

Pavement & Materials Partnering Committee

Work Product Scoping Document

Use of Recycled Asphalt Shingles (RAS) in Hot Mix Asphalt

Task Group

Asphalt Task Group/Recycling Subtask Group

Title:

Use RAS up to ± 3% in Hot Mix Asphalt

Problem Process

- Annual
- Expedited
- Emerging Initiative

Statement of Effort/Improvement *(What is the issue?)*

The goal of this effort is to revise Caltrans Standard Specifications to allow the use Recycled Asphalt Shingles (RAS) in Hot Mix Asphalt (HMA). Caltrans and Industry seek to develop and implement a sustainable, biddable, and buildable specification which will incorporate around three percent RAS into a HMA without compromising pavement quality or life.

Purpose *(Why we need to work on this.)*

There is a growing interest from Legislators and Industry on using RAS in pavement mixes to reduce the amount of virgin binder needed for HMA and redirect RAS from landfills. This effort supports Caltrans' goals of Sustainability and Stewardship. By incorporating increased RAS content, Caltrans reduces pressure on virgin materials sources, takes advantage of binder within the RAS material, diverts RAS from landfills and ultimately creates an increased economic benefit to the taxpayer.

As part of this work product, a recommendation will be made as to whether the binder content of the RAS will be considered in the overall binder content of the HMA.

Background *(Background information to better understand the issue or provide information on other efforts on going related to the issue.)*

State highway agencies (SHAs) are increasingly allowing Contractors to use Recycled Asphalt Pavement (RAP) and RAS in new pavement mixes placed on highways. There is a big concern about the performance of RAS in HMA due to its stiff properties as a RAS binder. Therefore, the use of RAS creates new challenges for state highway agencies (SHAs) to specify and control the quality of asphalt mixtures to ensure long-term pavement performance. Caltrans' current specification does not allow RAS in HMA. Caltrans and Industry seek to develop specifications to incorporate RAS in HMA.

According to the U.S. Environmental Protection Agency, approximately 11 million tons of asphalt roofing shingles are disposed of each year. About one million tons is waste produced by the roofing manufacturers and about 10 million tons is waste produced by residential tear-off shingles. The 11 million tons amounts to about 8 percent of the nation's total building-related waste. From a cost and environmental perspective continuing to place shingles in landfills is unsustainable.

To reduce the amount of shingles in local landfills many States are recycling roofing shingles in HMA. The environmental benefits of using RAS in pavement are twofold. Recycling shingles conserves space in crowded landfills and reuses valuable resources - asphalt binder and fine

aggregate. However, the use of RAS creates new challenges for SHAs to specify and control the quality of asphalt mixtures to ensure long-term pavement performance

Over the past 10 years the use of RAS in asphalt pavement throughout the U.S. is steadily increasing. Consistent with Caltrans' Stewardship and Sustainability Goals, using RAS saves money, conserves resources and can produce good quality pavements.

The University of California Pavement Research Center (UCPRC) has conducted some limited research (Research Report: UCPRC-RR-2016-06: Investigation of the Effect of Reclaimed Asphalt Pavement and Reclaimed Asphalt Shingles on the Performance Properties of Asphalt Binders Phase 1 Laboratory Testing) on potential use of RAS and their effect in HMA. Caltrans and Industry are determined to use RAS as a binder replacement instead of an aggregates replacement in HMA. Caltrans will review the current state-of-the-practices to offset the stiff RAS binder for use in HMA mixes without compromising material quality and roadway performance.

Approach *(What approach will the Task Group use to attempt to ensure that the effort/improvement 1) will be Street-Ready, 2) will be tracked and managed to ensure expected performance and 3) will be implemented consistently statewide? This includes defining stakeholders to be included in the effort/improvement to attempt to ensure consistent implementation statewide as appropriate. What training/ guidance will be required? If "Pilot Projects" are to be used explain how in the approach.)*

1. Street Ready Assurance

The working group (WG) will collaborate with Industry, Construction, Materials Engineering and Testing Services (METS), and Asphalt Pavements to review and develop a RAS specification and then circulate the specification for comments from Industry, Construction, METS, and Design personnel to achieve a viable specification that can be implemented consistently statewide. To ensure the non-Standard Special Provision (nSSP) is street ready the Recycling Subtask Group will:

- a) Review current practices regarding mixes with RAS and the use of rejuvenators by other Department of Transportations (DOTs). Review of current relevant research reports and national recommended standards by American Association of State Highways and Transportation Officials (AASHTO), American Standard for Testing and Materials (ASTM) etc. Identify recommendations and key focus areas.
- b) Summarize the relevant pertinent information, identify recommendations, and key focus areas.
- c) Evaluate the national standards including Asphalt Mix Design Methods-Manual Series (MS-2) regarding rejuvenators and RAS. Develop and write a draft pilot project specification incorporating best practices and findings. And, circulate the draft specification for comment among stake holders.
- d) Create special testing and construction forms for construction pilot projects.
- e) Review, approval of draft pilot project specification and recommendations.

Identify proposed program changes Caltrans would need to make to responsibly incorporate the increased RAS. These include but are not limited to:

- Specification changes
- Test method changes (e.g. Crack test, solvent extraction, etc.)
- Testing equipment changes
- Contract administration changes
- Materials changes (e.g. Rejuvenator usage, etc.)
- Stockpile management
- Labor management
- Risk assessment and mitigation
- Value assessment (cost to benefit)

Develop a recommendations report and presentation of findings to the Asphalt Task Group.

Include communication plan (Impacted District staff, contracting community, etc.)

2. Pilot Projects

Implement pilot projects. Initiate minimum 6 pilot projects statewide in April 2020.

3. Pilot Project Monitoring

- Monitor the constructed pilot projects to evaluate whether the specification is constructible before statewide implementation. Create a summary report on lessons learned and develop a recommendations report and presentation of findings to the Asphalt Task Group.
- Based on the pilot project report, the NSSP's will be revised as needed and incorporated into the recommendations.

4. Consistently Implemented

- a) The revised draft specification will be submitted to Office of Engineer for their review on formatting and/or making languages consistent with standard specifications and approval of the nSSP. The WG will perform outreach to DMEs and District counterparts via the District Materials Engineer (DME) meetings with the goal to provide them with current information and to seek input throughout the nSSP creation and implementation process.
- b) Full implementation of nSSP Statewide will be initiated after consensus from all the mandatory stakeholders including FHWA.

5. Performance Tracking/Management

Short-term performance (design and constructability) tracking will be conducted during pilot projects and long-term performance will be conducted by Pavement Program annually or biannually through the Annual Pavement Condition Survey.

6. Research Needs

TBD.

Team Members (Indicate CT Chair and Industry Lead)

CT/Industry	Division/Firm Name	Member Name
Caltrans	Pavements	Allen King (CT-Chair)
Caltrans	Pavements	Kee Foo
Caltrans	METS	Guadalupe Magana
Caltrans	Construction	Ragu Thangavelautham
Industry	Granite Construction	Tony Limas (IN - Lead)
Industry	George Reed	Jordan Reed
Industry	Vulcan	Pascal Mascarenhas
Industry	Granite Rock Company	Frank Rancadore

Objectives/Deliverables/Due Dates *(What is important to be done, what is the expected outcome, and when is each deliverable due and to who?)*

Description: The WG will work together to develop and produce a draft pilot project specification by September 30, 2019 which ultimately will be included in the Standard Specifications.

Details:

Milestone #	Description	Responsible Party	Due Date (Start/Complete)
1 a)	Approval of SD	ATG/EC	July 10, 2019
1 b)	Review current practices, other DOT's and current research work	Allen King/Tony Limas	July 15, 2019 to Aug 15, 2019
1 c)	Summarize literature review	Allen King/Tony Limas	Aug 16, 2019 to Aug 31, 2019
1 d)	Develop draft pilot project specification report and submit to the ATG for approval	Allen King/Tony Limas	Sept 1, 2019 to Sept 30, 2019
1 e)	Identify Potential Pilot Projects	STG	By end of Feb 2020

Pavement & Materials Partnering Committee
 Scoping Document
 Asphalt Task Group/Recycling Subtask Group
 Use of Recycled Asphalt Shingles (RAS) in Hot Mix Asphalt
 July 9, 2019

1 f)	Develop special forms for testing/construction pilot projects	Guadalupe Magana/Ragu Thangavelautham	Oct 2019 to March 15, 2020
2	Begin implement pilot projects	Allen King/Tony Limas /Districts	Apr 16, 2020
3 a)	Monitor pilot projects for evaluation (Mix design and constructability)	Allen King/Tony Limas/WG	Apr 16, 2020 to June 2021
3 b)	Report on results of pilot projects. Present recommendation to ATG in a written report and as a presentation	Allen King	July 30, 2021
3 c)	Revise pilot project specification and incorporate into RSS/SSP	Allen King/Tony Limas/ WG	July-Aug 2021

Resources To Develop and Implement *(Staff hours and expenses.)*

Milestones	Caltrans Hours	Industry Hours
Development	4 people x 30 hrs. x 6 months = 720 hrs. + travel	720 hrs. plus travel
Pilot (if used)	200 hrs.	100 hrs.
Implementation	200 hrs.	100 hrs.

Benefits *(For example, increased life cycle, reduced costs, reduced risk factors, compliance with Caltrans goals etc. Quantify benefits and define success and performance measures.)*

One of Caltrans' core principles is sustainability, which is reflected in Caltrans' mission and goals. Caltrans supports and encourages the use of recycled material in the Department's pavements. Use of RAS in HMA is a way to support sustainability and could help reduce the cost of HMA, save energy, and decrease greenhouse gas emissions.

Cost benefit:

- Three percent RAS could save up to 3% virgin aggregates if only aggregate replacement is considered. It could save up to 10% asphalt binder if binder replacement is considered

Success: Implementation of an up to 3% RAS Specification

Performance measures: Full implementation of RAS and number of RAS projects after 2023.

Estimated Impact to Caltrans and Contractor - *(What are the impacts to policy, specifications, construction practices, and stakeholders? Include an estimate to overall increase/decrease in project cost, District/HQ resources at project level, and Contractor/supplier impact. Estimate increased/reduced risk factors for Caltrans and Contractor.)*

- Supports CT's stewardship and sustainability goals.
- Revised specifications allowing for the use of RAS.
- Best practices for RAS stockpile management.
- Decrease in project cost.
- No increased cost to industry from construction standpoint.
- Additional cost to CT would be PYs at District level due to verification testing and QA. This cost could be offset by saving in overall project cost.
- Reduced cost for materials for contractor.
- Risk: Not having follow up evaluation after completion of projects.
- Potential risk of premature pavement cracking which the task group will attempt to minimize utilizing current best practices for use of RAS.

Impediments to Completion of Deliverables – *(Identify impediments and potential mitigation measures to address impediments.)*

Impediment: Lack of good collaboration among Caltrans and industry stakeholders

- Mitigation: Members of working group will communicate with their stakeholders

Impediment: Agreeing on best methodology to determine binder properties of HMA mixture

- Mitigation: Follow current industry best practices (what's working for other SHAs)

Impediments: Caltrans' new experience with rejuvenating agents

- Mitigation: Follow current industry best practices (what's working for other SHAs)

Impediment: Shifting of key personnel both with Caltrans and Industry to carry on long term objectives.

- Mitigation: Keep detailed notes on progress so that this information can be handed down to new members.

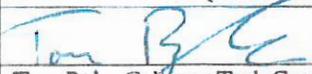
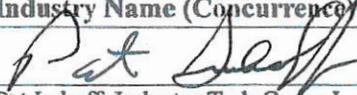
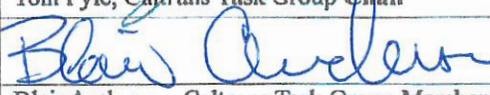
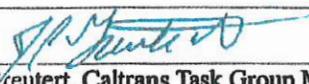
Pavement & Materials Partnering Committee
 Scoping Document
 Asphalt Task Group/Recycling Subtask Group
 Use of Recycled Asphalt Shingles (RAS) in Hot Mix Asphalt
 July 9, 2019

Recommendation and Approval

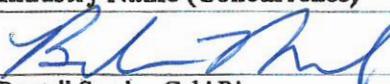
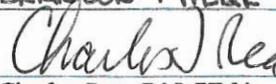
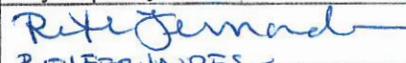
This scoping document for Use RAS ± 3% in Hot Mix Asphalt was prepared by Asphalt Task Group/Recycling Subtask Group to address a priority issue with statewide significance and is within the Pavement & Materials Partnering Committee mission as described in the Pavement & Materials Partnering Committee Charter. The Subtask Group members have determined the scope, resources required and timeline for delivery of this project to attempt to ensure that the deliverables are achievable. A signature here indicates that each Task Group and PMPC Executive Committee is committed to providing the resources to support this effort within the prescribed timeframes. Furthermore, it is everyone's responsibility to ensure that the final effort/improvement will be:

- 1) Street-Ready,
- 2) Monitored and reported for performance,
- 3) Successfully implemented statewide as appropriate.

Scoping Document Recommendation and Industry Concurrence by PMPC TG:

Caltrans Name (Recommendation)	Date	Industry Name (Concurrence)	Date
 Tom Pyle, Caltrans Task Group Chair	7/9/19	 Pat Imhoff, Industry Task Group Lead	7/9/19
 Blair Anderson, Caltrans Task Group Member	7/11/19	 Tracy Zubeck, Industry Task Group Co-Member	7/9/19
 Tim, Greutert, Caltrans Task Group Member	7/9/19		

Scoping Document Approval and Industry Concurrence by PMPC EC:

Caltrans Name (Approval)	Date	Industry Name (Concurrence)	Date
 Sergio Aceves, Chair - Division of Maintenance - Pavement Program	7/18/19	 Russell Snyder, CalAPA BRANDON MILLAR	7/18/19
 Ray Hopkins, Division of Construction	7/18/19	 Charley Rea, CALCIMA	7/18/19
 Ruth Forhan Tom Ostrom, Division of Engineering Services - Structures Policy and Innovation			
 Dan Speer, Division of Engineering Services - Materials Engineering & Testing Services	7/18/19		

Approval Date: _____