

Pavement

FEBRUARY 2023

Project Title:  
New Rubberized Hot-Mix Asphalt  
(RHMA) with Recycled Asphalt  
Pavement (RAP)/Recycled Asphalt  
Singles (RAS) for Interlayers and  
Base for Rigid Pavements

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Task Manager:  
Weili Zhao  
Transportation Engineer  
weili.zhao@dot.ca.gov

## New Rubberized Hot Mix Asphalt (RHMA) with Recycled Asphalt Pavement (RAP) /Recycled Asphalt Singles (RAS) for Interlayers and Base for Rigid Pavements

Laboratory testing to establish properties of RHMA containing RAP/RAS

### 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 the aged binder from the RAP/RAS on the virgin binder aging properties and the degree of blending that occurs during mix production and thereafter.

The binder in existing pavements is known to oxidize and age-harden over time and hence significantly alter original binder properties. Studies have also demonstrated that the aged RAP/RAS binder can blend appreciably with the virgin binder, ultimately changing the binder properties, which could affect pavement performance (i.e., rutting, cracking, and raveling) especially when the mix contains higher percentages of RAP/RAS.

To date, solvent extraction and recovery is the only method that physically separates the RAP/RAS binder from the aggregate for characterization. The process has long been questioned because of the force-blending of the virgin and RAP binders, the potential for altering the rheological properties of the binder, the method followed for recovering the binder, and health risks to workers and hazardous waste disposal issues.

Non-representative blending and rheology results can have significant implications in terms of understanding for both hot and cold weather performance. These concerns are further complicated when rejuvenating agents used to soften the RAP binder and warm-mix technologies are used.



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## WHAT ARE WE DOING?

This is a continuation of current research to investigate the use of RAP in Rubberized Hot Mix Asphalt (RHMA) without reducing the amount of recycled tire rubber used by Caltrans. This phase will continue laboratory testing to establish properties of RHMA mixes containing RAP/RAS.

## WHAT IS OUR GOAL?

The goal of this project is to develop guidelines for minimizing the risk of using high RAP and/or RAS contents in asphalt concrete mixes in California.

## WHAT IS THE BENEFIT?

As the availability of asphalt and aggregates declines, it becomes more desirable to use higher quantities of RAP/RAS in asphalt mix designs and less expensive virgin materials. This research helps to better understand full effects of RAP/RAS on the performance grade of the composite binder which will allow Caltrans to design more durable pavements.

## WHAT IS THE PROGRESS TO DATE?

As of February 2023, the research team has made the following progress:

- Completed literature review.
- Continued laboratory testing of asphalt, concrete, and composite specimens.
- Continued monitoring test sections. Conducted analysis of embedded instrumentation and FWD data. Started finite element analyses of FWD data.