User Guide for the Warm Mix Asphalt and Anti Strip Additives Technical Committee
(Published 12/31/2019)

**Introduction:** This program is used to evaluate the various warm mix asphalt technologies (additives and foaming) used to produce asphalt mixtures for pavements. It also evaluates anti-strip additives used to improve the adhesion of liquid asphalt to aggregate in asphalt mixtures. These additives and technologies are used to enhance the performance of the asphalt mixture, aid in compaction of asphalt mixtures in the field, and reduce asphalt plant operating temperatures.

**Key Aspects of the Program:**

**Warm Mix Asphalt (WMA)** The work plan for evaluation of the WMA technologies is designed to evaluate the system being used (foaming or additives) and determine how it will impact the performance of asphalt binder and asphalt mixture. This is done by comparing a control binder and mix to the same binder and mix with the additive or foaming technology.

**Anti-Strip Additives (ASA)** The work plan for evaluation of ASA products is designed to evaluate the additive by determining how it will impact performance of the asphalt binder and asphalt mixtures. This is done by comparing a control asphalt binder and asphalt mixtures (limestone and granite sourced) to the same binder and mixtures with the ASA added.

For both programs, the control mix is a 100% virgin (no recycled materials) mix, and an unmodified (no modifiers like REOB, Polymers or PPA) asphalt binder. The additives are added at the manufacturer’s recommended dosage rate and compared to the control mix in several different tests. There are procedures set up within both workplans to work with plant produced mixes or mixes produced in a lab.

**Terminology:**
**Warm Mix Asphalt (WMA)** – Warm mix asphalt refers to asphalt concrete mixtures that are produced at temperatures approximately 50°F (28°C) or less than typically used in the production of hot mix asphalt. The goal with warm mix asphalt is to produce mixtures with similar strength, durability, and performance characteristics as hot mix asphalt using substantially reduced production temperatures.

**Chemically-Processed Warm Mix Asphalt** – Asphalt mixing process which includes technologies that use additives to improve coating, mixture workability, and compaction, as well as adhesion promoters.

**Foaming-Processed Warm Mix Asphalt** – Asphalt mixing process which includes processes that introduce small amounts of water to hot asphalt, either via a foaming nozzle, damp aggregate, or a mineral filler such as zeolite to reduce viscosity of the binder.

**Organic-Additive Warm Mix Asphalt** – Asphalt mixing process which includes technologies that use synthetic wax additives specifically engineered to achieve the temperature reduction by reducing viscosity of the binder.

**Anti-Strip Additives (ASA)** - Anti stripping additives are the chemical compounds, which renders minimum stripping (breaking) of bonds between the aggregate surface and the bitumen. The stripping is attributed to water which gets between the bitumen film and the aggregate surface.

**Review of Evaluations and Significance of Data Generated:**

NOTE: Tests described below are run in both the WMA and ASA Programs unless noted otherwise

- Asphalt Binder Testing:
  - Performance Graded Testing and Multiple Stress Creep Recovery

  The purpose of these tests is to see if the additives used as WMA and ASA have any impact on the properties of the asphalt binder. A control binder is tested without the additives, and then that same binder is tested with additive. The standard suite of PG binder tests is run. Any change in PG binder test results could demonstrate a modification of the binder. Each manufacturer or agency would need to determine if the change in binder properties is an impact that is important to them, or what level of change in binder properties is significant.

- Asphalt Mixture Testing:
  - Tensile Strength Ratio
The purpose of this test is to see if the WMA or ASA additives have any impact on the moisture sensitivity of the mixture. An ASA additive should result in an increase in the TSR Ratio. For the ASA program, this test is run on two separate mixes, one that is predominantly granite, and another mix that is predominantly limestone. The WMA program runs this test on a granite mix only. Besides test results for dry and saturated strength, photos of the specimens are produced so the agency can determine if there is any visual stripping of the asphalt from test specimens that is visible.

- **Performance Testing – Hamburg Wheel**

  The purpose of this test is to see if the WMA or ASA additives have any impact on the rutting resistance of the mixture. It also is an indicator of the moisture sensitivity of the mixture. The results of this test are reported as number of wheel passes run, rut depth in millimeters, and the stripping inflection point (a mathematical analysis where stripping may be impacting the test results). Photos of the specimens and the water bath after testing are also produced so the agency can determine if there is any visual stripping of the asphalt from the test specimens that is visible.

- **Boil Test (for ASA program only)**

  The purpose of this test is to see if any stripping of the asphalt from the particles occurs during boiling. This test is run on two separate mixes, one that is predominantly granite, and another mix that is predominantly limestone. Photos of the samples after boiling in water will be produced so the agency can see if any asphalt is coming off the particles, or if the water is becoming cloudy due to stripping of the fine particles during the test.

- **Spectrography – Fingerprint of the Additive**

  A spectrographic analysis of the additives for both the WMA and ASA program is run. This done to ensure that the chemistry of the product submitted hasn’t changed. Significant changes in chemistry would result in a need to retest the product.