

**SYNTHESIS OF WARM MIX ASPHALT PAVING
STRATEGIES FOR USE IN MONTANA HIGHWAY
CONSTRUCTION**

Executive Summary

by

Steven W. Perkins
of the

Western Transportation Institute
College of Engineering
Montana State University

Executive Summary prepared for the

State of Montana
Department of Transportation
Research Programs

in cooperation with the

U.S. Department of Transportation
Federal Highway Administration

November 2009

EXECUTIVE SUMMARY

Warm Mix Asphalt (WMA) used as an alternative to conventional Hot Mix Asphalt (HMA) has gained national prominence. WMA uses technological advances that reduce the temperature needed to produce and compact asphalt for the construction of pavements. It offers the potential to reduce construction costs by lowering energy use, improving quality and efficiency of construction, improving environmental stewardship through decreased air emissions and creating a healthier work environment.

WMA technologies fall broadly into one of four categories based on the type of additive used, namely, those having water-based additives, water-bearing additives, chemical additives and organic additives. At the time of this report, 12 WMA technologies are identified. Many of these technologies involve relatively simple plant and mix design modifications to introduce the temperature-reducing additive in the mixture stream. Other technologies, particularly those involving water-based foaming techniques, require more substantial modifications.

NCHRP Project 9-43 has been tasked with developing a mix design methodology for WMA. Phase I of this study is complete and was concerned with developing a draft standard of practice for mix design of WMA, which is further evaluated and updated with work being performed under Phase II. Phase II is expected to be completed by March 2010. The draft standard of practice follows a framework established for HMA with the following modifications: 1) to account for reduced aging during production due to lower production temperatures, guidelines are given for increasing the high temperature stiffness of the binder; 2) practices for evaluating workability at lower production temperatures are given; 3) short term aging of mixtures prior to gyratory compaction and material used for performance tests is recommended; and 4) use of higher percentages of RAP is encouraged.

Construction practices with WMA are not greatly different from those for HMA, with the greatest differences being the need for plant modifications for certain technologies. An informal survey of state DOTs, produced 12 states having specifications for WMA use.

A number of demonstration projects have been conducted and the majority has shown good success. The most significant concern with WMA appears to be with premature rutting and stripping of mixtures. Hamburg wheel tracking device tests have demonstrated both favorable and unfavorable rutting and stripping results. Issues that may be pertinent in these studies involve the presence of excessive moisture in the aggregate that may not be driven off at the lower production temperatures and the need for short term aging to simulate realistic field conditions.

Based on the results of this study, it is recommended that MDT undertake research and implementation studies to allow WMA to be used in practice on Montana roadways. In particular, it is recommended that a comprehensive mixture design study be undertaken using the majority of WMA technologies and aggregate and binder materials common to Montana's regions. This study should use draft recommendations contained in NCHRP Project 9-43. The influence of RAP, cure time, aggregate water adsorption rates and lime should be examined to see if these variables can be used to address rutting and stripping issues. Practices for reheating bulk field specimens for laboratory testing should be evaluated. An approval system for existing and future WMA technologies needs to be established. Based on the above work, a specification for WMA needs to be established. Finally, field trials should be constructed according to this specification to evaluate the long-term performance of WMA in Montana.