WMA Specification and Policy Document Development in Minnesota

Tim Clyne
Mn/DOT

TRB 90th Annual Meeting

Acknowledgements

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- ★Roger Olson, Ed Johnson

Industry

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Potential Benefits of WMA

Environmental

- ★ Lower greenhouse gas emissions
- ★ Lower fuel consumption

Operational

- ★ Better compaction
- ★ More comfortable working conditions

Performance

- ★ Can use RAP and/or shingles with WMA
- ★ Eliminates bumps in overlays
- ★ Reduced binder aging – reduced cracking

WMA EXPERIENCE IN MINNESOTA

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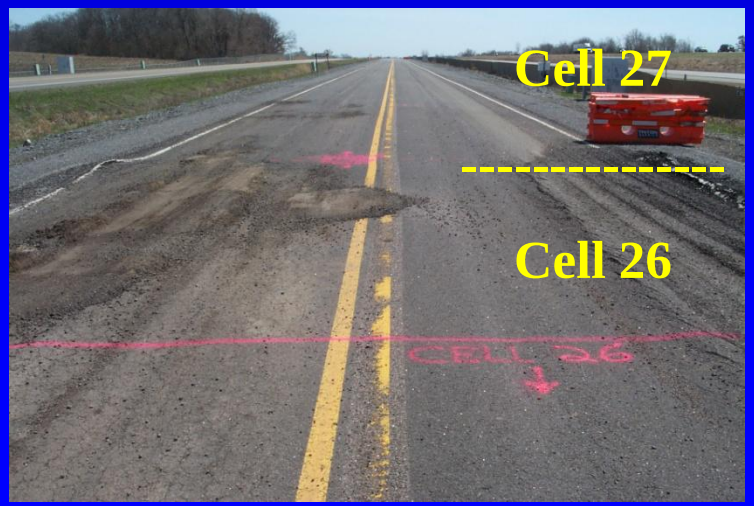
Oil Gravel
Early WMA by Another Name

TRB LVR Conference (1995) – Demo Project Outside MnROAD
Cell 32 (1998) – Cold Mix Paving Practice
Cell 27 (1999) – Chip Seal / Large Stone Base
Cell 28 (1999) – Oil Gravel (luke warm mix) / Large Stone Base
Cell 26 (2000) – Oil Gravel (warm mix) / Reclaimed Base
Cell 27 (2000) – Oil Gravel (warm mix) / Large Stone Base
Several County Roads throughout Minnesota in 1990's



- ★Oil Gravel requires solid base
- ★No Transverse Cracking or Rutting
- ★Some Fatigue and Rough Ride

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Olmsted & Goodhue Counties

First known true WMA jobs in MN (2007)

- ★Revix (Evotherm 3G) technology
- ★Olmsted CR 104
  - ★5 mile stretch
- ★Goodhue CSAH11
  - ★537 tons placed in 4,200 feet of the EB lane

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Crow Wing County

County Road 108 (2008)

- ★2913 tons WMA, 272 tons HMA
- ★58-34 HMA vs. 58-28 WMA
- ★Estimated 5 years of extended service life
  - ★Life cycle cost analyses are favorable for WMA
- ★*ASCE Cold Regions paper 2009*

County now allows alternate bids on several projects

- ★20,000 tons WMA in 2009 (CR 2)

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2008 MnROAD Construction

- 6 Cells on Mainline
- Wear and Non-Wear
- 12.5 mm NMAS
- Traffic Level 4
- PG 58-34
- 20% RAP from MnROAD
- No requirements for WMA technology

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Mn/DOT Trunk Highway 95

Late season paving (2009)

- ★ Contractor was delayed, needed to finish paving before winter
- ★ Supplemental Agreement – Mn/DOT paid extra $0.60 per ton for WMA
- ★ Business as usual (mostly)
  - ★ Good density 2nd day after going back to HMA rolling pattern

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Mn/DOT District 3 and 7 Projects in 2010

First "regular" Mn/DOT projects requiring WMA

S-1 (2360) PLANT MIXED ASPHALT PAVEMENT – USE OF WARM MIX ASPHALT TECHNOLOGIES

The provisions of the attached 2360 Plant Mixed Asphalt Pavement (Gyratory Design) Specification is hereby modified as follows in order to use Warm Mix Asphalt (WMA)

All provisions for the production and placement of WMA will be the same as the conventional HMA mixtures as stipulated in 2360 Plant Mixed Asphalt Pavement (Gyratory Design) Specification except as noted below.

S-2.1 MIXTURE DESIGN

The contractor is responsible to use the same design used to produce the Hot Mix Asphalt, then modifying it to accommodate products or processes to meet the Warm mix criteria. This modification process will be limited to the same as described by the WMA Technical Working Group and found at http://www.warmmixasphalt.com/WmaTechnologies.aspx

Recycled Asphalt Shingles will not be allowed in any mixes on this project.

S-3.1 MIXTURE QUALITY MANAGEMENT

The Warm Mix Asphalt produced will not be allowed to exceed temperatures greater than 275 °F. Any WMA over that temperature will not be allowed to be used.

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REVIX / Evotherm 3G

REVIX™ developed by Mathy Technology & Engineering and Paragon Technical Services, Inc.

- ★ Chemical additive added at terminal or HMA plant
- ★ Requires no plant modification
- ★ Binder shipped from supplier with WMA chemical package already added

This technology is now marketed as Evotherm 3G

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Maxam AquaBlack

Bituminous Roadways

- ★Installed on 2 local plants
  - ★Try for a 3rd failed
- ★15% of production was WMA

Knife River

Duininck Brothers

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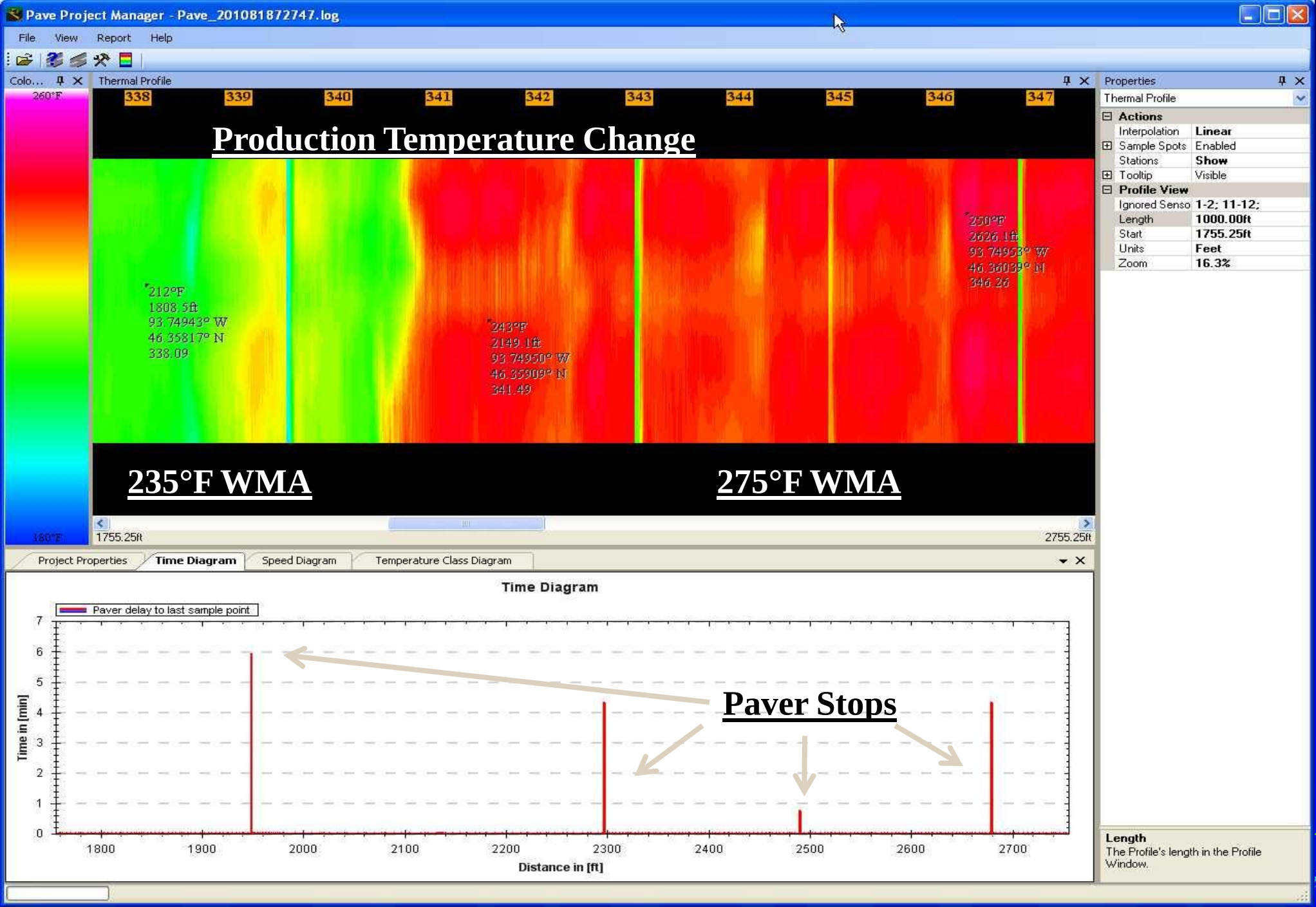
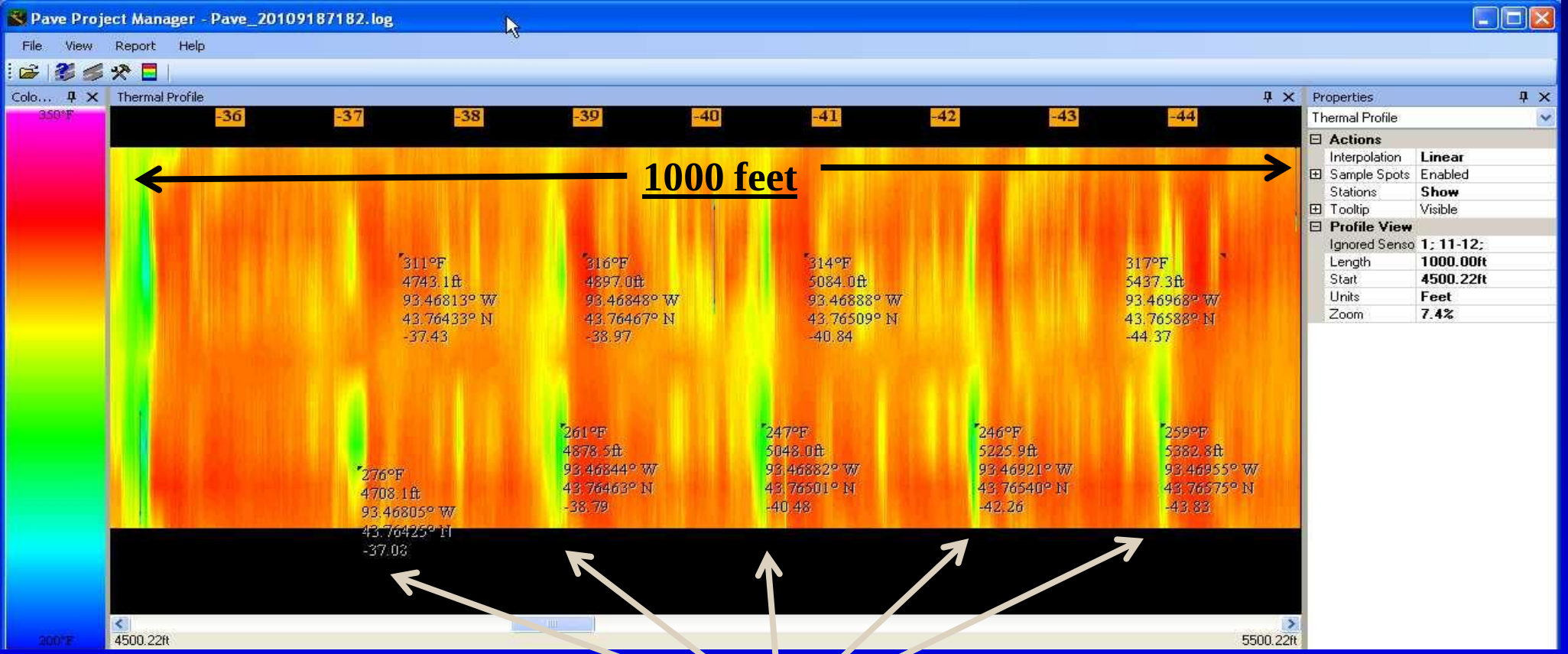
Pavement Surface Temp

MOBA Pave-IR

12 sensors spaced 1 foot apart,
reading interval = every 6 inches


Pave Project Manager - Pave_201081872747.log
File View Report Help
Thermal Profile
338 339 340 341 342 343 344 345 346 347
Production Temperature Change
212°F
1808.5ft
93.74943° W
46.35817° N
338.09
243°F
2149.1ft
93.74950° W
46.35909° N
341.49
250°F
2626.1ft
93.74953° W
46.36039° N
346.26
235°F WMA
275°F WMA
1755.25ft
2755.25ft
Properties
Thermal Profile
Actions
Interpolation Linear
Sample Spots Enabled
Stations Show
Tooltip Visible
Profile View
Ignored Senso 1-2; 11-12;
Length 1000.00ft
Start 1755.25ft
Units Feet
Zoom 16.3%
Project Properties
Time Diagram
Speed Diagram
Temperature Class Diagram
Time Diagram
Paver delay to last sample point
Time in [min]
Distance in [ft]
Paver Stops
Length
The Profile's length in the Profile Window.



Cyclic End of Truckload Thermal Segregation

This picture is HMA

WMA paving did not see same segregation at end of truck

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Mn/DOT 2011 Bituminous Specification

2009 Position Memo

Permissive Spec

www.dot.state.mn.us/materials/bituminous.html

Table 2360.6-C5
Mixture Temperature Control[C]

Air Temperature	Compacted Mat Thickness, inches[A]			
°F [°C]	1 inch [25 mm]	1-1/2 inch [40 mm]	2 inch [50 mm]	≥3 inch [75 mm]
+32-40 [0-5]	--	265 [B] [129]	255 [124]	250 [121]
+ 41-50 [6-10]	270 [B] [130]	260 [127]	250 [121]	245 [118]
+ 51-60 [11-15]	260 [B] [127]	255 [124]	245 [118]	240 [115]
+ 61-70 [16-21]	250 [B] [121]	245 [118]	240 [115]	235 [113]
+ 71-80 [22-27]	245 [118]	240 [115]	235 [113]	235 [113]
+ 81-90 [28-32]	235 [113]	230 [110]	230 [110]	230 [110]
91+ [+ 33]	230 [110]	230 [110]	230 [110]	225 [107]

(A) Based on approved or specified compacted lift thickness.

(B) A minimum of one pneumatic-tire roller shall be used for intermediate rolling unless otherwise directed by the Engineer. The Engineer may specify or modify in writing (with concurrence from the Department Bituminous Engineer) a minimum laydown temperature.

(C) Not applicable if a WMA additive or process is used.

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WMA Frequently Asked Questions

Frequently Asked Questions
about
Warm Mix Asphalt (WMA)

Warm Mix Asphalt (WMA) is a relatively new technology in the United States, and in Minnesota in particular. The list below is not an exhaustive list of questions about warm mix, but it does try to answer some of the most common questions about this technology.

What is Warm Mix Asphalt?
Warm Mix Asphalt (WMA) is the generic term for any technology (additive or water foaming technique) added to an asphalt mixture that allows the mixing and compaction temperature to be reduced by 20 to 100°F. It allows the mix to remain workable at lower temperatures, and has potential environmental, operational, and performance benefits over traditional hot mix asphalt (HMA).

The contractor has approached us (local agencies) about substituting WMA for HMA. Should we use WMA on our project?
Mn/DOT supports the use of WMA as an alternate to HMA on most projects.

Should we pay an additional cost for warm mix?
The use of WMA may add between $0.60 to $2.00 per ton of mix, although as WMA becomes more commonly used that price differential should be reduced. However, agencies should not pay the additional costs if WMA is proposed after the project has already been let.

Are there any pavement performance issues with WMA?
The oldest WMA projects in the US are only 6 years old, so no long term performance data is available. Early rutting and moisture damage are potentially of concern, although no known WMA projects have shown these distresses to date.

Thank You!

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