
RAP Percentage Based on Binder

**HMA Recycling Expert Task Group
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Manchester, NH**

RAP Percentage Based on Binder

- Historically Agency specifications limiting RAP in HMA have been based on RAP % in terms of total mix.
- Many Agency specifications allow greater percentages of RAP in base and intermediate layers than in surface mixes.
 - Percentage binder replacement allowed by these types of specifications would be greater in lower lifts, and would be magnified by the typically lower binder contents of these mixes.
- Does the current practice adequately describe the “impact” RAP has on the binder in the mixture?
- Does the current practice drive the desired behavior of HMA producers?
- Should RAP specifications be based on percentage binder replacement?

Agency Specification Review (Selected States)

■ Idaho (draft)

- *RAP Binder Percentages and Binder Grade Selection.* The Contractor will determine the percentage of RAP used and the binder grade required to meet specifications. The Contractor will select the percentage of RAP used in the mix by determining the contribution of the RAP binder toward the total binder in the mix, by weight.

Level	RAP binder by weight of the total binder in the mixture, %	Binder Grade Adjustment to compensate for the stiffness of the asphalt binder in the RAP
1	0 to 17	No binder grade adjustment is made.
2	> 17 to 30	Full depth paving over base course: The selected binder grade adjustment for the virgin asphalt binder is one grade lower for the high and low temperature than the binder grade required for the specified on the plans. (The asphalt binder grade adjustment may be determined as shown in Level 3.) Overlays over existing pavement : No binder grade adjustment is made.
3	>30	The selected binder grade adjustment for the asphalt binder shall be determined using a blending chart for high and low temperatures. The Contractor shall supply the blending chart and the RAP test data used in determining the binder selection.

Agency Specification Review (Selected States)

■ Ohio

- Places minimum virgin asphalt binder content on some mixes for “Standard RAP Limits”

Asphalt Mix Application	Percent RAP by Dry Weight of Mix	Minimum Virgin Asphalt Binder Content	Comments
Heavy Traffic Polymer Surface Course	10 max		For non-polymer virgin binder allow 20% max RAP
Medium Traffic Surface Course	20 max	5.0	Polymer or non-polymer virgin.
Light Traffic Surface Course		5.2	
Intermediate Course	35 max		Any mix type used as an intermediate course.
Base Course 301	50 max		The Laboratory will establish the asphalt binder content.
Base Course 302	40 (30) max		A lower limit of 30 percent will be required if poor production mixing or coating is evident.

Agency Specification Review (Selected States)

■ Ohio

- Places minimum virgin asphalt binder content on most mixes for “Extended RAP Limits”
- Does not require binder grade change when 26% to 40% RAP is used with WMA

Asphalt Mix Application	Percent RAP by Dry Weight of Mix	Minimum Virgin Asphalt Binder Content	Comments
Heavy Traffic Polymer Surface Course	15 max	5.0	For non-polymer binder allow 25% max RAP and 4.6 min virgin.
Medium Traffic Surface Course	25 max	4.8	Polymer or non-polymer virgin.
Light Traffic Surface Course		5.0	
Intermediate Course	40 max	3.0	Any mix type used as an intermediate course.
Base Course 301	55 max		The Laboratory will establish the asphalt binder content.
Base Course 302	45 (40) max	1.8	A lower limit of 40 percent will be required if poor coating is evident. The virgin requirement of 302.02 does not apply.

Agency Specification Review (Selected States)

■ Alabama

- Reported to previously have a specification which required at least 50% virgin binder.
- NCAT comments
- New WMA specification will allow increase RAP %

■ **Missouri**

- RAP is limited to 20% by weight of total mix
- Shingles are limited to 7% by weight of total mix
- 70% of the binder content must be virgin when shingles are used.
- Typically does not come into play unless shingles are used in conjunction with RAP

■ **APAC Missouri comments**

- Limitations seem restrictive, but they allow the use of recycle in mixes at a very high rate without burdensome binder testing.
- Limits are also at a breakpoint where exceeding them would create a need to bump binder grades

Agency Specification Review (Selected States)

■ Tennessee

- Requires 65% virgin binder on base mixes.
- Requires 80% virgin binder on surface mixes.

■ Iowa

- Allows 20% of binder to come from RAP before subjecting the contractor to one drop in binder grade
- At 30% binder from RAP, they have the option of dropping the binder grade further

■ South Dakota

- Does not allow RAP mixes except by special provisions.
- When they allow RAP, they supply the RAP from the project.
- They pay for the binder as a separate line item, thus the contractor is not paid for the effective binder in the RAP.

Agency Specification Review (Selected States)

■ South Carolina

- Limits RAP % Based on whether the RAP has been fractionated or not

Type of Mix	Maximum % RAP	
	Non Fractionated RAP	Fractionated RAP
Surface A	-	10
Surface B	15	20
Surface C	20	25
Surface CM	20	25
Surface D	20	25
Surface E	-	25*
Intermediate A	-	10
Intermediate B	20	25
Intermediate C	25	30
Base A	30	30
Base B	30	30
Base C	-	30*
Base D	-	30*

Agency Specification Review (Selected States)

- **Michigan**
 - Gerry Huber

- **Wisconsin**
 - Jack Weigle

- **Goals of this discussion?**
 - Identify states that use this method
 - Identify obstacles to method
 - Identify solutions or research needs to overcome obstacles
 - Identify if RAP ETG supports method in lieu of total RAP contribution

- **Discussion**