

# RAP/RAS Subtask Group Working List

## As of Oct. 11, 2013

March 14, 2013 (TransLab Sacramento)  
April 4, 2013 (D-11 Fontana)  
May 2, 2013 (Granite Sacramento)  
May 30, 2013 (D-11 Fontana)  
June 24, 2013 (Granite Sacramento)  
July 30, 2013 (D-11 Fontana)  
August 5, 2013 (Granite Sacramento)  
October 11, 2013 (D-11 Fontana)

**Next Meeting November 13, 2013 (San Diego)**

**Printed in Red** = Issue Being Worked on

**Printed in Blue** = Issue Resolved

**Printed in Green** = Sept. 5, 2103 Comments

### Unresolved Issues

#### **Issue 6. For mixes with higher RAP content, consider the addition of natural sand?**

*(4/4/2013) Future discussion for mixes with RAP  $\geq$  25% (dwa).*

*(4/4/2013) Caltrans and Industry need to monitor gyratory compactor, RAP replacement and field compatibility effect on natural fines demand.*

*(4/4/2013) On the back burner, will monitor test data*

*(5/2/13) Pending accumulation of gyratory data.*

*(5/30/13) Still pending accumulation of gyratory data.*

*(24Jun13) Still pending accumulation of gyratory data.*

*(10/11/13) Still pending accumulation of gyratory data.*

#### **Issue 7. (New 5/2/13) Addition of materials to minimize stockpile clumping of RAS and facilitate feeder flow.**

*(5/30/13) Caltrans is inclined to leave the anti-clumping issue to the contractor. Caltrans will write proposed language for the "clumping" issue and treatment and QC requirements. Contractor will need to address this issue in their QC plan.*

- Zeolite?
- Natural fines?
- RAP/RAS blend?

*(24Jun13) No change in status.*

Effect of zeolite on gradation? 1 lb/ton of HMA...unlikely to affect gradation.  
PennDOT uses 25-50% natural fines.

(Sept 5, 2013) Joe will look for spec language for addition of anti-clumping material and share with group.

(10/11/13) Issue still pending – waiting for information from Joe.

**Issue 9: (10/1/2013) Specifications require two RAP fractions in mix designs. This should be clarified.**

RE's are requiring both coarse and fine RAP fractions in mix design containing >15% RAP.  
(9/26/2013) Possible language to clarify requirements:

~~“The maximum percentages of fractionated RAP may be comprised of coarse, fine, or the combination of both. Use a separate cold feed bin for each stockpile of fractionated RAP introduced into the mix”.~~

(10/11/13) – Joe will look at the proposed language (above), consult with some RE's and get back with the STG at the next meeting.

Joe said that issues that arise on individual contracts should be referred to him for clarification.

**Issue 11 – Need to finalize Step 3 – 0% to 40% by binder replacement - RAS is limited to a max of 5% by dwa. This will be an NSSP.**

(10/11/13) - **How do we account for binder stiffness in RAP/RAS mixes?**

**Step 1: Use blending chart to determine binder properties of proposed:**

1. Virgin binder
2. RAP binder
3. RAS binder

**Step 2: (if needed) Use blending chart to determine binder properties of:**

1. Combined binder properties from Step 1
2. Rejuvenator or recycling agent

**Step 3: Verify binder properties of laboratory mix (optional)**

1. Produce mix in laboratory using proposed Virgin Binder, RAP, RAS and Rejuvenator or Recycling Agent
2. Recover binder from laboratory mix to verify binder properties

**Step 4: Verify binder properties of plant produced mix**

1. Produce mix for verification
2. Recover binder and verify binder meets specified PG Grade

**October 11, 2013 Action Items**

1. Tony will review the specifications from other states to see how (if) they address the anti-clumping issue and will share with the group.
2. Joe will look at the proposed language for RAP fractionation, consult with some RE's and get back with the STG at the next meeting.
3. Tony will contact SJ Refining for presentation on recycling/rejuvenating product.

Next meeting – Wednesday, November 13, 2013 in San Diego at 1:00 to 4pm (Go To Meeting available).

Meeting adjourned at 2:30 pm.

**Resolved Issues**

**Issue 1. RAP/RAS Specification Progress**

*Given Caltrans goal of having a RAP/RAS binder replacement specification on the server effective July 2014, and after additional discussion, Industry proposes that the “binder replacement” terminology be integrated in the spec as soon as possible. This would eliminate confusion between weight of aggregate replacement and binder replacement terminology and minimize duplication of effort; ie, revisiting the RAP specifications to accommodate the binder replacement language required for the RAP/RAS specifications. Incorporating Caltrans 3 to 5% RAS specifications (September 2012) into the current discussion will allow for a smoother transition to our ultimate goal of having a RAP/RAS binder replacement specification by July of 2014.*

*(4/4/2013) RAS incorporation now in process*

**Issue 2. RAP Fractionation**

**(3/14/2013) RAP fractionation on ¼” sieve for mixes with ≥15% RAP (dwa)**

- Screen size?
  - Industry proposal = ½ or ⅝-inch
  - CT compromise - ⅜-inch?

*Industry proposed a contractor option for fractionation. As a compromise to Caltrans requirement to fractionate, industry proposed fractionation at the ½-inch or ⅝-inch screen.*

*(5/2/2013) Industry is concerned that fractionation on the ¼-inch screen may create the following problems and add additional cost without realizing any real benefit:*

- excessive fines may limit the amount of RAP (may not allow for 25% RAP) (dwa)*
- require additional stockpile space*
- require an additional plant bin*
- require additional belt scale capable of measuring a small quantity of RAP; eg, less than 10% RAP (dwa)*
- additional testing (LP-9/daily testing)*

*(5/2/2013) Industry proposes a ⅜-inch nominal maximum fractionated product*

*(5/2/2013) Meeting – Caltrans not comfortable with the nominal maximum criteria – want to avoid arguments over small percentage points – want to stick with 100% passing 3/8” screen (or less) with tolerance of between 1 to 3% - TBD by next meeting.*

*(5/2/13) Industry accepts ⅜-inch for fractionation; tolerance of up to 2% retained on stockpile...after 10 minutes of Gilson “shaking”; alternatively stated, 98% passing the ⅜-inch sieve.*

***FRACTIONATION ISSUE RESOLVED! (waiting for Industry conformation)***

*(5/30/2013) Industry concurs with 5/2/13 resolution*

*Caltrans proposed RSS includes 97% - 100% passing 3/8 sieve*

*Caltrans proposed RSS includes 10 minutes +/- 15 seconds of Gilson “shaking”.*

**Issue 3. Industry wants to revisit the language regarding the PG binder grading required on a “bump down”**

*(4/4/2013) Industry has solicited input from Caltrans-approved binder suppliers as to availability of PG binders. Data will be forthcoming.*

*(4/4/2013) Caltrans wants a single bump down – if the single bump down grade is not available, that option disappears – there may be an exception when considering PG 64-10 and PG 64-16 grades, Joe will get back with us at the next meeting. Caltrans will consider work done by PCCAS, Rita and Bob will bring back information from 4/16/13 meeting. Additional information from other states, NAPA, AI, etc will be gathered by industry and shared with the group.*

*As we move to RAS and binder replacement criteria we will need to look at a “true grade” of the final binder – lots of work, lots of discussion necessary.*

(5/2/2013)

- Tier 1 – allow binder replacement up to 15% (total including both RAP & RAS)
- Tier 2 – allow binder replacement between 15% and 25% (total including both RAP & RAS)
- Tier 3 – allow binder replacement between 25% and 40% (total including both RAP & RAS)
- Hamid will look into the pooled fund study that was done by 6 states (Caltrans participated) and see what data were gathered and what the results were by next meeting.
- Joe will put out a questionnaire to the AASHTO group server on RAS use, performance, procedures, specifications, etc. Joe will draft the questions and circulate to the STG for comment prior to posting by June meeting.
- Industry will also research other resources (states, NAPA, NCAT, etc) and bring back to the group (work in progress).

Options to consider Bump Down? If you want 40% binder replacement, Caltrans requires a one-grade “bump down.) The only binder that may be problematic is the PG 58-34 (from a PG 64-28). Blending Chart? Rejuvenator?

% recycle by weight of aggregate	Current Section 39	
≤ 15%	RAP and RAS (combined 15% by weight; RAS ≤ 5%) on ANY lift	max 15% binder replacement when RAS is used (to be addressed by RSS)
> 15 % ≤ 25%	Upper 0.2ft – RAP only; max 25% binder replacement Lower lifts – RAP only; max 40% binder replacement; bump down No RAS!!!	

Goal – Binder Replacement

Joe Peterson to provide first draft prior to 30May13 \*\*\*

Binder Replacement	Criterion/Criteria
≤ 25% w/ max 5% RAS (by dwa)	***
25% to 40% w/ max 5% RAS (by dwa)	***

<p>Under consideration?</p> <ul style="list-style-type: none"> <li>▪ Bump down</li> <li>▪ Binder recovery</li> <li>▪ Rejuvenator</li> <li>▪ Several cycles of PAV</li> <li>▪ UCPRC evaluating RAP mastic; may obviate the need to extract and recover binder</li> <li>▪ Combined virgin &amp; recycled binders – evaluate PG (How close is the combined binder to the original specified???)</li> </ul>
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(5/30/13)

Revised Implementation Schedule

	% recycle by weight of aggregate	Target
Step 1 <sup>a, d</sup>	RAP ≤ 15%	Current spec
	RAS ≤ 5%	Max 15% binder replacement when RAS is used (Currently an NSSP) <sup>b</sup> (9-5-2013) 2006 version is current. Waiting for 2010 version. (otherwise 2006 Spec available on demand)
Step 2 <sup>c</sup>	> 15 % ≤ 25%	Upper 0.2ft – RAP only; max 25% binder replacement Lower lifts – RAP only; max 40% binder replacement; bump down (current) Goal to have this completed prior to July 1 <sup>st</sup> , 2013 (specification moratorium) No RAS!!! (9-5-2013) This is done
Step 3 <sup>e</sup>	0% to 40% by binder replacement	RAS is limited to a max of 5% by dwa. This will be an SSP. Goal is 12-15-2013 (9-5-2013 meeting)

Notes:

- a. Contractors can request a CCO subject to approval by the RE. Caltrans would expect an economic analysis as per the Standard Specifications.
- b. Caltrans will NOT use a CPD
- c. Tony sent proposed changes to the specifications (Step 2) to industry. Industry had no comments.
- d. Caltrans ~~has~~ will modify the hidden language in the NSSP to make it 0% - 5% at the contractors option.
- e. Under consideration - -
  - a. Bump down
  - b. Binder recovery
  - c. Use of rejuvenator

- d. Several cycles of PAV
- e. UCPRC evaluating RAP mastic; may obviate the need to extract and recover binder
- f. Combined virgin & recycled binders – evaluate PG (How close is the combined binder to the original specified???)
- g. As we move to RAS and binder replacement criteria we will need to look at a “true grade” of the final binder – lots of work, lots of discussion necessary.

(24Jun13)

Per Edgar Hitti, Paramount can produce a PG 58-34.

Binder replacement >15% requires a “bump down.”

No constraints as to HOW one achieves the “true grade.” Eg, one could make use of a rejuvenator.

Step 2 (shown in table above): If Contractor wants to use RAS? Contractor must request a CCO from the RE. Caltrans expects a credit...because of saving\$ in binder.

The RAP&RAS task group members are encouraged to review the TXDOT presentation and paper. Other specs to consider ... Indiana, Utah, Texas ... others? Perhaps have UCPRC to do this literature review???

(October 11, 2013)

Resolution is that the bump down binders should be available to meet these requirements (per the binder suppliers). Per Caltrans, if they are not, this option will not be available. STG agreed on 10/11/13.

**Issue 4. Industry recommends reducing the frequency/amount of testing required for mixes containing  $\leq 15\%$  RAP (*dwa*)**

*Industry proposes that testing be conducted once every 3 days or once per 5000 tons of mix, whichever is lesser.*

(4/4/2013) Caltrans will take this back for consideration and report back at the next meeting.

(5/2/2013) Caltrans does not plan to revise current (Section 39) testing requirements.

**Issue 5. Industry recommends consideration of a wider tolerance on JMF RAP content during production.**

(3/14/2013)

Current draft requires (*dwa*):

- mixes with  $\leq 15\%$  RAP, tolerance is JMF  $\pm 5\%$
- mixes with  $\leq 25\%$  RAP, tolerance is JMF  $\pm 3\%$
- (4/4/2013) compromise from Caltrans for new JMF “trigger”

>15-25% ±4%...but not to exceed 25% binder replacement  
>25% ±3% (in the future)  
~~Regardless of RAP content, binder replacement cannot exceed 25%.~~

*Industry is requesting clarification on these tolerances. Industry believes these tolerances apply to HMA production. For example, in the current Section 39 specifications allows for a mix design containing 10% RAP (dwa). In this instance, during production the contractor can produce a mix targeting 5-15% RAP (dwa). The only tolerance on the targeted RAP percentage is related to the MPQP requirements.*

*(4/4/2013) As a condition of fractionating RAP, for mixes containing 15 to 25 % RAP (dwa), industry request the specification allow up to 29% RAP (dwa) as long as the mix does not exceed 25% binder replacement.*

*(4/4/2013) Caltrans will be considering a similar approach as taken by other states – relate maximum RAP content to traffic volumes.*

*(5/2/2013) Since Industry has agreed to current Section 39 RAP language, this discussion is no longer be warranted. Industry will respond to Caltrans suggestion at next meeting; ie, 30May13. Tony Limas to solicit Industry for comment; ie, is there an Industry consensus.*

*(5/2/2013)*

May be considered as part of the transition to binder replacement in the future.

*(5/30/2013) Industry concurs with replacement language*

***Issue 8 - (5/2/13) %RAP – need to clearly distinguish between percent by dry weight of aggregate (dwa) or percent by binder replacement (abr)!!! (See table above).***

*(9/5/2013) Done*

**Issue 10: (10/1/2013) RAS nSSP requires 0% deleterious material for pre-consumer RAS**

The Tier 1 RAS nSSP indicates pre-consumer shingles must have 0 percent deleterious material. This is a problem. While there is significantly less deleterious material in pre-consumer shingles, to require 0 percent is not reasonable. Pre-consumer shingles processing generates a small amount of deleterious material, the primary source being a small amount of wrappers and wood from pieces of shipping pallets.

AASHTO MP-15 allow 1.5 percent deleterious material retained on the no. 4 sieve for both pre and post shingles consumer (see excerpt below).

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**8. DELETERIOUS SUBSTANCES**

- 8.1. Reclaimed asphalt shingles shall not contain extraneous waste materials and shall be essentially nail-free. Extraneous materials such as metals, glass, rubber, soil, brick, tars, paper, wood, and plastic shall not exceed 3.0 percent by mass as determined on material retained on the 4.57-mm (No. 4) sieve. Lightweight material such as paper, wood, and plastic shall not exceed 1.5 percent by mass as determined on material retained on the 4.75-mm (No. 4) sieve.
- 8.2. Reclaimed asphalt shingles shall contain less than the maximum percentage of asbestos fibers based on testing procedures and frequencies established in conjunction with the specifying jurisdiction and state or federal environmental regulatory agencies.

(10/11/13) Caltrans will include language specifically stating the requirements for pre-processed material. Agreed that the limit will be 1.5 percent and be consistent with post-processed material.