

Pavement & Materials Partnering Committee

Work Product Scoping Document

Use Reclaimed Asphalt Pavement (RAP) Up to 40% in Hot Mix Asphalt

Task Group

Asphalt Task Group/Recycling Subtask Group

Title:

Use RAP up to 40% in Hot Mix Asphalt (HMA)

Problem Process

- Annual
- Expedited
- Emerging Initiative

Statement of Effort/Improvement

The goal of this effort is to revise Caltrans Standard Specification (Section-39) to allow up to 40% Recycled Asphalt Pavement (RAP) in HMA. Caltrans and Industry seek to develop and implement a sustainable, biddable, and buildable specification which will incorporate a higher percentage of RAP than currently specified, up to 40% RAP into HMA without compromising pavement quality or service life.

Purpose

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

Background

Public Resources Code section 42704 states that on or before January 1, 2014, the California Department of Transportation (Caltrans) may, with input from the Caltrans/Industry Rock Products Committee, establish specifications for the use of reclaimed asphalt pavement (RAP) of up to 40 percent for hot mix asphalt (HMA) mixes. In 2009, Caltrans began allowing the use of up to 15 percent RAP in HMA by aggregate weight. In 2013, Caltrans allowed up to 25 percent RAP aggregate in aggregate blends in HMA mixes. In 2018, Caltrans modified the current specification and implemented a non-Standard Special Provision (nSSP) allowing up to 25 percent aggregate in the aggregate blend in HMA without the use of blending charts. Caltrans has been working with the asphalt industry to develop specifications that allows the use of RAP up to 40 percent in HMA mixes.

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In October 2014, the Federal Highway Administration (FHWA) issued a memorandum on Recycled Materials in Asphalt Pavements, reporting that some state agencies were experiencing pre-mature pavement cracking on relatively new pavements when utilizing high contents of recycled asphalt binder from RAP or Recycled Asphalt Shingles (RAS) in the asphalt mix. Asphalt Binder Replacement (ABR) is a catch-all term referring to RAP and RAS. Based on the percentage of ABR used in the asphalt mix, various degrees of stiffness will be experienced by the pavement structure. The higher RAP content will increase the stiffness of the pavement which helps prevent rutting in the pavement structure but can lead to increased pre-mature cracking in the pavement structure due to the stiffness, paving in low temperatures or placement of thin HMA overlays sections. These factors will be considered in the development of a specification that allows up to 40 percent RAP in the aggregate blend.

1. Street Ready Assurance

The working group (WG) will collaborate with Industry, Construction, Materials Engineering and Testing Services (METS), and the office of Asphalt Pavement to develop a revised specification that incorporates the higher RAP content. Following development of the nSSP, the WG will circulate the revised specification for comments from Industry, Construction, METS, FHWA 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 WG will:

- a) Review current practices regarding mixes with 25%+ RAP 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 RAP. 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 RAP. 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

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- 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. Perform 3-6 pilot projects statewide in 2019/2020.

3. Pilot Project Monitoring

- a) 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.
- b) Based on the pilot project report, the draft specification will be revised to incorporate 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

Currently, University of California Pavement Research Center, Davis (UCPRC) is conducting research which includes high RAP mixes design, testing method, rejuvenators to be used, laboratory performances of the mixes, and Heavy Vehicle Simulation (HVS) testing.

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Team Members

CT/Industry	Division/Firm Name	Member Name
Caltrans	Asphalt Pavements	Raghubar Shrestha (CT-Chair)
Caltrans	Asphalt Pavements	Kee Foo
Caltrans	METS	Audrie Spears
Caltrans	Construction	Ebi Fini
Industry	Granite Construction	Tony Limas (IN-Lead)
Industry	George Reed	Phil Reader
Industry	Vulcan	Pascal Mascarenhas
Industry	Sully-Miller Contracting	Don Vivant

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Objectives/Deliverables/Due Dates

Description: The WG will work together to develop and produce a draft pilot project specification by June 2021 which ultimately will be included in the Standard Specifications.

Details:

Milestone #	Description	Responsible Party	Due Date (Start/Complete)
1 a)	Review current practices, other DOT's and current research work	Raghubar Shrestha/Tony Limas	Nov 1, 2018 to Mar 15 2019
1 b)	Summarize literature review	Raghubar Shrestha/Tony Limas	Mar 16, 2019 to May 31, 2019
1 c)	Develop draft pilot project specification report and submit the ATG for approval	Raghubar Shrestha/Tony Limas	Jun 1, 2019 to Aug 15, 2019
1 d)	Develop special forms for testing/construction pilot projects	WG/Mets Lab/Construction Division	Jun 1, 2019 to Aug 15, 2019
1 e)	Review and approval of draft specification	ATG	Aug 16, 2019 to Sep 15, 2019
2	Begin implement pilot projects	Raghubar Shrestha/Tony Limas /Districts	Sep 16, 2019 to Oct 31, 2020
3 a)	Monitor pilot projects for evaluation (design and constructability)	Caltrans	Sep 17, 2019 to Mar 31, 2021
3 b)	Revise pilot project specification and report	Raghubar Shrestha/Tony Limas/ WG	Apr 1, 2021 to Jun 30, 2021
4 a)	Submission to OE for formatting and/or approval	OE/WG	July 1, 2021
4 b)	Full implementation of nSSP statewide	CT - OAP	Oct 31, 2021
5	Long Term Pavement performance tracking/management	Caltrans	July 2021 – Ongoing
6	Research	Caltrans/UCPRC	Continue/Ongoing

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Resources to Develop and Implement (Staff hours and expenses.)

	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.
Long Term performance	200 hrs.	N/A
Other Resources	UCPRC	N/A

Benefits

One of Caltrans’ core principles is sustainability, which is reflected in Caltrans’ mission and goals. Caltrans supports and encourages the use of recycled materials in the Department’s pavements for sustainability. Use of RAP 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: 40% RAP in HMA would save 38% virgin aggregate, and at least 1.5% of virgin asphalt binder in mixes.

Success: Implementation of an up to 40% RAP Specification.

Performance measures: Full implementation of RAP and number of RAP projects above 25% after 2020.

- **Estimated Impact to Caltrans and Contractor** - Supporting CT’s stewardship and sustainability goals.
- Revised specifications allowing for the use of RAP up to 40%.
- Decrease in overall project cost by utilizing aggregate and binder in RAP.
- Likely to be some additional cost in job mix formula acceptance and verification test.
- Additional cost to CT would be PYs at District level due to verification testing and Quality Assurance. This cost could be offset by saving in overall project cost.
- Reduced cost for materials for contractors.
- Extends life of virgin aggregate resources.
- 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 high RAP.

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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 work group will communicate with their stakeholders.

Impediment: Agreeing on a single methodology to address mixture performance.

- Mitigation: Research current best practice for use of high RAP.

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

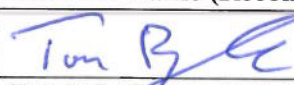
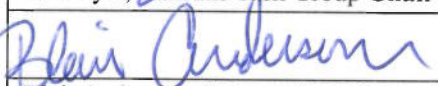

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Recommendation and Approval

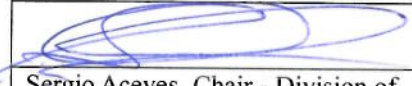
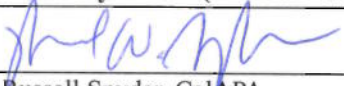
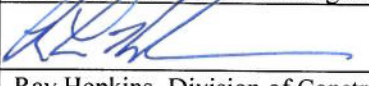
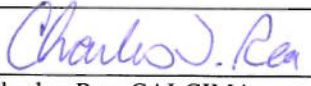
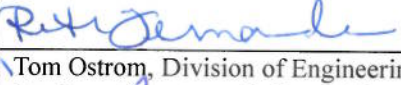
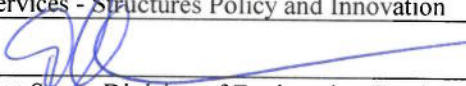
This scoping document for Use Reclaimed Asphalt Pavement (RAP) up to 40% in Hot Mix Asphalt was prepared by the Recycling Subtask Group to address a priority issue with statewide significance and is within the Pavement & Materials Partnering Committee mission as described in the Pavement & Materials 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	4-17-19	Pat Imhoff, Industry Task Group Lead	
 Blair Anderson, Caltrans Task Group Member	4-17-19	Tracy Zubek, Industry Task Group Co-Member	
 Tim, Greutert, Caltrans Task Group Member	4/17/19		

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	4/18/19	 Russell Snyder, CalAPA	04/18/19
 Ray Hopkins, Division of Construction	4/18/19	 Charley Rea, CALCIMA	4/18/19
 Tom Ostrom, Division of Engineering Services - Structures Policy and Innovation	4/18/19		
 Dan Speer, Division of Engineering Services - Materials Engineering & Testing Services	4/18/19		

Approval Date: _____