

# HMA & WMA Technologies

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[www.store.asphaltpavement.org](http://www.store.asphaltpavement.org)



- ◆ Pavement evaluation and project selection
- ◆ Materials and Mix Design
- ◆ Construction & Quality Control
- ◆ Performance



*Information Series 128*



U.S. Department  
of Transportation  
Federal Highway  
Administration



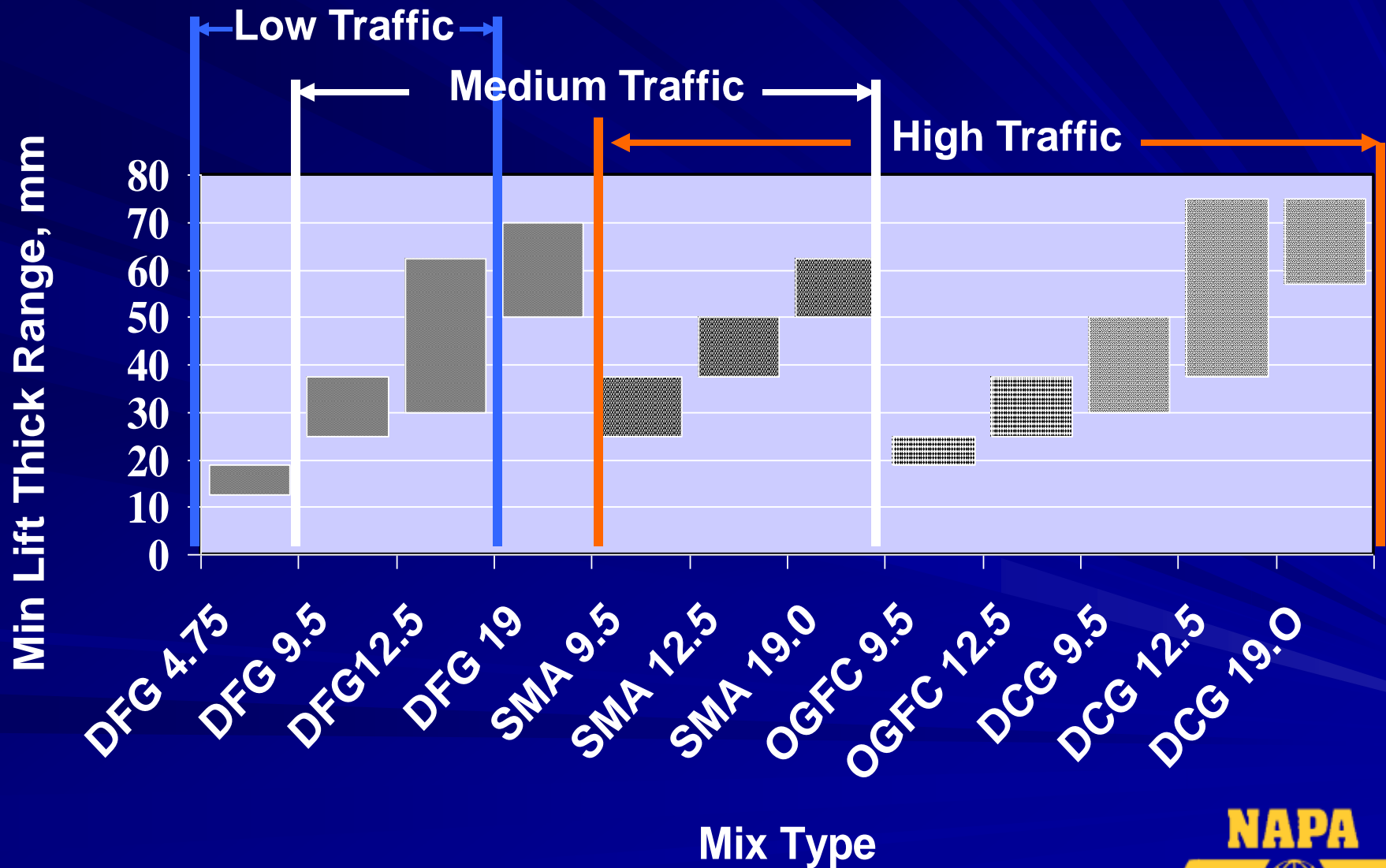
NATIONAL ASPHALT  
PAVEMENT ASSOCIATION

# ***HMA Pavement Mix Type Selection Guide***



# Recommended Mix Types

## Surface Courses



**TECHBRIEF**



# Results of Long-Term Pavement Performance SPS-3 Analysis: Preventive Maintenance of Flexible Pavements

FHWA Publication No.: FHWA-HRT-11-049

FHWA Contact: Larry Wiser, HRDI-30, (202) 493-3079,  
[larry.wiser@dot.gov](mailto:larry.wiser@dot.gov)





# Recycling RAP & RAS



# Reclaimed Asphalt Pavement in Asphalt Mixtures: State of the Practice

PUBLICATION NO. FHWA-HRT-11-021

APRIL 2011

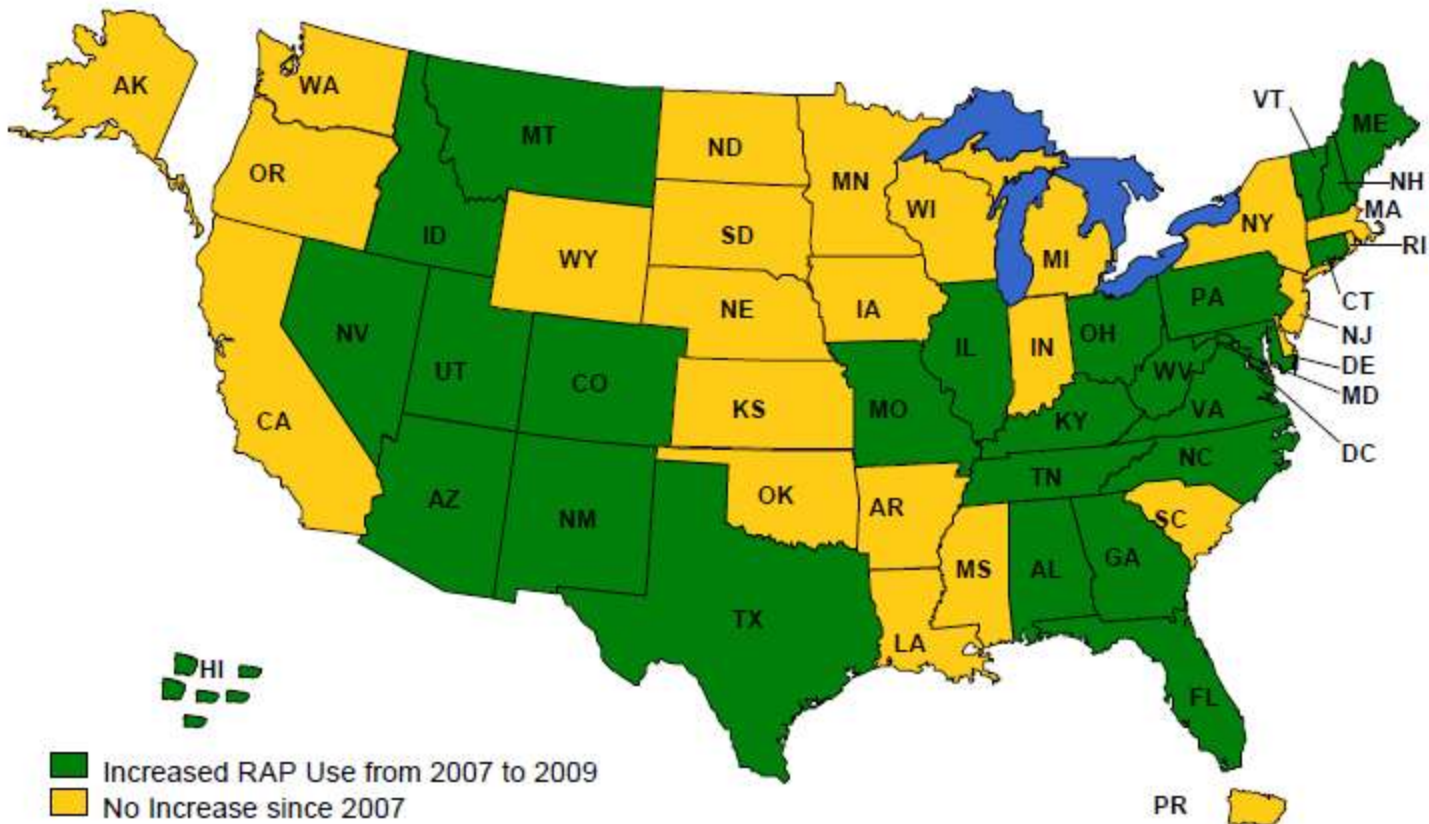


U.S. Department of Transportation  
**Federal Highway Administration**

Research, Development, and Technology  
Turner-Fairbank Highway Research Center  
6300 Georgetown Pike  
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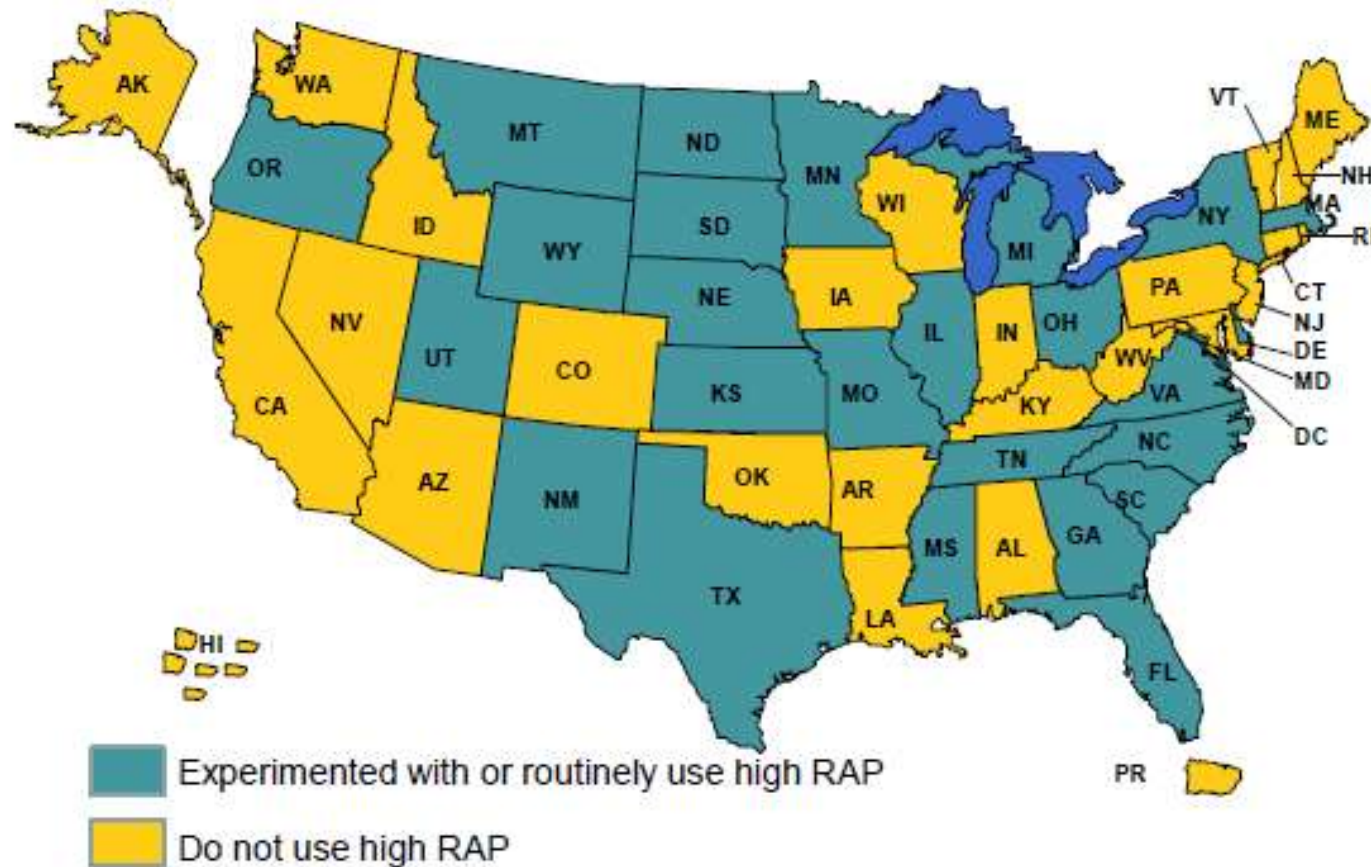


# States increasing RAP use





# States that have experimented with or routinely use high RAP mixtures



# High RAP Performance

- ◆ The performance and life of pavement containing up to 30 percent RAP is similar to virgin pavements with no RAP. A survey of LTPP sections containing at least 30 percent RAP showed similar performance to virgin sections.



# The Value of Milling



- Removes cracked and aged pavement surface
- Improves pavement smoothness
- Maintains curb height, drainage inlets, and bridge clearances
- Improves bond with overlay

Ref: Randy West, NCAT

3/30/2010

11

Using RAP to Maximize Your  
Pavement Dollar  
Kent Hansen, P.E.





Quality Improvement Series 124



## ***Designing HMA Mixtures with High RAP Content*** ***A Practical Guide***



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Information Series 123

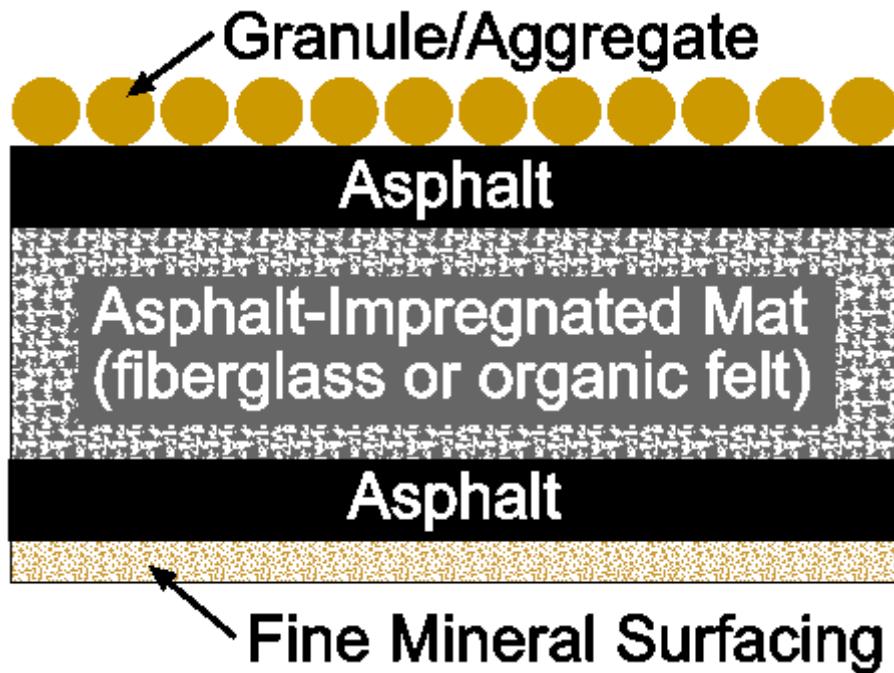


## ***Recycling Hot-Mix Asphalt Pavements***



# RAS

Why use asphalt shingles in asphalt pavement?



**All materials  
commonly used in  
asphalt  
pavements**



# Sources

## ◆ Manufactures' waste

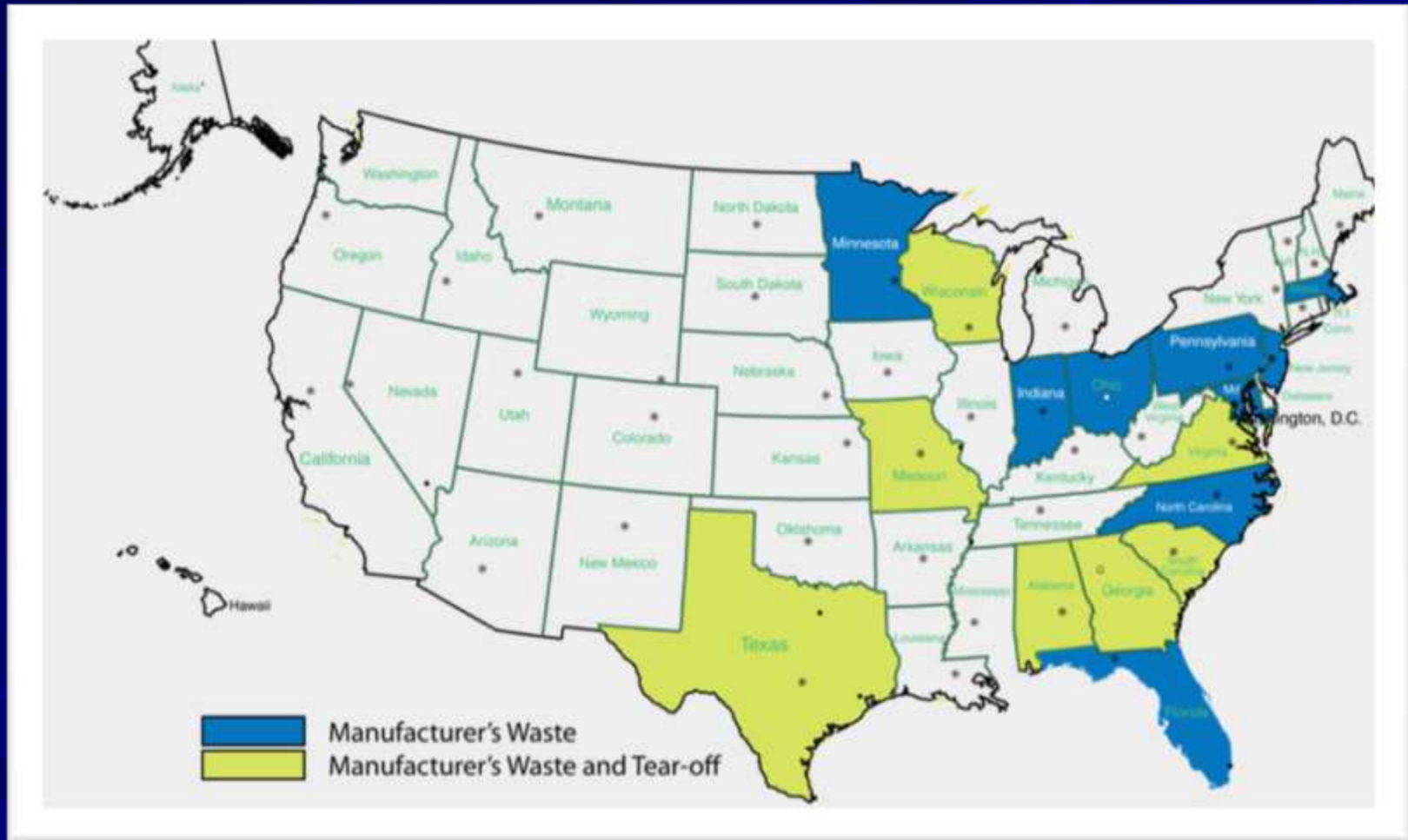
- Limited ~1 MT annual
- Not in every state

## ◆ Tear-offs

- ~10 MT annual
- Everywhere?
  - State regulations
  - Processors



# States Allowing RAS in Asphalt Mixes



# Pooled Fund Study

- ◆ TPF-5(213) Performance of Recycled Asphalt Shingles in Hot Mix Asphalt
- ◆ Sponsoring Agency – Missouri DOT
- ◆ Partners – CA, CO, IA, IN, MN, MO
- ◆ <http://www.pooledfund.org/projectdetails.asp?id=441&status=4>

# RAS Summary

- ◆ Shingles are too valuable to throw away.
- ◆ Use manufacturers' waste if available
- ◆ Tear-offs
  - Work with roofers to get clean material.
  - Work with local agencies on sampling plan
- ◆ Performance
  - Improved rutting resistance
  - Reduced temperature susceptibility
  - Minimum affect on cold temperature properties

# RAS Summary (cont)

## ◆ Mix AC Content

- Will reduce the amount of new asphalt required
- Total asphalt contents often higher (0.2-0.4%)

## ◆ Plant production

- Similar to RAP

## ◆ Mix design

- Similar to RAP

## ◆ Construction

- Use conventional equipment
- Some contractors report easier density



Information Series 136



## Guidelines for the Use of Reclaimed Asphalt Shingles in Asphalt Pavements



## The 5th Asphalt Shingle Recycling Forum

October 27-28, 2011  
Dallas, TX

**CLICK HERE**  
for more information.



# www.morerap.us



## Recycling Asphalt Pavement Expert Task Group

[RAP HOME](#)[ASPHALT RECYCLING EVENTS](#)[PAST RAP MEETINGS](#)[ASPHALT RECYCLING RESOURCES](#)

The purpose of this Expert Task Group (ETG) is to coordinate, develop, and improve national guidance and recommendations for the asphalt pavement recycling program. This group will provide feedback as well as encourage correct utilization of recycling technologies and address construction problems with current state-of-the-practice solutions.

The members consist of representatives from highway agencies, industry, and academia.

The ETG is sponsored by FHWA.



# What is WMA?

- ◆ Allows a reduction in the temperatures at which asphalt mixes are produced and placed.





# WMA Technologies Available in U.S.

In 2005





## WMA Technologies Available in U.S.

In 2011







# WMA Technologies Available in U.S.

... and  
beyond



# 2<sup>nd</sup> International WMA Conference

◆ 550 persons

◆ 24 countries







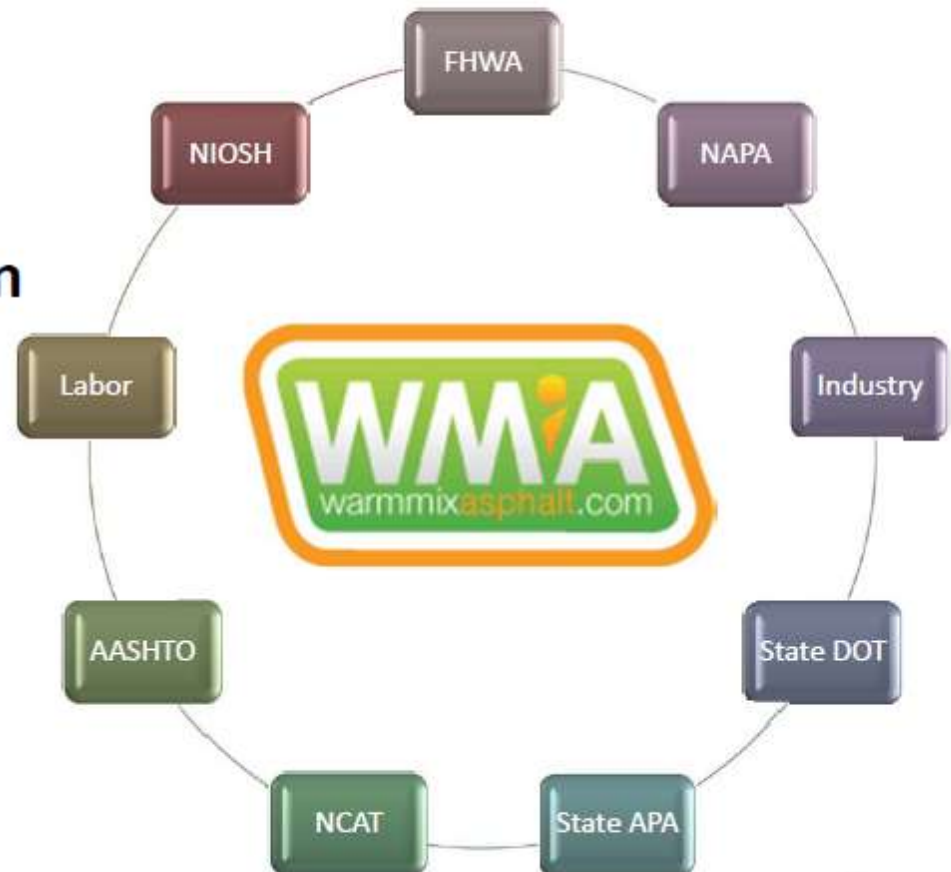
# Stakeholder Engagement: WMA Technical Working Group

Established 2005

**Co-Chairs:**  
**Matthew Corrigan**



**Ron White**



# Warm-Mix Asphalt



warmmixasphalt.com

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[WMA European Practice](#)

[Report](#)



[TWG Meetings](#)

## PLEASE NOTE:

The contents of this web site are to promote the understanding of warm-mix asphalt during its research and development phase in the United States. This web site cannot be used to promote or single out any one specific asphalt technology.

## Warm-mix Asphalt, the Wave of the Future

Warm-mix asphalt technologies allow the producers of asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road. Reductions of 50 to 100 degrees Fahrenheit have been documented. Such drastic reductions have the obvious benefits of cutting fuel consumption and decreasing the production of greenhouse gases. In addition, engineering benefits include better compaction on the road, the ability to haul paving mix for longer distances, and extending the paving season by being able to pave at lower temperatures.

[Read more about the benefits of warm-mix asphalt](#)



**Mark Your Calendar!**  
**2nd International Conference on Warm-mix Asphalt**  
**October 11-13, 2011**

## SUBMIT FOR PUBLICATION

Do you have a presentation or report on warm-mix asphalt to share?

[SUBMIT NOW](#)



## NEWSLETTER

Sign up for our newsletter!







# The Every Day Counts Initiative



INGENUITY IMAGINATION

INVENTION INNOVATION

## Accelerating Technology Deployment



Warm Mix Asphalt (WMA)



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







# Performance Metrics



INGENUITY IMAGINATION

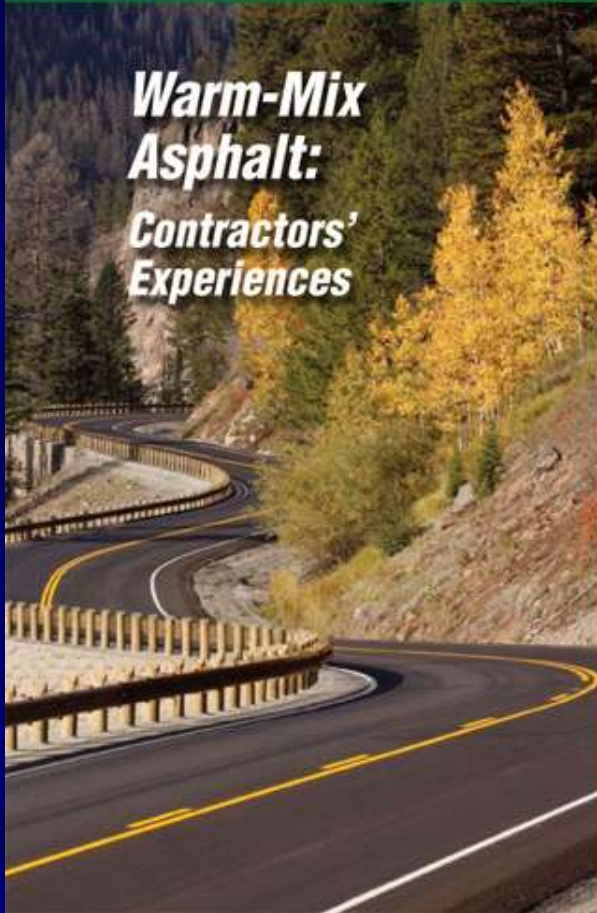
INVENTION INNOVATION

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.

Information Series 134



# ***Warm-Mix Asphalt: Contractors' Experiences***

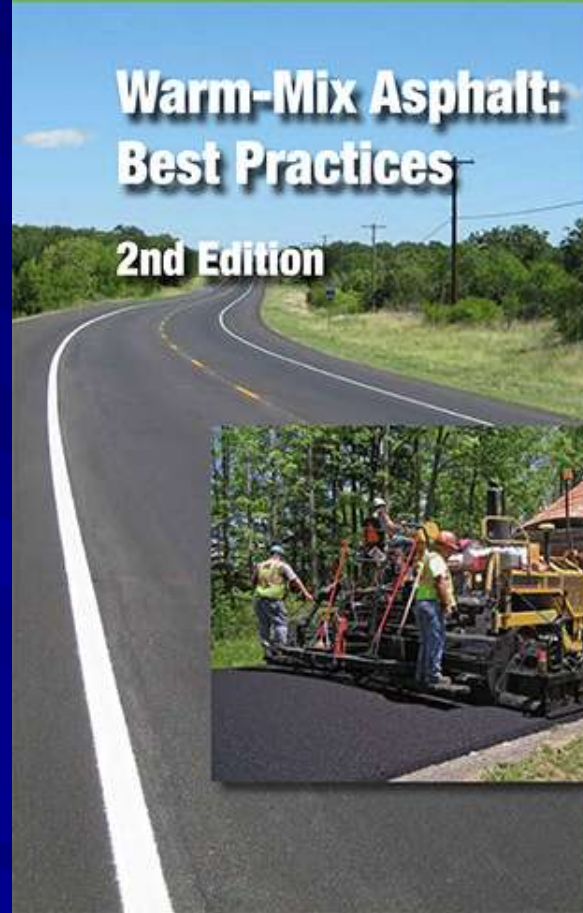


Quality Improvement Publication 125  
2nd Edition



# **Warm-Mix Asphalt: Best Practices**

**2nd Edition**







Improving the  
Performance of  
the Transportation  
Industry Through  
Training

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FHWA-NHI-131137

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## Course Description

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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:

# RAP/RAS/WMA Survey

## RAP

	Total Estimated Tons Million	
Year	2009	2010
Tons Accepted	67.2	73.5
Tons use in HMA/WMA	56.1	62.1
Tons used in Aggregate	6.2	7.3
Tons used in Cold Mix	1.5	1.6
Tons used in Other	0.7	0.8
Tons Landfilled	0.1	0.004
Avg. RAP %	16.2	18.0



# RAP/RAS/WMA Survey

## RAS

	Total Estimated Tons Thousand	
	2009	2010
Companies/branches reporting using RAS	44	61
Tons Accepted	957	1,851
Tons use in HMA/WMA	701	1,099
Tons used in Aggregate	6	3
Tons used in Cold Mix	-	-
Tons used in Other	123	124
Tons Landfilled	-	6

57% increase

# RAP/RAS/WMA Survey

## WMA

	Estimated Total Tons, million	
	2009	2010
Companies/branches reporting using WMA	85	121
DOT	10.7	25.8
Other Agency	3.7	10.1
Commercial & Residential	4.8	11.7
Total	19.2	47.6

Percent increase = 148%





# RAP/RAS/WMA Survey

## WMA

	Estimated Total Tons, million	
	2009	2010
Companies/branches reporting using WMA	85	121
DOT	10.7	25.8
Other Agency	3.7	10.1
Commercial & Residential	4.8	11.7
Total	19.2	47.6

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