



# RAP/RAS Task Team Update

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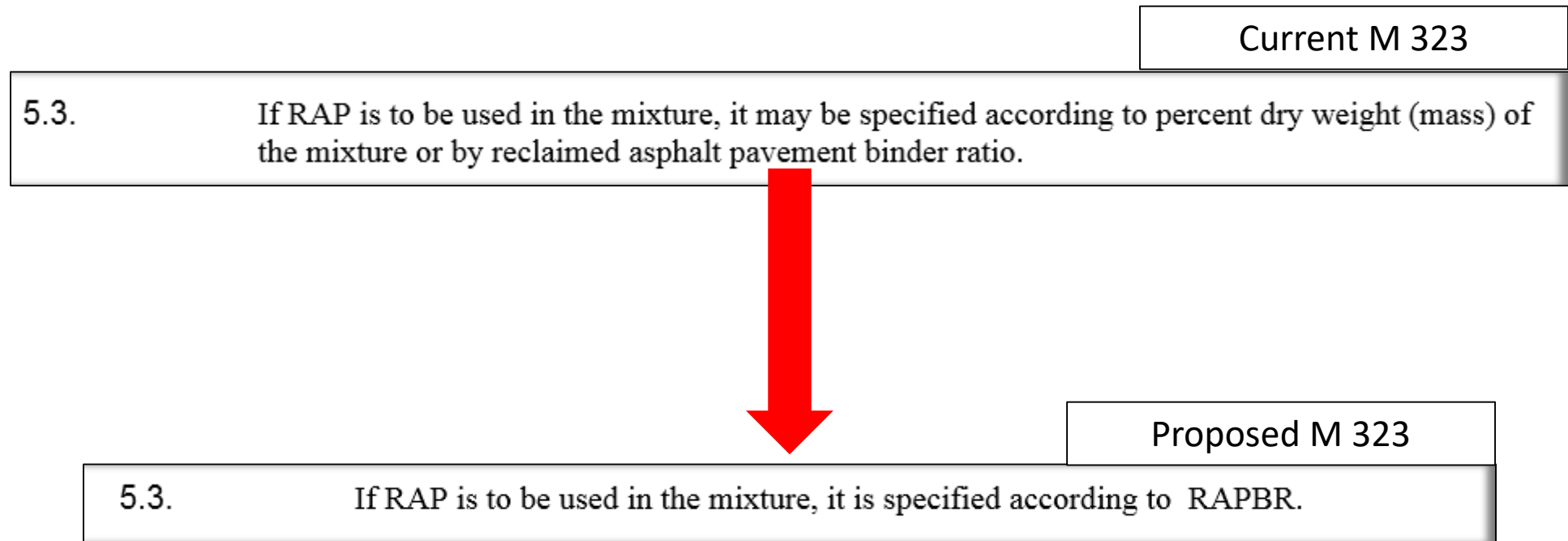
# Primary Activities

- Update/revise AASHTO M 323 “Standard Specification for Superpave Volumetric Mix Design”
- Recap major issues
  - Looking for guidance!



# Issue No. 1

Eliminating the option to specify the amount of RAP in a mixture by percent dry weight and only allow it to be specified by the RAP binder ratio (RAPBR).



# Issue No. 1

## *Rationale:*

- The presence of RAP primarily impacts the binder characteristics of the mixture, and should be specified accordingly.
- Another consideration is the increased use of fractionated RAP where the amount of recycled binder varies depending on the size of the fractionated RAP.
- Example:
  - Traditionally a mixture with 15% RAP might also have a RAP binder ratio of 0.15 since the binder content in the RAP was generally close to the binder content in the mixture.
  - However, if the fine portion of fractionated RAP was used with a higher binder content, 15% RAP might have an actual RAP binder ratio of 0.20 due to the higher binder content in the RAP.

## Issue No. 2

Deleting binder adjustment table and requiring that adjustments would be based on actual characterized properties of the RAP asphalt binder and virgin binder - either specific to an individual mix design or across a larger geographical area, as determined by the Agency.

Current M 323

**Table 2**—Binder Selection Guidelines for Reclaimed Asphalt Pavement (RAP) Mixtures

Recommended Virgin Asphalt Binder Grade	RAP Percentage
No change in binder selection	<15
Select virgin binder one grade softer than normal (e.g., select a PG 58-28 if a PG 64-22 would normally be used)	15 to 25
Follow recommendations from Appendix X1	>25



Proposed M 323

5.3.1.

The binder grade selected in Sections 5.1.3 and 5.2 must be adjusted to account for the amount and stiffness of the RAP binder. This adjustment shall be based on characterized properties of RAP asphalt binder either specific to a mix design or within a geographical area, as determined by the Agency. Develop the binder selection adjustment requirements in accordance with Appendix X3.

# Issue No. 2

## *Rationale:*

- The standard has been revised to encourage agencies to actually conduct their own analysis on their own binder materials rather than using a “default” value for making binder grade adjustments for mixes containing RAP.
- Nationally, there is too much variability in RAP binder to establish a “one size fits all” for all of the AASHTO agencies
- Example:
  - RAP binder from an existing eight year old pavement in northern Montana will likely be significantly different than the RAP binder from an existing 25 year old pavement in south Texas that was milled up and sat in a stockpile for six years.

# Binder Adjustment Example

2015 FDOT RAP Data		
	T <sub>c</sub> High	T <sub>c</sub> Low
Average	93.7	-19.5
Std Dev	3.88	2.14
N	69	69

FDOT Virgin Binder Data			
		T <sub>c</sub> High	T <sub>c</sub> Low
67-22	Average	69.1	-25
	Std Dev	0.75	1.83
	N	20	20
58-22	Average	61.3	-29.4
	Std Dev	0.82	1.23
	N	35	35
52-28	Average	56.6	-32.3
	Std Dev	2.42	2.38
	N	45	45

$$RAPBR_{\max} = \frac{T_c(\text{need}) - T_c(\text{virgin})}{T_c(\text{RAP Binder}) - T_c(\text{virgin})}$$

58-22			
Inputs	RAP	T <sub>c</sub> High (Average)	93.7
		T <sub>c</sub> High (Std. Dev)	3.88
		T <sub>c</sub> Low (Average)	-19.5
		T <sub>c</sub> Low (Std. Dev)	2.14
	Virgin Binder	T <sub>c</sub> High (Average)	61.3
		T <sub>c</sub> High (Std. Dev)	0.82
		T <sub>c</sub> Low (Average)	-29.4
		T <sub>c</sub> Low (Std. Dev)	1.23
	Specs	T <sub>c</sub> High	70.0
T <sub>c</sub> Low		-22.0	
Calculations	RAP	T <sub>c</sub> High (98% Reliability)	86.0
		T <sub>c</sub> Low (98% Reliability)	-15.2
	Virgin Binder	T <sub>c</sub> High (98% Reliability)	59.7
		T <sub>c</sub> Low (98% Reliability)	-26.9
	T <sub>c</sub> High	RAPBR <sub>min</sub>	0.393
	T <sub>c</sub> Low	RAPBR <sub>max</sub>	0.422



# Issue No. 3

Adding a note and table to provide binder selection guidelines for Agencies that won't do their own analysis

Proposed M 323

**Note 4**—In lieu of developing Agency specific binder selection requirements, the binder grade selected in Sections 5.1.3 and 5.2 can be adjusted according to Table 2 based on RAPBR to account for the amount and stiffness of the RAP binder. Procedures for developing a blending chart are included in Appendix X2.

Proposed M 323

**Table 2**—Binder Selection Guidelines for Reclaimed Asphalt Pavement (RAP) Mixtures

Recommended Virgin Asphalt Binder Grade	RAPBR
No change in binder selection	$\leq 0.15$
Follow recommendations from Appendix X2	$>0.15$

## Issue No. 3

### *Rationale:*

- Table 2 was only included to provide guidance for agencies that do not have the capability or resources to conduct the actual binder analysis

# Issue No. 4

Limited the table to two tiers as opposed to three tiers

Current M 323

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Proposed M 323

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Recommended Virgin Asphalt Binder Grade	RAPBR
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Follow recommendations from Appendix X2	$>0.15$

# Issue No. 4

## Rationale:

- Nationally, there is too much variability in RAP binder to establish a “one size fits all” for all of the AASHTO agencies.
- In some instances (depending on the binders involved) selecting a binder grade that is “one grade softer than normal” may be an inaccurate change, that could result in a resultant binder that is either too soft or is too stiff, so this option was eliminated.

Editor’s Note: The Task Team was pretty much split on two or three tiers.

# Issue No. 5

## Setting the RBR limits in Table 2 at 0.15

Proposed M 323

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Recommended Virgin Asphalt Binder Grade	RAPBR
No change in binder selection	$\leq 0.15$
Follow recommendations from Appendix X2	$>0.15$

# Issue No. 5

## Rationale:

- The work conducted by NCAT under NCHRP 09-46 “Improved Mix Design, Evaluation, and Materials Management Practices for Hot Mix Asphalt with High Reclaimed Asphalt Pavement Content” recommended that this limit be established at 0.25, which is the value used in Table 3 in the old standard.
- However, many members of the Task Team felt that that value was too high and that it should be set at either 0.20 or 0.15.
- The PI from that project was on the Task Team and concurred that 0.25 may be too high, especially when considering fractionated RAP.
- The limit in the new Table 2 of 0.15 is a very conservative value.

Editor’s Note: The Task Team was pretty much split between 0.15 and 0.20.

# Issue No. 6

Provided an option to use a cracking performance test instead of using the RAPBR binder selection requirements in the standard.

Proposed M 323

**Note 5**—A mixture performance test for cracking implemented by an agency is acceptable in lieu of the RAPBR binder selection criteria in Section 5.3.1.

# Issue No. 6

## Rationale:

- With the increased usage of balanced mix design and asphalt performance tests, the Task Team felt that the use of a cracking test was a better option with respect to binder selection.
- Since there isn't a national consensus on which cracking test to use, the Task Team felt language should be added to allow an Agency to use a cracking test – if they have one that is implemented in their state.

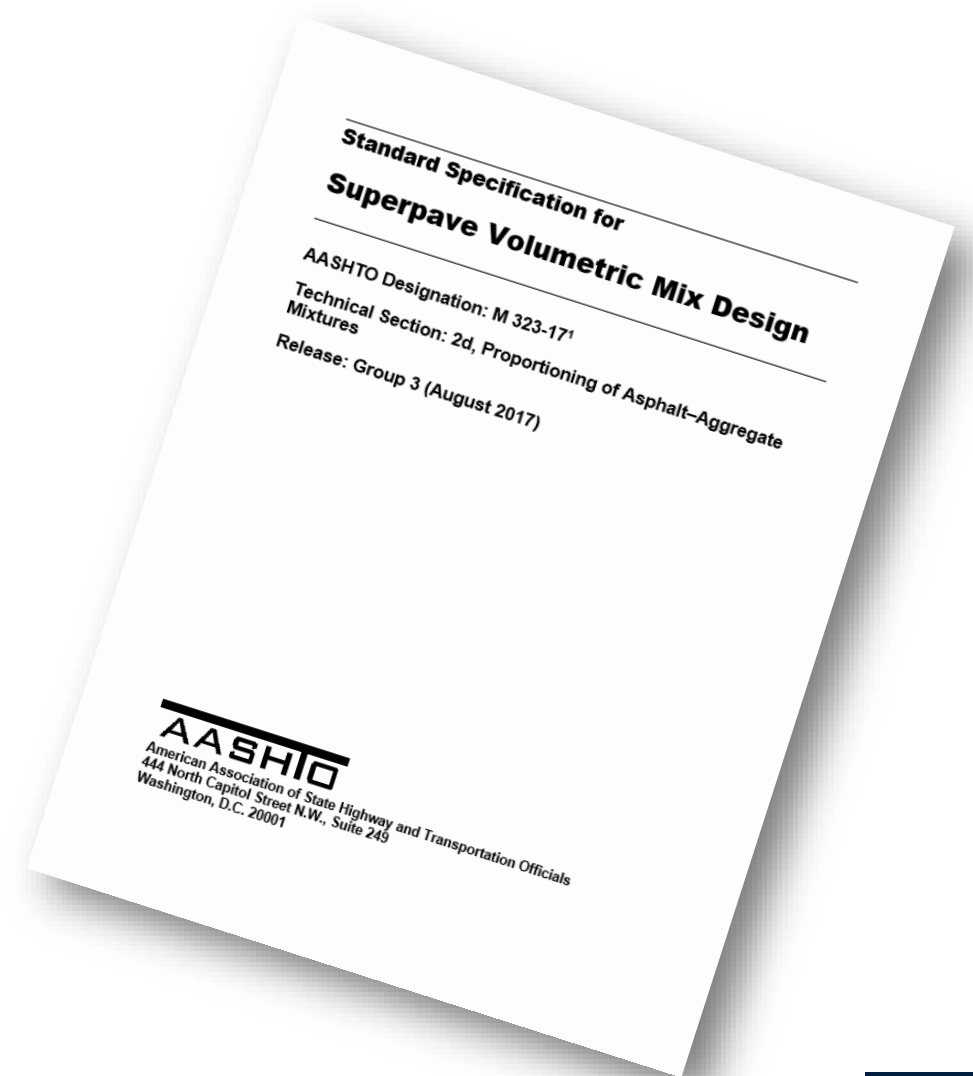


# Less Controversial Changes...

- Added definitions for binder content ( $P_b$ ) and RAP binder content ( $P_{bR\text{AP}}$ )
- Added references to AASHTO M 332 “Standard Specification for Performance-Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test” for binder selection – in addition to the existing M 320 references.
- Changed references to LTPPBind (it’s currently web based...)
- Determined the Primary Control Sieve did not apply to the 4.75 mm mix
- Decided not to add Delta  $T_c$  requirements for high RAP mixes
- No plans to address Rejuvenators
  - Pending NCHRP Project 09-58

# Next Steps

- Revised M 323 standard and commentary will be distributed to the entire ETG for comments
- Comments will be addressed by Task Team – as appropriate.
- Revised version will be forwarded to ETG Chair for distribution to AASHTO SOM for their consideration.





Thank You.

Questions?