

**Pavement & Materials Partnering Committee**  
**Work Product Scoping Document**  
**Use Reclaimed Asphalt Pavement (RAP) Up to 40% in Hot Mix Asphalt**  
**November 27, 2018**

**Task Group**

Asphalt Task 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% 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% percent RAP into HMA without compromising pavement quality or its service life. The use of rejuvenators with high RAP percentages has shown to contribute to the performance contributions of the RAP binder. Evaluation of rejuvenators and their performance will be considered as part of this effort.

**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. The Recycling subtask group will explore incorporating the higher reclaimed asphalt pavement material into HMA that is consistent with Caltrans' Stewardship and Sustainability Goals. 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. Recently, 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.

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.

### **Approach**

#### **1. Street Ready Assurance**

The working group (WG) will collaborate with Industry, Construction, Materials Engineering and Testing Services (METS), and Asphalt Pavements to develop a revised specification that incorporates the higher RAP content then 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 Recycling Subtask Group will:

1. Perform a research synthesis regarding mixes with 25%+ RAP and the use of rejuvenators. Identify recommendations and key focus areas.
2. Perform a literary review of current, relevant RAP best practices from at least 6 other public entities (states, counties, cities) and identify key focus areas.
3. Evaluate the national standards including Asphalt Mix Design Methods-Manual Series (MS-2) regarding rejuvenators and RAP. Determine appropriate practices for incorporation into the specification.
4. Develop and write a draft nSSP incorporating best practices and findings.
5. Circulate draft nSSP for comment among stake holders.
6. Create special construction forms for pilot projects.
7. Perform 3-6 pilot projects statewide in 2019/2020. Create a summary report on lessons learned.

#### **2. 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.

3. Consistently Implemented

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.

4. Pilot Projects (if anticipated)

3 to 6 pilot projects are needed to evaluate whether the specification is constructible before statewide implementation.

5. Research Needs (if necessary)

UCPRC to incorporate testing of the high RAP mixes in current ongoing RAP research project such as Heavy Vehicle Simulation (HVS) testing which are being planned for 2019.

**Team Members (Indicate CT Chair and Industry Lead)**

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

**Objectives/Deliverables/Due Dates**

Description: The WG will work together to develop and produce a final nSSP by April 1, 2021 which ultimately will be included in the Standard Specifications in 2021.

Details:

<b>Milestones</b>	<b>Name - Responsible Party</b>	<b>Due Date (Start/Complete)</b>
Literature review and report of findings	Raghu Shrestha	Nov 15, 2018 to Mar 15, 2019
Develop report of recommendations to ATG on path forward	Raghu Shrestha	Nov 15, 2018 to Mar 15, 2019

**Resources to Develop and Implement**

	<b>Caltrans Hours</b>	<b>Industry Hours</b>
Development	720 hrs. plus travel	720 hrs. plus travel
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.

**Impediments to Completion of Deliverables**

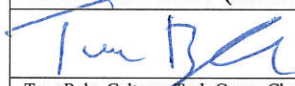

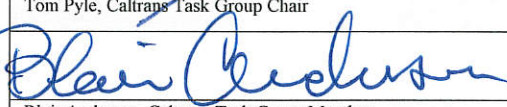

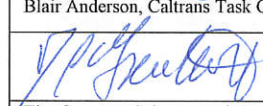
- Impediment: Lack of good collaboration among Caltrans and industry stakeholders.
  - Mitigation: Members of work group will communicate with their stakeholders.
- Impediment: Agreeing on a single methodology to address mixture performance.
  - Mitigation: Researched current best practice for use of high RAP.
- Impediment: Shifting of key personnel both with Caltrans and Industry to carry on long term objectives.

**Recommendation and Approval**



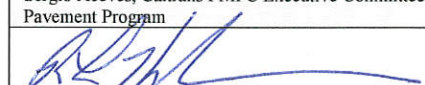
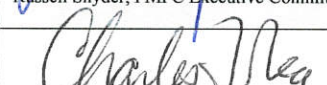
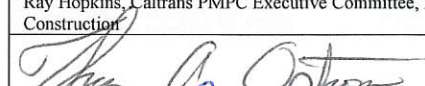

This scoping document for Use Reclaimed Asphalt Pavement (RAP) up to 40% in Hot Mix Asphalt was prepared by the Recycling Subtask Group to address a priority issue with statewide significance and is within the Pavement & Materials Partnering Committee mission as described in the Pavement & Materials 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	12/5/18	 Pat Imhoff, Industry Task Group Lead	12/5/18
 Blair Anderson, Caltrans Task Group Member	12/5/18	 Tracy Zubek, Industry Task Group Co-Member	12/5/18
 Tim Greutert, Caltrans Task Group Member	12/5/18		

**Scoping Document Approval and Industry Concurrence by PMPC EC:**

Caltrans Name (Approval)	Date	Industry Name (Concurrence)	Date
 Sergio Aceves, Caltrans PMPC Executive Committee – Chair, Pavement Program	12/11/18	 Russell Snyder, PMPC Executive Committee	12/6/18
 Ray Hopkins, Caltrans PMPC Executive Committee, Headquarter Construction	12/6/18	 Charley Rea, PMPC Executive Committee	12/6/18
 Tom Ostrom, Caltrans PMPC Executive Committee, Structures Policy and Innovation	12/6/18		
 Dan Speer, Caltrans PMPC Executive Committee, Materials Engineering and Testing Services	12/6/18		

Approval Date: \_\_\_\_\_