

# **LTPP SPS-10: Warm Mix Asphalt (WMA) Overlays of AC Pavements**

FHWA Asphalt Mixture ETG  
April 8, 2015  
Fall River, Massachusetts

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Florida DOT



U.S. Department of Transportation  
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# Background

- Need to investigate long-term performance of WMA
  - Higher potential for rutting?
  - Increased risk of moisture damage?
- Compare WMA to HMA
- Compare various WMA technologies
- Investigate inclusion of RAP in various quantities

# Experimental Design

## WMA Technology

Wet				Dry								
Freeze		No Freeze		Freeze		No Freeze						
High	Low	High	Low	High	Low	High	Low					
Core Test Sections on Project												
HMA (Control)	WMA (Foaming Process)		WMA (Chemical Additive)		2	2	2	2	2	2	2	2

Moisture  
Temperature  
Traffic



16 Projects

# SPS-10 Requirements

- Asphalt overlay of existing asphalt pavements
- Overlay thickness from 2" – 4"
  - Test Sections ~ 800' long
  - 500' plus transition and sampling areas
- Dense-graded mix
- RAP content 10 - 25% (binder replacement)
- 1 HMA control test section
- 2 WMA test sections
  - Foaming Process
  - Chemical Additive



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# Experimental Layer Requirements

- Mix design and asphalt binder grade selection based on Agency's standard practice
- Overlay thickness selected by Agency's standard practice
- Uniformity between HMA and WMA
  - Same binder source/grade
  - Same aggregate source/gradations
  - Mix design/JMF

# Tests on Experimental Layer

- Dynamic Modulus – Small-scale AMPT (TP 79)
  - 0, 6, 12 and 18 months after construction
- 38 mm diameter x 110 mm height specimens
  - Re-cored horizontally from 6" diameter core
  - Otherwise in accordance with AASHTO TP79



# Tests on Experimental Layer (cont.)

- Binder Testing – DSR, BBR, MSCR
  - Tank Binder
  - Extracted binder at 0, 6, 12 and 18 months
- Hamburg Wheel Tracker
  - Initial time period only
- Basic Mix Characterization
  - $G_{mb}$ ,  $G_{mm}$ ,  $P_b$ ,  $G_{se}$ ,  $G_b$ , aggregate gradation

# Tests on Existing Asphalt Layers

- Dynamic Modulus – Small-scale AMPT (TP 79)
- Binder Testing – DSR, BBR, MSCR
- Hamburg Wheel Tracker
- Basic Mix Characterization
  - $G_{mb}$ ,  $G_{mm}$ ,  $P_b$ ,  $G_{se}$ ,  $G_b$ , aggregate gradation

All tests performed at initial time period only



# ETG Recommendations

- Supplementary Tests for Agencies:
  - Based on NCHRP Research Digest 370
  - “Guidelines for Project Selection and Materials Sampling, Conditioning, and Testing in WMA Research Studies”



# Supplementary Tests

Rutting	
Flow Number (AMPT)	AASHTO TP 79
Hamburg Test	AASHTO T 324 (Note: Prepare specimens at air voids content of 7±1% and conduct test at standard conditions: 50°C under water.)
APA	AASHTO T 340
Modulus	
Dynamic Modulus (AMPT)	AASHTO PP 61
Fatigue Cracking	
Beam Fatigue	AASHTO T 321
Overlay Test	<u>TxDOT Method: Tex-248-F</u> , <i>Test Procedure for Overlay Test</i> , February 2014
Simplified Viscoelastic Continuum Damage (S-VECD)	AASHTO TP 107
Superpave Indirect Tension Test (IDT)	University of Florida
Semi-Circular Bending Test at Intermediate Temperatures	Louisiana Transportation Research Center (LTRC)
Thermal (Low Temperature) Cracking	
IDT Creep Compliance and Strength	AASHTO T 322
Semi-Circular Bending Test	AASHTO TP 105
Disk Shaped Compact Tension – DC(T) Test	ASTM D7313

# Supplementary Tests

Durability	
Moisture Sensitivity	AASHTO T 283 (Note: 1 Freeze/Thaw cycle)
Hamburg Test	AASHTO T 324 (Note: Prepare specimens at air voids content of $7\pm 1\%$ and conduct test at standard conditions: $50^{\circ}\text{C}$ under water.)
Other	
$G_{mm}$	AASHTO T 209
Volumetric Properties	AASHTO R 35
Gyratory Compaction to $N_{design}$	AASHTO T 312

Additional information on these recommended tests can be found at the following location:

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rrd\\_370.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_370.pdf)

# Current Status

- 27 States/Provinces plan to nominate a project
- To date, 18 projects have been nominated:
  - 13 projects accepted
  - 3 projects rejected
  - 2 projects being evaluated

# Accepted Project Nominations

- Arizona (2)
- Ontario (2)
- Florida
- Georgia
- Nevada
- New Mexico
- Oklahoma
- Oregon
- Texas
- Washington
- Manitoba

# *Plans to Nominate*

- Alabama
- Arkansas
- Delaware
- District of Columbia
- Kansas
- Louisiana
- Michigan
- Minnesota
- Nebraska
- North Carolina
- Rhode Island
- South Carolina
- Vermont
- Virginia
- Quebec
- Saskatchewan

# Supplemental Sections

- Agencies can build additional test sections that will be monitored as part of the LTPP program
  - Varying levels of RAP
  - Additional WMA technologies
  - Layer thickness variation
  - Open or gap graded mixtures
  - Varying aggregate sources/absorption levels
  - Other variables of interest to Agency



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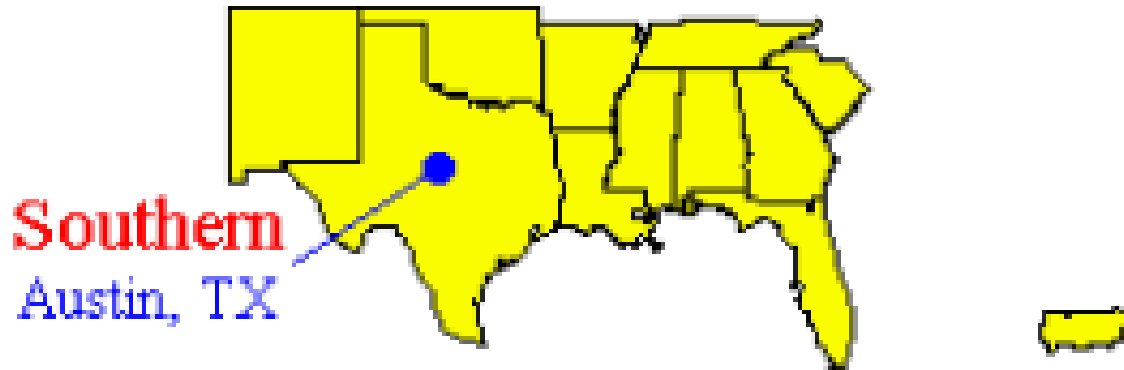
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# ETG Recommendations

- Supplementary Test Sections:
  - Variable Density Levels
  - WMA produced at HMA temperatures
  - Other WMA technologies
  - High Recycle Binder Ratio ( $>0.25$ ) Mixes



# Southern Region



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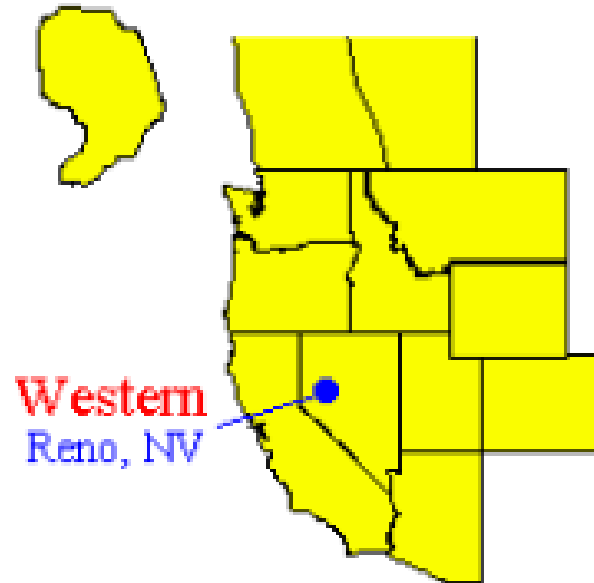
# Southern Region

- New Mexico - I-40 (October 2014)
  - WMA with chemical additive (Cecabase)
  - WMA with chemical additive (Cecabase) and PG 70-28+ binder (standard binder is PG 70-28 binder)
- Oklahoma - SR-66 (April 2015)
  - Stone matrix asphalt with chemical WMA additive
    - No fibers, RAP, or RAS
  - PG 64-22 binder with 10% - 25% RAP/RAS
    - standard binder is PG 70-28
  - PG 58-28 binder with 10% - 25% RAP/RAS

# Southern Region

- Georgia – US-84 (Summer 2015)
  - 1.5” overlay (standard overlay is 2”)
- Texas - US-277 (February 2015)
  - No Supplemental Sections
- Florida – SR-77 Jackson County (Spring 2016)
  - Chemical at HMA temperature
  - Foaming with >35% RAP
  - Chemical with >35% RAP

# Western Region



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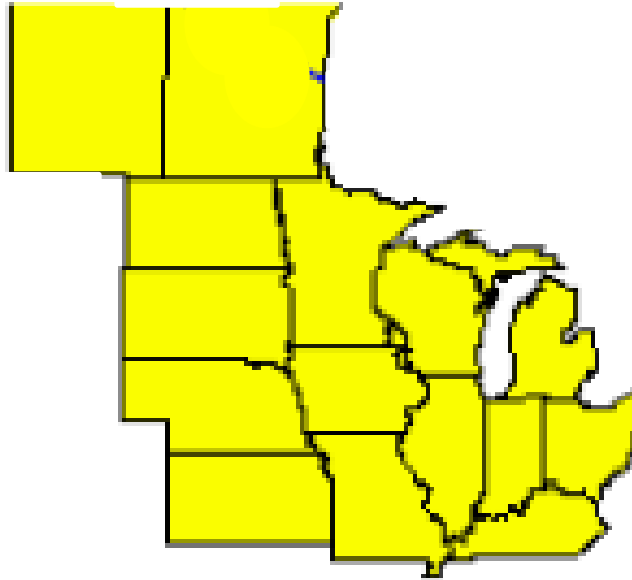
# Western Region

- Arizona: (Both projects will have the same supplemental test sections):
  - 1 foaming section with increased RAP,
  - 1 chemical section with increased RAP,
  - 1 HMA with increased RAP.
- Nevada:
  - 1 organic WMA section,
  - 1 foaming additive,
  - 1 foaming additive with TBR (terminal blend rubber),
  - HMA with TBR

# Western Region

- Oregon:
  - 1 foaming section produced at hot mix temperatures,
  - 1 HMA section with increased RAP
- Washington:
  - 1 HMA section with ½” NMAS and 60 gyration mix
  - 1 foaming section with ½” NMAS and 60 gyration mix,
  - 1 HMA section with 3/8” NMAS and 100 gyration mix,
  - 1 HMA with 3/8” NMAS and 60 gyration mix

# North Central Region



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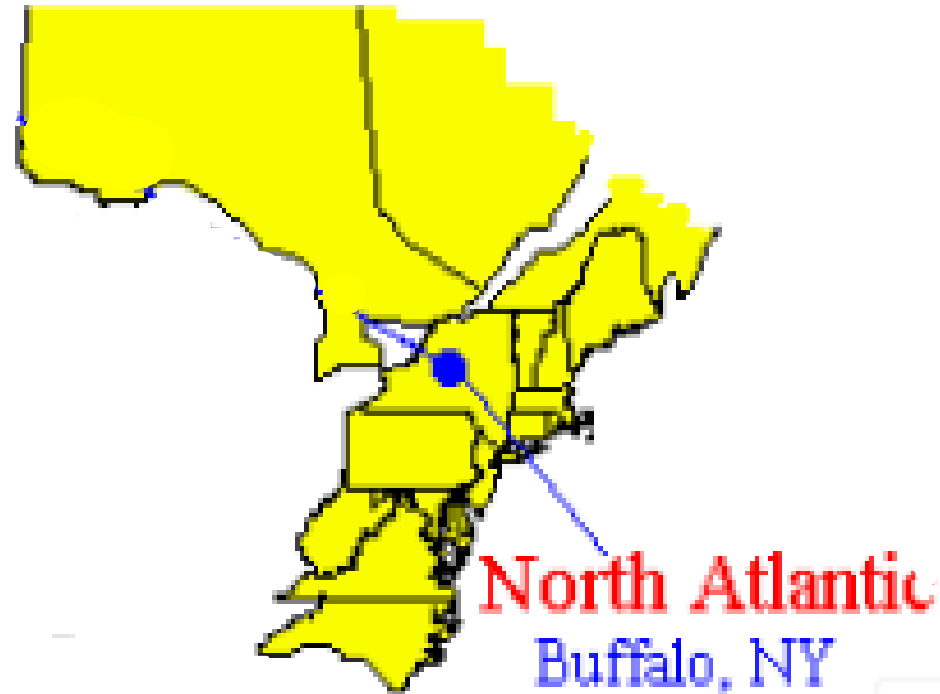
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# North Central Region

- Manitoba:
  - WMA Chemical Additive & Foaming Process test section (Evotherm and Water),
  - WMA Foaming Process test section (water).



# North Atlantic Region



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# North Atlantic Region

- Ontario:
  - WMA Chemical Additive test section (Rediset),
  - WMA Organic Additive test section (SonneWarmix).

# Summary

- 13 of the 16 projects have been selected
  - 5 Western Region
  - 5 Southern Region
  - 2 North Atlantic Region
  - 1 North Central Region
- Majority will be constructed 2015
  - Time's running out if you need something
- Most states are adding supplemental sections

# Contacts

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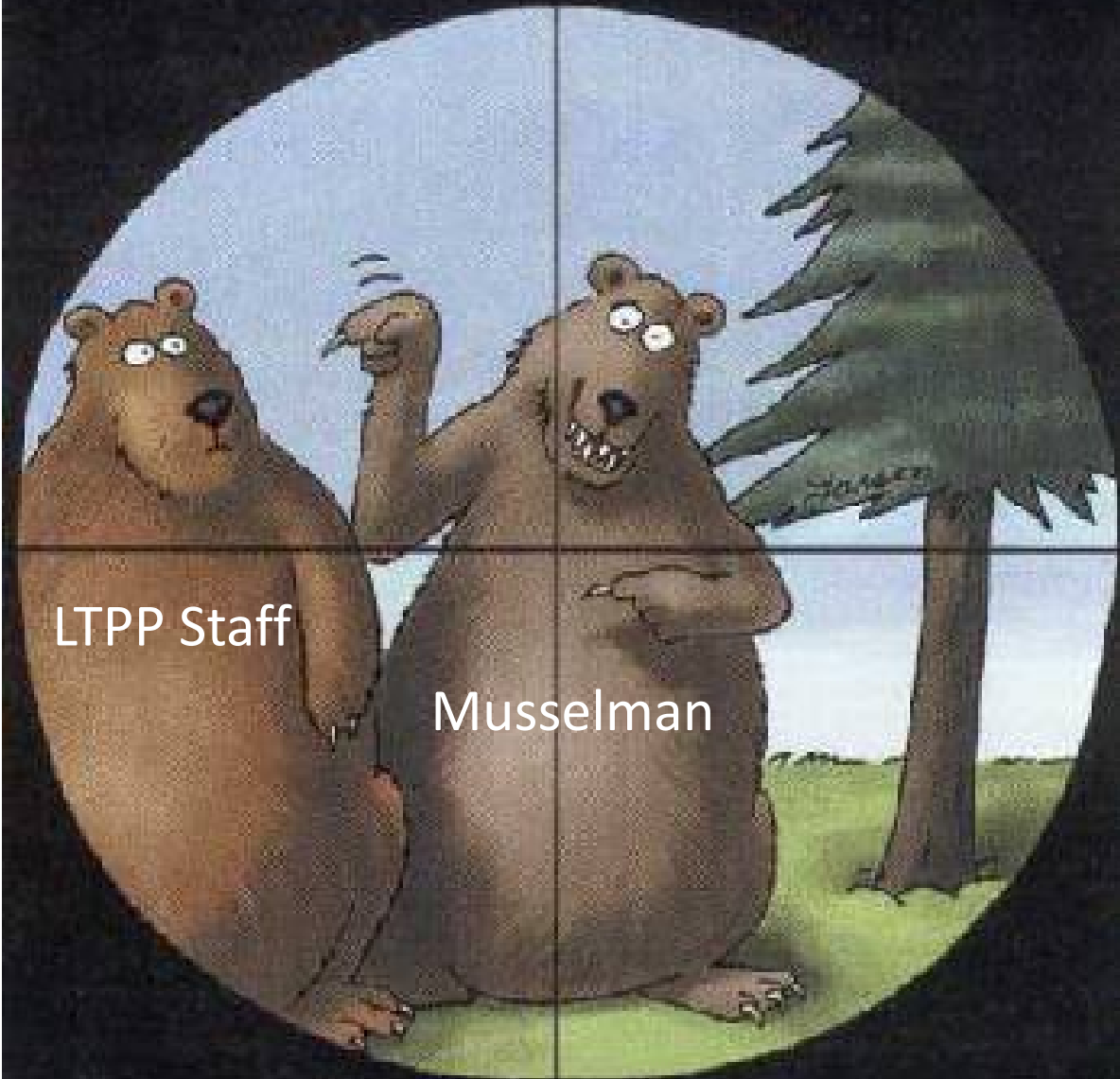
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# Thank You... Questions?

