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CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

Research Results

RHMA-G Layer Thickness Limits

Development of testing procedures and criteria to assess Rubberized Hot Mix Asphalt–Gap Graded (RHMA-G) layer thickness limits.

Pavement

JUNE 2024

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

Task Number: 3760

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WHAT WAS THE NEED?

This task was a continuation of a research study that assess RHMA-G layer thickness limits. Caltrans design procedures and specifications currently limit the thickness of RHMA-G layers to 0.2 ft and only allow it to be used in surface layers. These requirements were developed in the past based on higher RHMA G mix costs and potential rutting concerns. At present, the cost of RHMA-G and conventional HMA mixes are comparable. Furthermore, RHMA-G rutting performance has been improved by introducing new mix design procedures, testing requirements and quality control, and tighter compaction specifications. Subsequently, there has been a need to update the criteria for RHMA-G layer thickness limits, use of multiple layers of RHMA-G, and use of RHMA-G in non-surface layers.

Caltrans currently does not permit the use of Reclaimed Asphalt Pavement (RAP) in RHMA-G mixes or in Rubberized Hot Mix Asphalt–Open Graded (RHMA-O) mixes. However, there has been increasing interest in allowing the use of RAP as a binder or aggregate replacement in RHMA without reducing the amount used of recycled tires.

WHAT WAS OUR GOAL?

The The goal of this research study was two-fold:

1. to develop updated criteria for determining optimal thickness limits of RHMA-G layers, and
2. to verify whether RAP can be effectively used in RHMA mixes.

WHAT DID WE DO?

The goal of this study was achieved through two different level analyses. The present task focused on the first level analysis to assess rutting resistance. It included four subtasks:

- Placing four different RHMA-G mixes and performing five heavy vehicle simulator tests on the test track at the University of California Pavement Research Center campus. The

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RHMA-G mixes differed in nominal maximum aggregate sizes, in layer thickness (one or two lifts), and the use of coarse RAP as aggregate replacement.
- Conducting associated laboratory testing of RHMA-G mixes.
- Performing CalME simulations using data collected during the first subtask.
- Preparing a research report.

WHAT WAS THE OUTCOME?

The results of this task showed that:
- the performances of all four mixes were satisfactory in terms of the level of trafficking required to reach a terminal average maximum rut of a half of an inch.
- the differences in nominal maximum aggregate size and/or the addition of RAP as a coarse aggregate replacement appeared not to have any significant influence on the heavy vehicle simulator and laboratory test results.

Recommendations for updated design procedures and specifications regarding RHMA G will be made in a separate report that documents the second-level analysis.

WHAT IS THE BENEFIT?

- RHMA-G, placed as a single thick layer, or placed in multiple layers, offers comparable performance to conventional HMA. The use of RHMA-G mixes would help increase the use of recycled tires, reduce maintenance costs, and decrease environmental impacts, leading to more sustainable pavements.
- RAP can be used as a binder or as aggregate replacement in both gap-graded and open-graded RHMA mixes. This would help preserve natural resources from a sustainability perspective.

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To view the complete report:
https://escholarship.org/uc/item/7wq3s753