DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

New Rubberized Hot Mix Asphalt Materials with Recycled Asphalt Pavement/Recycled Asphalt Shingles, Part B for Interlayers and Base for Rigid Pavements

Characterizing Rubberized Hot Mix Asphalt with Recycled Asphalt Materials (RAP) with Recycled Asphalt Shingles (RAS) for Interlayers and Base Layers under Rigid Pavements.

Pavement

November 2025

Project Title: Partnered Pavement Research Center (PPRC) 20: Mechanistic-Empirical Design

Task Number: 3977

Start Date: September 1, 2021

Completion Date: September 30, 2023

Task Manager:

Somayeh Mafi
Senior Transportation Engineer
Somayeh.Mafi@dot.ca.gov

WHAT IS THE NEED?

The California Department of Transportation (Caltrans) has increased the allowable binder replacement of RAP to 25 percent in asphalt mixes. Potential concerns associated with the use of RAP/RAS include the influence of aged binder from the RAP/RAS on binder aging properties and the degree of blending during mix production and service life. Binder in existing pavements is known to oxidize and age-harden over time, significantly altering its original properties. Studies have demonstrated that aged RAP/RAS binder can blend with virgin binder, ultimately changing binder properties, which could affect pavement performance, especially when higher percentages of RAP/RAS are used.

Currently, solvent extraction and recovery is the only method to physically separate RAP/RAS binder from aggregate for characterization. This process has long been questioned due to the force-blending of virgin and RAP binders, potential alteration of binder rheology, worker health risks, and hazardous waste disposal issues. Non-representative blending and rheology results can significantly impact asphalt performance in both hot and cold weather. These challenges are further complicated when rejuvenating agents are added to soften RAP binder or when warm-mix technologies are applied.

WHAT ARE WE DOING?

This research investigates the use of RAP in Rubberized Hot Mix Asphalt (RHMA) without reducing the amount of recycled tire rubber used by Caltrans. This phase continues laboratory

Caltrans

DRISI provides solutions and knowledge that improves California's transportation system.

testing to characterize the properties of RHMA mixes containing RAP/RAS.

This study includes the following sub-tasks:

- Literature review of recently completed research
- Laboratory testing of select RHMA mixes with RAP and/or RAS
- Field evaluation of Jointed Plain Concrete Pavement (JPCP) slab–base interaction
- Preparation of a research report

WHAT IS OUR GOAL?

The goal of this task is to develop guidelines for the use of RAP in RHMA mixes and to prepare PRS for RHMA used in interlayers and rigid pavement bases.

WHAT IS THE BENEFIT?

As the availability of asphalt and aggregates declines, using higher quantities of RAP/RAS in asphalt mixes while reducing reliance on costly virgin materials becomes increasingly desirable. This research improves understanding of how RAP/RAS affects the performance of composite binders, enabling Caltrans to design more durable, cost-effective pavements.

WHAT IS THE PROGRESS TO DATE?

Research activities are complete, and the research team is preparing the final report.