

I. PROBLEM NUMBER

II. PROBLEM TITLE DRAFT

Use of Asphalt Shingle (Manufacturer Waste and Post Consumer) in Asphalt Pavement

III. RESEARCH PROBLEM STATEMENT

A field study is needed to investigate the properties of HMA containing asphalt shingles.

Asphalt shingles are composed of fiberglass, asphalt binder and mineral matter (granules and filler). Manufacturer waste, that is tabs and off-spec shingles, have been used in hot mix asphalt for a number of years. More recently, the challenges of processing post-consumer shingles, those removed from roofs of residences, has been addressed making recycling into HMA possible.

In concept asphalt shingles are similar to reclaimed asphalt pavement. Each contains asphalt binder different than the asphalt binder normally used. The main issue with asphalt shingles, particularly post-consumer shingles is the hardness of the asphalt binder. A pooled fund study is currently addressing the design of HMA containing asphalt shingles. This research is a laboratory-based study.

Recent studies of RAP in plant mix have shown that the effect of the aged asphalt binder on hardness of binder in the hot mix is less pronounced than expected based on laboratory studies. The simplistic statement that the old asphalt binder is acting as black rock is not supported since the HMA maintain low temperature and fatigue performance.

IV. LITERATURE REVIEW

Some work has been done to investigate the stiffness of HMA containing asphalt shingles as an evaluation of its acceptability. The best known work was done by Advanced Asphalt Technologies by Ray Bonaquist looking at the blending of manufacturer waste shingles.

Current specifications in AASHTO M-323 regarding the selection of asphalt binder grade for HMA containing RAP indicate that the asphalt binder grade should be reduced one PG grade for high temperature and low temperature when the percent RAP exceeds 15% and a binder evaluation should be done if the percent RAP exceeds 25%.

Recent work by the North Central Superpave Center looking at the effect of reclaimed asphalt pavement on the properties of plant mixed hot mix asphalt indicates that the amount of hardening that occurred is significantly less than expected based on laboratory studies of the past. As a result of the field studies the Indiana Department of Transportation increased the percent asphalt binder replacement before changing PG-grade.

A study is needed to determine appropriate selection of asphalt binder grade for plant-produced HMA containing different amounts of shingles, both manufacturer waste and post consumer.

V. RESEARCH OBJECTIVE

The objective of this research is to develop recommendations for selection of asphalt binder grade based on the properties of plant-mixed hot mix asphalt containing various percentages of asphalt shingles.

Proposed Tasks:

- 1) Collect available information regarding the properties of Hot Mix Asphalt containing asphalt shingles.
- 2) Develop a study plan and experiment to be executed at hot mix plants. Due regard should be made for
 - I. Geographic distribution
 - II. Shingle additive to include manufacturer waste and post consumer.
- 3) Execute experiment at hot mix plants in different geographic locations.
- 4) Measure properties of experimental mixtures including but not limited to
 - I. Low temperature cracking behavior
 - II. Fatigue cracking behavior
 - III. Stiffness
 - IV. Durability, such as resistance to aging or moisture damage
- 5) Develop guidelines and proposed amendments to AASHTO M323

VI. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Proposed Funding -- \$300,000

Research Period – 24 months

VII. URGENCY AND PAYOFF POTENTIAL

Pressure to use asphalt shingles, particularly post consumer shingles, is increasing.

Potential savings in asphalt binder

11 million tons per year of shingles available for HMA

Contains 2 million tons of asphalt binder

300 million tons of HMA produced per year

Contains 14 million tons asphalt binder

10% asphalt binder replacement with shingles

At \$500 per ton of asphalt binder, potential savings of \$700 million per year are possible.

VIII. PERSON(S) DEVELOPING THE PROBLEM

This problem statement was developed by Gerry Huber as part of the activities of RAP Expert Task Group

IX. PROBLEM MONITOR

This is to be established by the AASHTO SOM

X. DATE AND SUBMITTED BY

This problem statement is submitted by the RAP ETG.