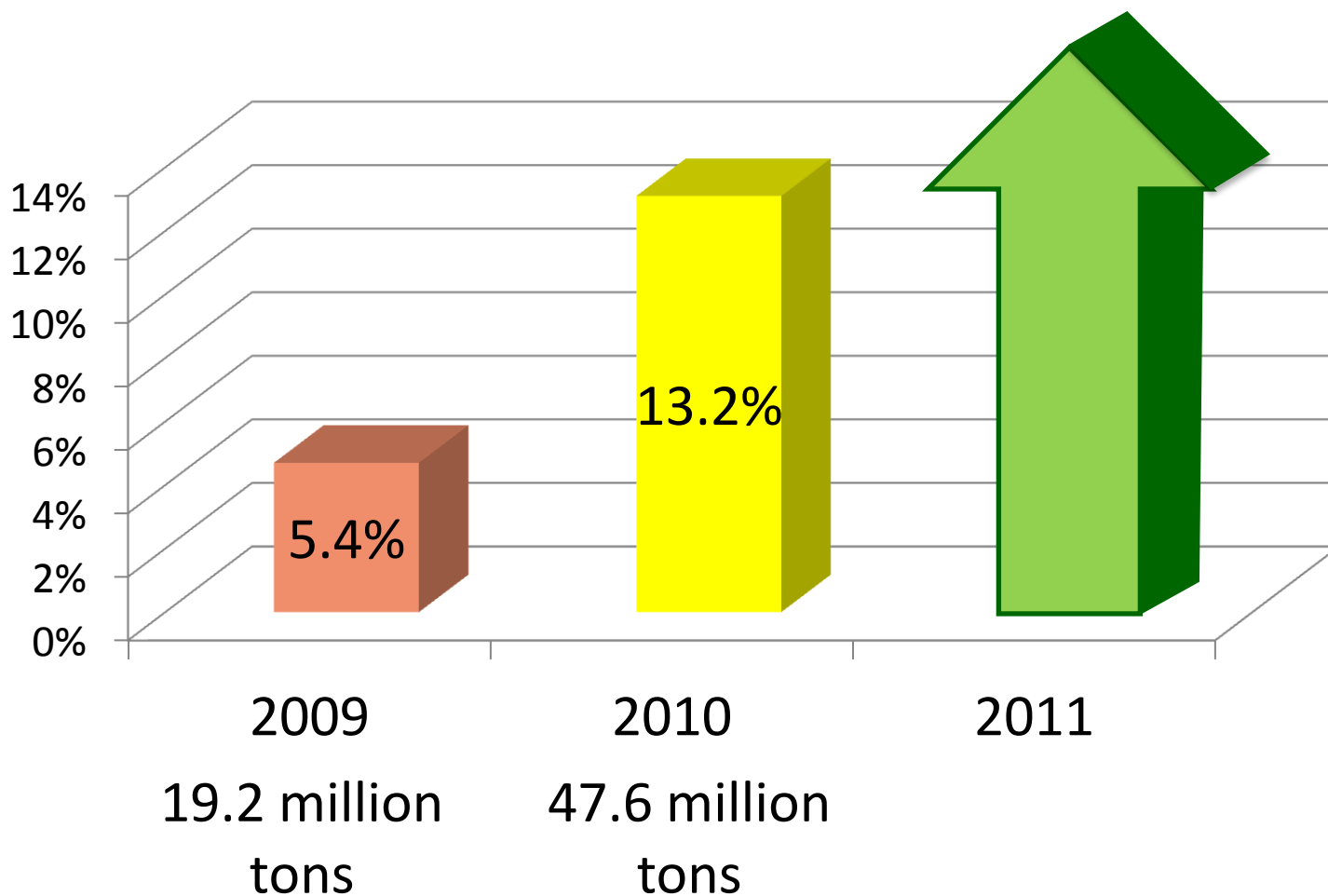
1. By December 2011, 40 State DOTs and all Federal Lands Divisions will have a specification &/or contractual language that allows WMA on Federal-aid or Federal Lands projects.
2. By December 2012, at least 30 State DOTs will have achieved set targets for WMA usage.





WMA Usage

Percentage of **Total** Asphalt Production in US
source: National Asphalt Pavement Association

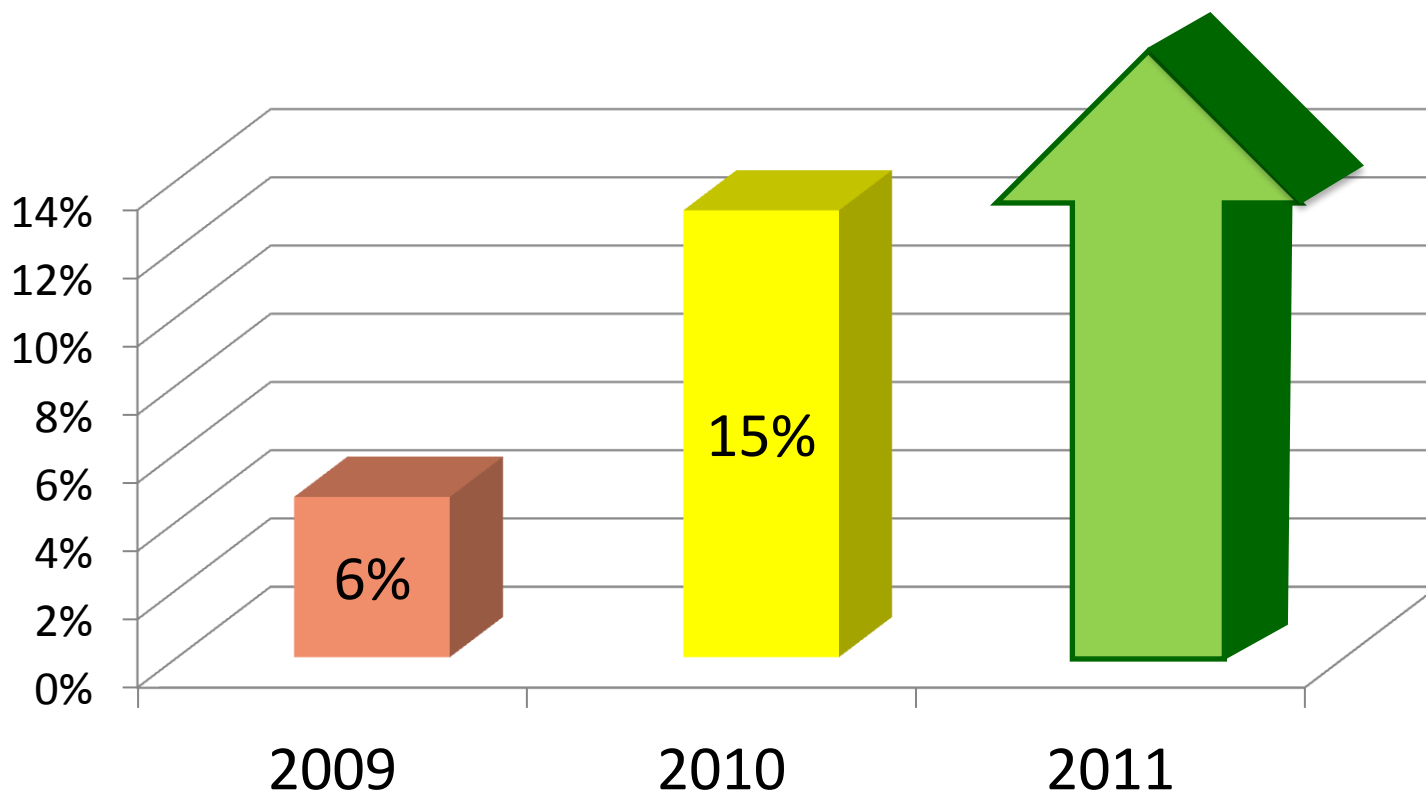




WMA Usage

Percentage of Asphalt Production for State DOTs

source: National Asphalt Pavement Association





WMA Technologies Available in U.S.

In 2005





WMA Technologies Available in U.S.

In 2011





WMA Technologies Available in U.S.

... and
beyond



General Technology Categories



Material Processing

- Ex. LEA (Hot Coated Coarse Agg + Moist Fine Agg + Additives)



Organic Additives

- Waxes, Zeolite



Chemical Additives

- Surfactants



Foaming Processing

- Water Injection, Zeolite



Hybrid Systems

Ex. H_2O + Surfactant



Technology Overview

- Many US technologies' web-link at:
<http://warmmixasphalt.com/wmatechnologies.aspx>



“This listing does NOT constitute an endorsement or approval.”



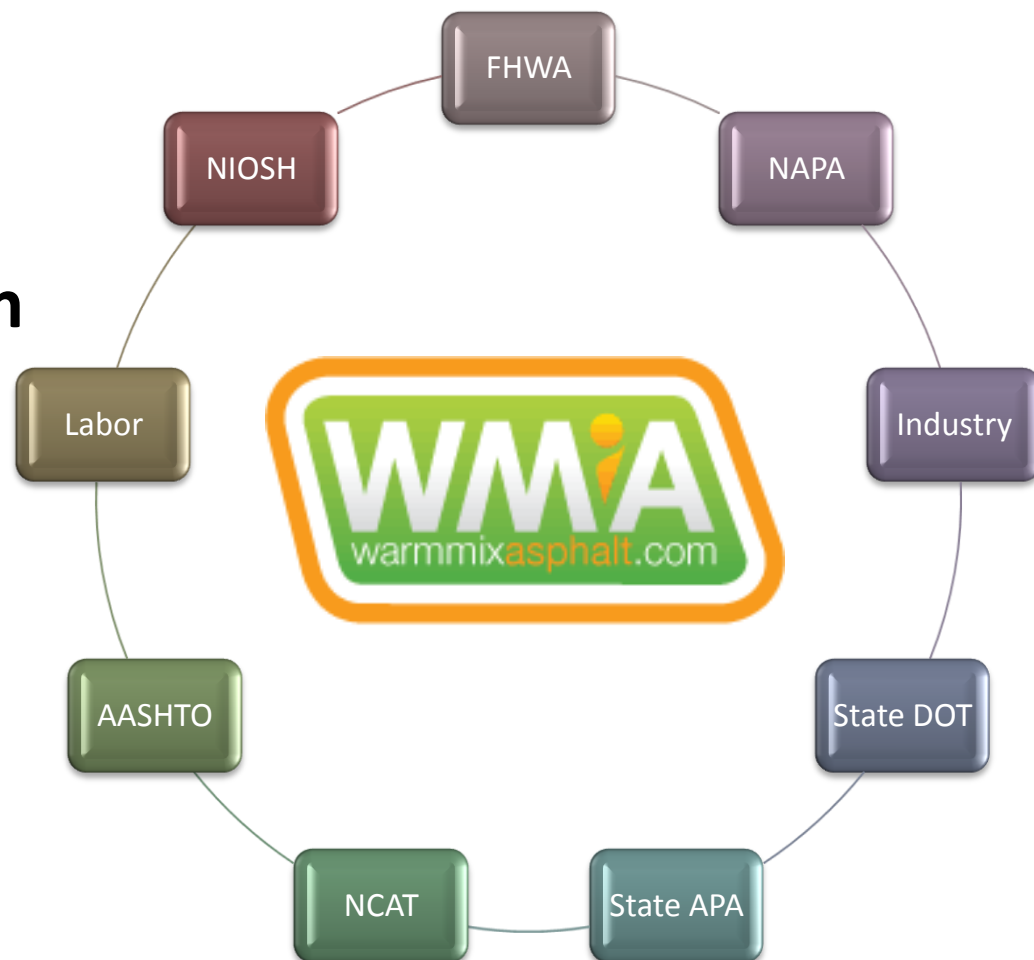
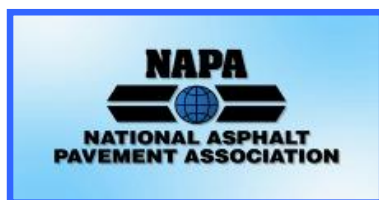
Stakeholder Engagement: WMA Technical Working Group

Established 2005

Co-Chairs:
Matthew Corrigan



Ron White





National Research Initiatives

- WMA TWG Task Force 08-02 *“National Program for WMA Technologies”*
 - To utilize AASHTO National Transportation Product Evaluation Program (NTPEP)
- Resulted in... NCHRP 20-07 Task 311 *“Development of a Warm Mix Asphalt Technology Evaluation Program”*
 - ... to develop a standardized evaluation program compatible with AASHTO NTPEP’s centralized system of testing, evaluation, and data reporting of engineering materials for the state DOTs.



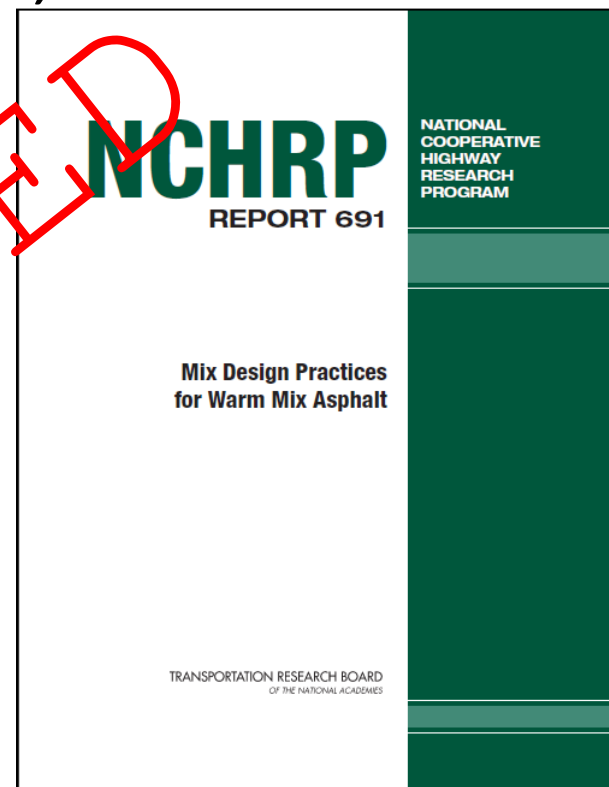


National Research Initiatives

- NCHRP 9-43 “Mix Design Practices for Warm Mix Asphalt” \$500,000

NCHRP Report 691

COMPLETED

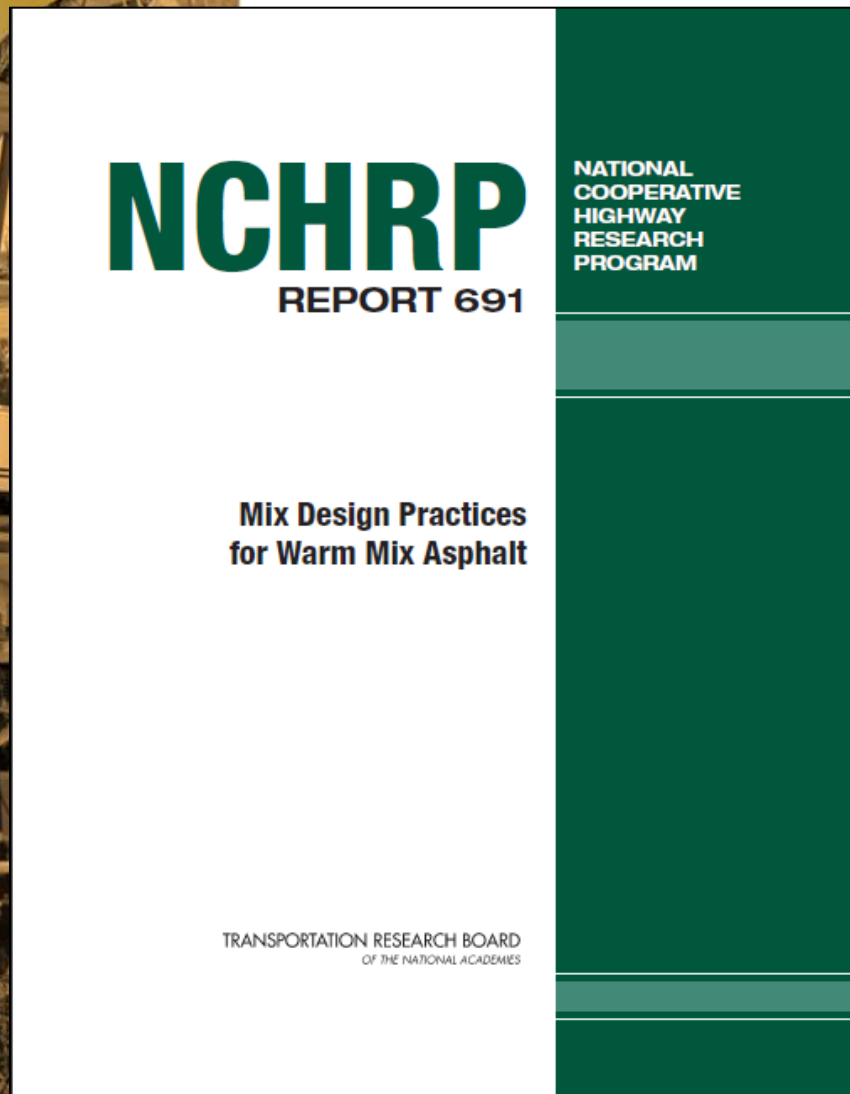


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NCHRP Project 09-43



- Final report completed and published as NCHRP Report 691 “Mix Design Practices for Warm-Mix Asphalt”
- http://trb.org/Main/Blurbs/Mix_Design_Practices_for_WarmMix_Aspphalt_165013.aspx



NCHRP Project 09-43

- Products:
 - Appendix to AASHTO R35 with commentary *“Special Mixture Design Considerations and Methods for Warm Mix Asphalt (WMA)”*
 - WMA Mix Design Workshop/Training Module
 - Being converted to web based training thru NHI
 - Chapter on WMA Mix Design for the NCHRP Project 09-33 Mix Design Manual
 - *“Standard Practice For Measuring Properties of Warm Mix Asphalt (WMA) for Performance Analysis Using the AASHTO MEPDG” (AASHTO Darwin ME Software)*





www.ct.gov/dot/AASHTO-R35



CONNECTICUT
DEPARTMENT OF TRANSPORTATION



Video On-Demand

Special Mixture Design Considerations and Methods for Warm Mix Asphalt (WMA)

*An Appendix to AASHTO R35
Standard Practice for Superpave
Volumetric Design for Hot-Mix
Asphalt (HMA)*



Ramon Bonaquist, Ph.D., P.E.

Special Mixture Design Considerations
and Methods for WMA



Improving the
Performance of
the Transportation
Industry Through
Training

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FHWA-NHI-131137

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Special Mixture Design Considerations and Methods for Warm Mix Asphalt - WEB-BASED

PROGRAM AREA: Pavements and Materials

COURSE NUMBER: FHWA-NHI-131137

CALENDAR YEAR	LENGTH	CEU	FEE
2011	2 Hours	0 Units	\$0 Per Participant
2012	2 Hours	0 Units	\$0 Per Participant

TRAINING LEVEL: Basic

CLASS SIZE: Minimum:1; Maximum:1

DESCRIPTION:

Highway transportation agencies are exploring the use of warm mix asphalt (WMA) for pavement projects. One of their main questions, particularly for agency mixture design technicians and engineers, is how WMA design differs from hot mix asphalt (HMA) design. "Mixture Design for Warm Mix Asphalt" is a Web-based training that presents the modifications to the current Superpave volumetric design procedure, as described in AASHTO R35, that are needed to complete a WMA mixture design. The training highlights key differences in WMA and HMA design procedures, and provides an opportunity to apply the AASHTO R35 standard practice to a WMA design modification.

OUTCOMES:

Upon completion of the course, participants will be able to:



National Research Initiatives

- NCHRP NCHRP 09-43 “Mix Design Practices for Warm Mix Asphalt” \$500,000
- NCHRP 09-47A “Engineering Properties, Emissions, and Field Performance” \$900,000
- NCHRP 09-49 “Performance of WMA Technologies: Stage I--Moisture Susceptibility” \$450,000
- NCHRP 09-49A “Performance of WMA Technologies: Stage II--Long-Term Field Performance” \$900,000





National Research Initiatives

Two WMA focused NCHRP projects for 2012:

- NCHRP 9-52 “Short-Term Laboratory Conditioning of Asphalt Mixtures” \$800,000
 - includes short-term laboratory conditioning of WMA mixtures for mix design and performance testing
- NCHRP 9-53 “Asphalt Foaming Characteristics for Warm Mix Asphalt Applications” \$700,000



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National Research Initiatives

Proposed NCHRP project for 2013:

- “Recycled Asphalt Shingles (RAS) and Recycled Asphalt Pavement (RAP) in HMA/WMA Mixtures”
- Endorsement by:
 - AASHTO SOM TS2c *Asphalt-Aggregate Mixtures*
 - FHWA WMA Technical Working Group
 - FHWA RAP Expert Task Group
 - TRB Committee AFK10 *General Issues in Asphalt Technology*



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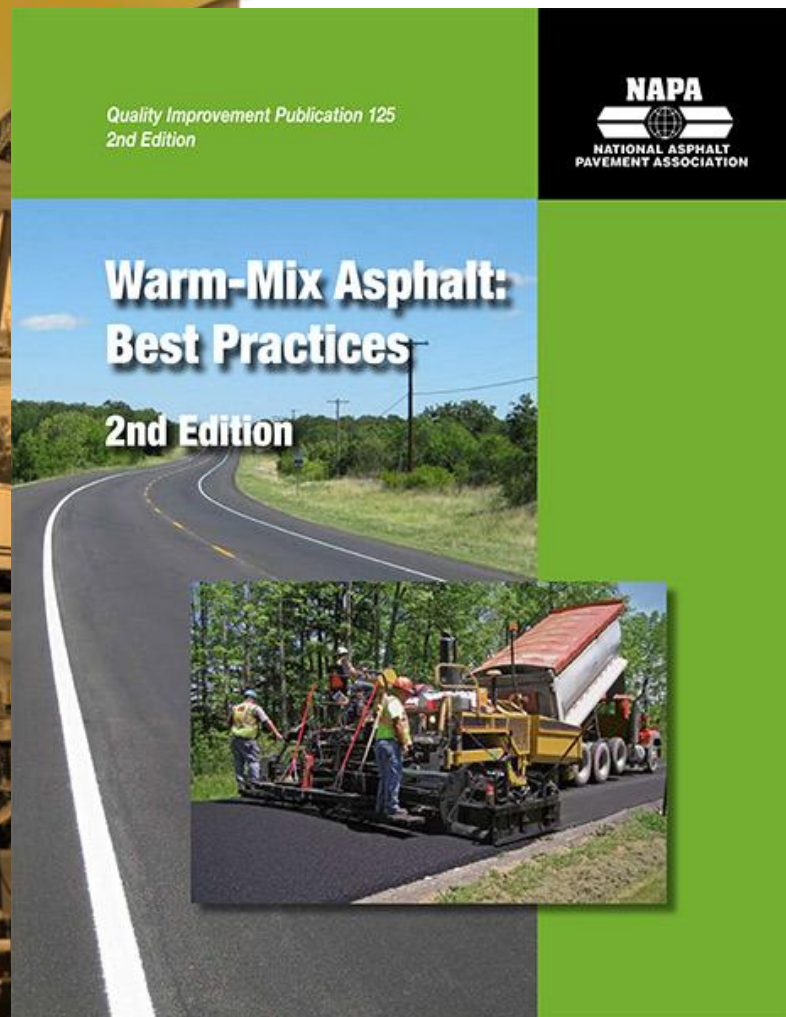


1st International Conference

- November 11-13, 2008 in Nashville, TN
 - Processes, Mix Production & Placement, Energy consumption, Mix Design, Material Properties

2ND INTERNATIONAL WARM-MIX CONFERENCE

- October 11-13, 2011 in St. Louis, MO
 - Lab & Field Properties, Design & Performance, Health & Environment, RAP w/ WMA, Binder & Mix Properties, Moisture Susceptibility, Construction, etc.



Warm-Mix Asphalt: Best Practices, 2nd Edition

- Stockpile Moisture Management
- Burner Adjustments and Efficiency
- Aggregate Drying and Baghouse Temperatures
- Drum Slope and Flighting
- Combustion Air
- RAP usage
- Placement Changes

Quality Improvement Series 125





The Givens

- WMA will continue to gain market share
- New innovations will occur
- Research will be challenged to keep up
- The demand for knowledge and training will grow
- Change is certain!!



Where do we go from here?

- Implementation of standardized mixture design procedure (AASHTO R35 Appendix)
- Emphasize performance testing of WMA
 - Asphalt Mixture Performance Tester (AMPT)
 - Dynamic Modulus, Flow Number, Fatigue
 - Lab conditioning of WMA mixtures for mechanical testing





Where do we go from here?

- Evaluation processes ... AASHTO NTPEP
 - Rigorous but not burdensome
 - Demonstrate successful projects
 - Document test results
 - Successful field trials
 - Not too time-consuming





Where do we go from here?

- Research
 - Short term performance is very promising
 - Document long term performance
 - Fatigue and cold temperature properties
 - WMA pavement ageing progression in the field
 - Lubricating phenomenon within mixture
 - Lab performance vs. field performance





FHWA will...

- Continue to work in partnership
 - WMA TWG & other Asphalt ETG's
 - AASHTO Subcommittee on Materials
 - Asphalt User-Producer Groups
- Continue to provide technical support
 - Mobile Asphalt Testing Laboratory Program
 - HQ/Resource Center
- Continue to explore
 - Turner-Fairbank Highway Research Center





FHWA will...

- Continue to support investigation, research, and training
 - Cooperative agreements with...
 - National Center for Asphalt Technology
 - Asphalt Institute
 - Focus on
 - Mixture design & performance testing
 - Binder ageing impacts
 - Production & lay-down
 - Forensics











Thank You!

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Warm Mix Asphalt Program Manager

ASPHALT

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