Performance of Recycled Asphalt Shingles in Hot Mix Asphalt

National Pooled Fund Study 1208

Missouri DOT, Lead State
Minnesota DOT
Iowa DOT
Colorado DOT
CalTrans
Federal Highway Administration

Impetus for Study

- The use of recycled asphalt shingles (RAS) in hot-mix asphalt (HMA) applications has grown across the US in the last 10 years.
- A number of states are using manufacturers' RAS with a growing interest in the use and applications of tear-off RAS in HMA.
  - Common concerns and questions in the use of tear-off shingles.
  - Previous research has limited laboratory testing & field surveys.
- Researchers and bituminous/material engineers still seeking additional research to study the effects of tear-off RAS on the performance of HMA applications and their economic value.
- Multiple state demonstration projects would provide adequate laboratory and field test results to answer the design, performance and environmental questions.
  - Qualification of tear-off RAS for use in HMA
  - Utilization of tear-off RAS for acceptable long-term performance.

Study Objectives

1. To address the concerns of QA/QC in the sourcing, processing and incorporation of the RAS to achieve a final product that would meet the requirements for use in state HMA applications. Create a specification that includes sufficient language to cover the QA/QC concerns.
2. To conduct demonstration projects to provide laboratory testing and field surveys to determine the behavior and performance of RAS in HMA at varying percentages, climates and traffic levels.
3. To create a comprehensive database on the performance of RAS in HMA applications.

Identified 7 Tasks

1. Conduct a literature search and review of nationwide applications of manufactured and tear-off shingles to provide an up to date literature review.
   a. Specifications
   b. Case studies / demonstration projects
   c. Environmental white papers and completed research on asbestos and polycyclic aromatic hydrocarbons (PAHs) in RAS
2. Review and implementation of QA/QC of equipment and best practices for processing and sourcing of shingles through field demonstration projects.
   a. Sourcing and mapping of clean tear-off shingles
   b. Processing into RAS (grinding, screening, equipment)
   c. Standard procedures to measure deleterious materials in RAS
   d. Environmental practices (worker health & safety, certification procedures, PAH testing)
   e. Specification review to include language that covers all concerns of QA/QC

Tasks 3-5

3. Field - visual surveys of HMA pavement applications using RAS:
   a. Past case studies and demonstrations
   b. State DOT and county applications
   c. New research and demonstrations over study period
4. Characterization of binder qualities:
   a. Blending of RAS binders with virgin binders
   b. Blending of RAS binders with recycled asphalt pavement (RAP) binders
   c. Total available binder in RAS and percent effective in the mix
   d. Performance Testing (low temperature cracking, rutting, fatigue cracking)
5. Mix design and performance testing:
   a. Gradation (fractionation) & Development of mix designs
   c. Aging effects
   d. Performance (fatigue cracking , rutting)
   f. % RAS for best performance according to regions

Tasks 6 &7

6. Statistical analysis.
    a. Field - visual surveys
    b. Characterization of binder qualities testing
    c. Mix design (volumetrics) and performance testing
7. Development of final report and technology transfer applications.
    a. Methods for characterizing shingles
    b. Mix design specifications

Acknowledgements

- John “JD” Wenzlick & Joe Schroer MoDOT
- Roger Olson, MnDOT
- John Hinrichsen & Scott Schram, IADOT
- Audrey Copeland & John D’Angelo, FHWA

Thank You!
Questions?