RAP/RAS Team Update

Jim Musselman

Oldcastle® Materials

Team Members

- John D’Angelo
- Gerry Huber
- Ron Sines
- Randy West
- Richard Willis
- Tim Ramirez
- Audrey Copeland
- Danny Gierhart
- Hassan Tabatabaee
- Lee Gallivan
- Tim Aschenbrener
- Jim Musselman
- Tanya Nash

Additional Support

- Tom Bennert
- Gerry Reinke
- Mike Anderson
- Pamela Turner
- Geoff Rowe

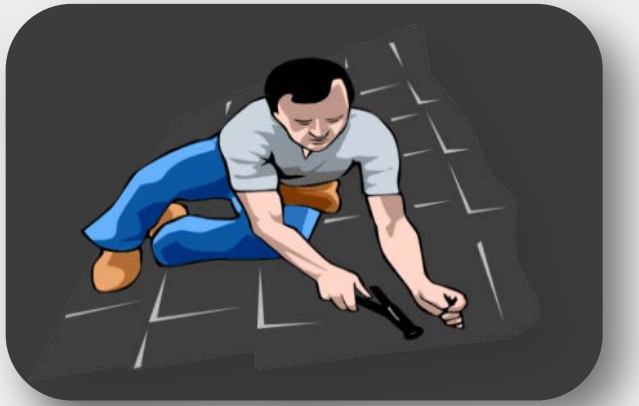
Asphalt Roofing Shingles

11 million tons of waste asphalt roofing shingles are generated in the US per year.

- Manufacturing Waste
  ~ 1 million tons
- Roofing tear-offs
  ~ 10 million tons

Recycled Asphalt Shingles (RAS)

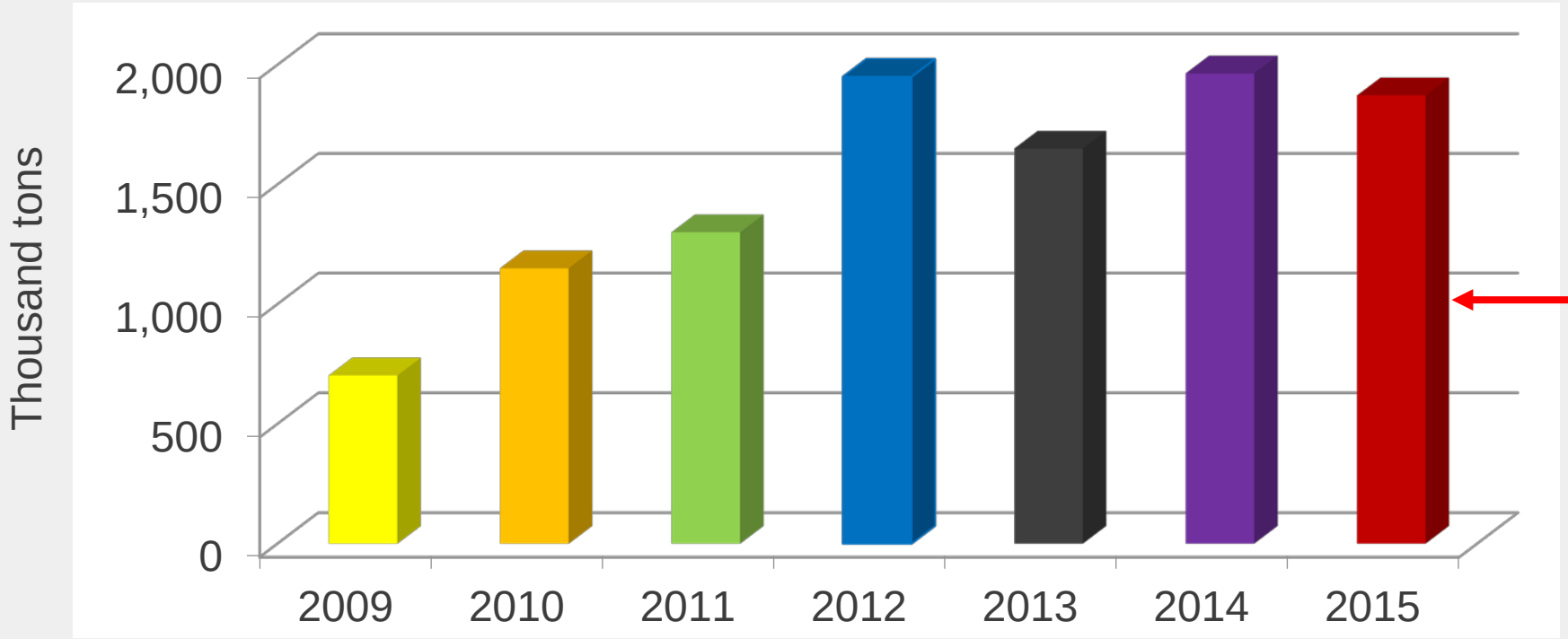
- Crushed/ground and screened
- Used in hot mix asphalt



RAS Usage in HMA/WMA

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Total asphalt mix: 358 360 366 360 351 352 365 (million tons)



~0.5% of total HMA tonnage

Oldcastle Materials

Recycled Asphalt Shingles (RAS)

Benefits

- Improved resistance to rutting
  - Due to fibers, angular aggregate and increased stiffness of binder
- Reduced costs for HMA production
  - High binder content
  - Conservation of natural resources
- Conservation of landfill space
  - Reduced costs for Shingle waste disposal

Risks

- Decreased resistance to cracking
  - Due to extremely hard binder stiffness
  - Due to low effective binder content

Quick Recap…

Two main issues with Recycled Asphalt Shingles:

- Binder quantity:
  - How much of the RAS binder becomes effective asphalt binder?
- Binder quality:
  - How to address the stiffness/brittleness of the RAS binder?

Oldcastle Materials

Task Force Recommendations

Binder Quantity:

- Raise minimum VMA by 0.1% for every 1% RAS (by weight of total aggregate).
  - Based on assumption of 70% binder availability
  - Will increase effective binder in the mix to offset for the potential for non-effective binder on the RAS
- Simple way of addressing binder availability
  - More binder → Improved durability
  - Angular aggregate and stiffer binder in RAS → Minimal risk of rutting
  - Conservative approach

Task Force Recommendations

Binder Quality:

- Focus on critical low temperature difference of the binder - ΔTc
  - ΔTc = Stiffness critical temp (S) – the Relaxation critical temp (m-value)
  - Measured with the Bending Beam Rheometer (BBR)
- Criteria: ΔTc for the blended binder should be greater than or equal to -5.0°C
- Binder is PAV aged for 40 hours

Options included in the Standard

- Binder aging option – PAV aged for 40 hours
- Mixture aging option – Loose mix conditioned at 135°C for 24 hours
- Agency may use a mixture performance test for cracking in lieu of the binder testing for ΔTc.
- Agency may default to RASBR ≤ 0.10
- Agency may set allowable RAS tiers

Advantages

- Relatively simple approach
- Focused on the end result
  - Base binders are different
- Setting RAS limits
  - Informed decision making by Agencies
  - Based on: available base binders and existing RAS materials

Actions:

Revised PP 78: Standard Practice: "*Design Considerations When Using Reclaimed Asphalt Shingles (RAS) in Asphalt Mixtures*"

Full subcommittee ballot

SOM Technical Section 2d

All affirmative votes

Currently at Publishers

Will be published as balloted

August 2017


Standard Practice for

Design Considerations When Using Reclaimed Asphalt Shingles (RAS) in Asphalt Mixtures

AASHTO Designation: PP 78-17[1]

Technical Section: 2d, Proportioning of Asphalt–Aggregate Mixtures

Release: Group 3 (August 2017)

AASHTO

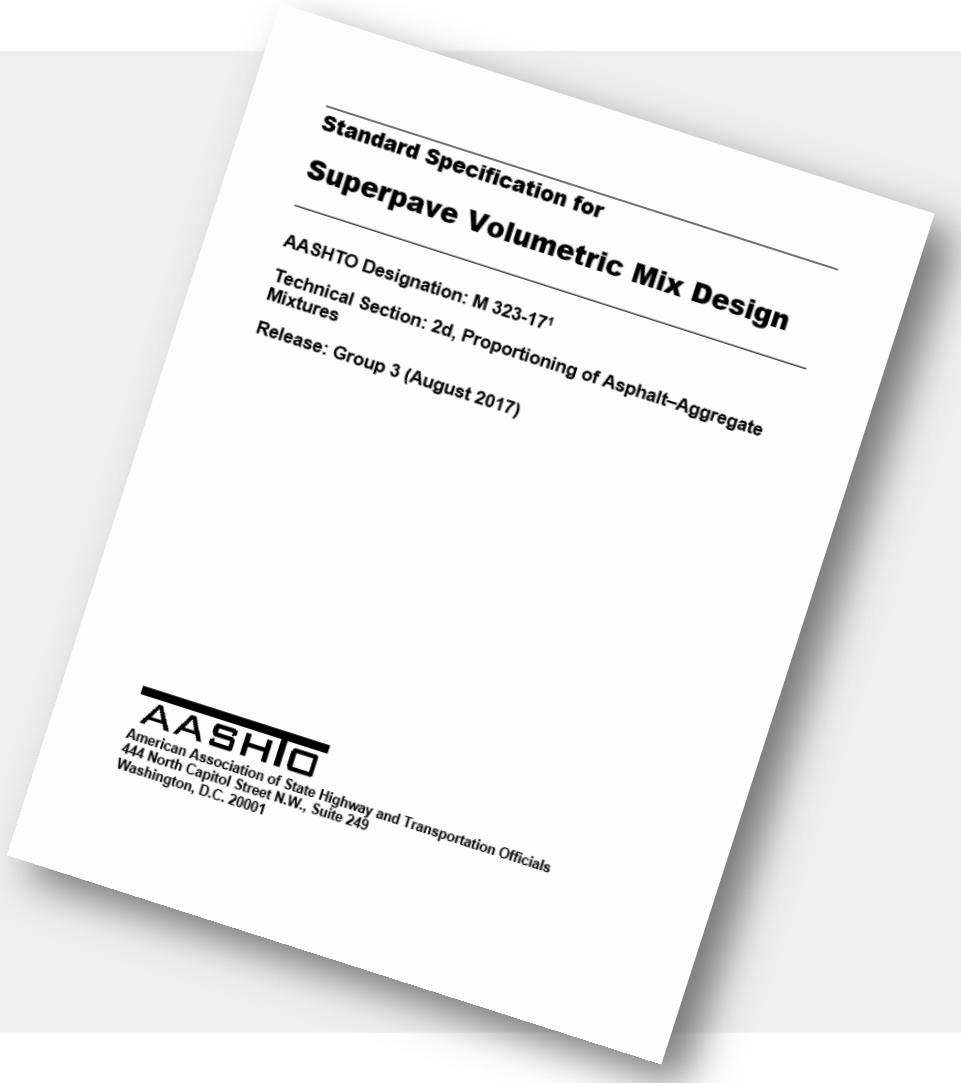
American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

Oldcastle Materials

Future Activities

AASHTO M 323:

- Table 2 and Table 3 inconsistencies
- By weight of mixture or aggregate or RAPBR?
- Add option for mixture performance test and/or Delta Tc for high RAP mixes?
- Appendix X3 – RAP stockpiles
- Do we need to add consideration for Rejuvenators? (would also apply for PP 78)
- Table 5: Need to add a PCS to the 4.75 mm mix.



Oldcastle Materials

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

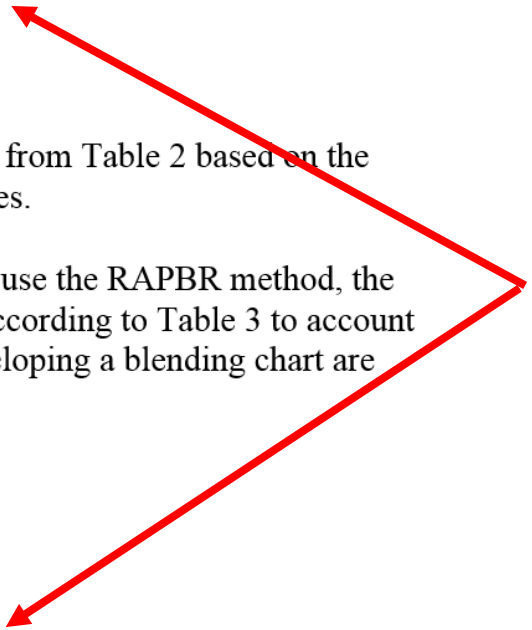
Recommended Virgin Asphalt Binder Grade	RAP Percentage
No change in binder selection	<15
Select virgin binder one grade softer than normal (e.g., select a PG 58-28 if a PG 64-22 would normally be used)	15 to 25
Follow recommendations from Appendix X1	>25

Note 4—An Agency may alter the virgin binder selection criteria from Table 2 based on the research procedures provided in Appendix X2 and field experiences.

5.3.2. *Reclaimed asphalt pavement binder ratio*—If the agency elects to use the RAPBR method, the binder grade selected in Sections 5.1.3 and 5.2 must be adjusted according to Table 3 to account for the amount of stiffness of the RAP binder. Procedures for developing a blending chart are included in Appendix X2.

Table 3—Binder Selection Guidelines for Reclaimed Asphalt Pavement (RAP) Mixtures

Recommended Virgin Asphalt Binder Grade	RAPBR
No change in binder selection	<0.25
Follow recommendations from Appendix X2	>0.25



Future Activities

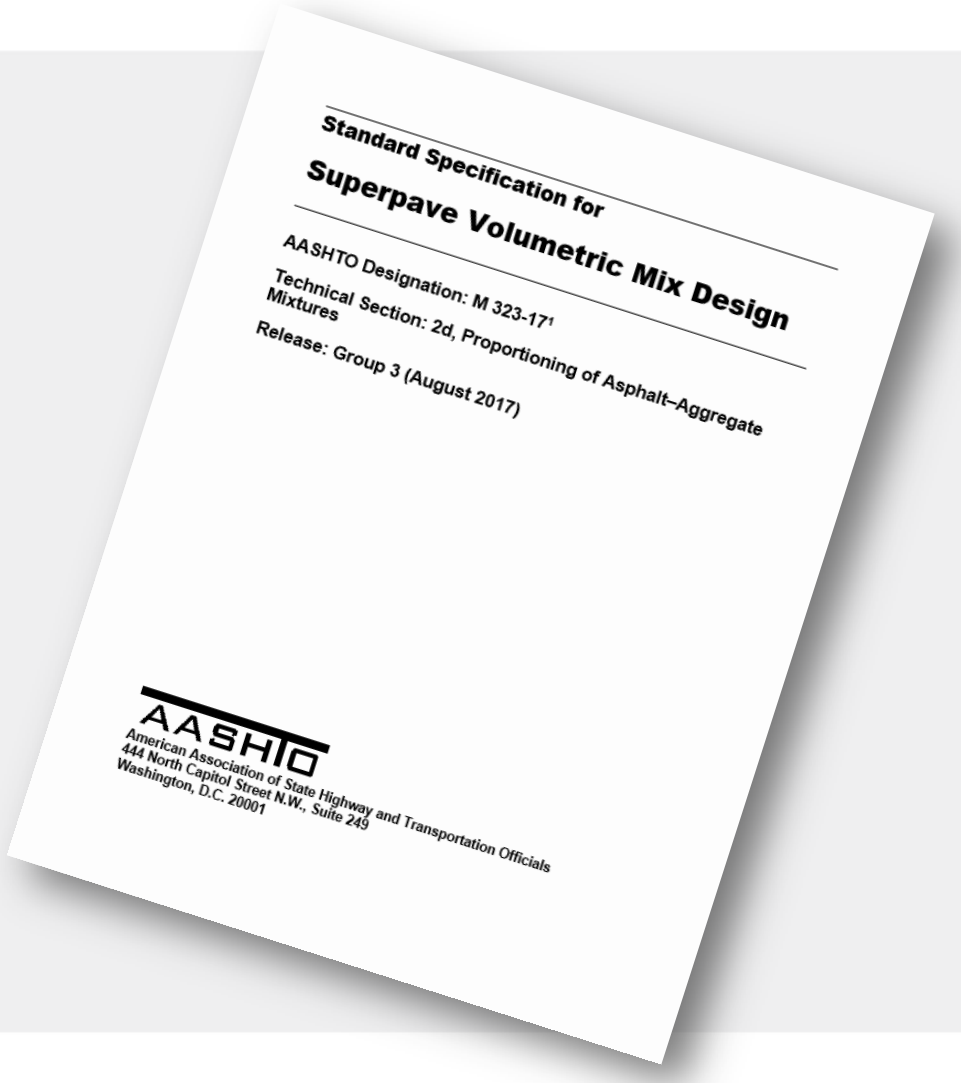
AASHTO M 323:

- Table 2 and Table 3 inconsistencies
- By weight of mixture or aggregate or RAPBR?
- Add option for mixture performance test and/or Delta Tc for high RAP mixes?
- Appendix X3 – RAP stockpiles
- Do we need to add consideration for Rejuvenators? (would also apply for PP 78)
- Table 5: Need to add a PCS to the 4.75 mm mix.

AASHTO PP 78

- Probably will need to revise based on latest research

New Members?



Oldcastle Materials

Questions?

Oldcastle® Materials