

Fractionation and the Effect on HMA Production

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Reclaimed Asphalt Pavement (RAP)



- Greatest single upfront cost saving measure available to MTO and Municipal agencies is increasing the usage RAP
- Different RAP processing techniques have the potential to change the marketplace and the quality of our material

RAP in OPSS.PROV 1151

Traffic Category	Binder Course		Surface Course
	150 mm or More Below Pavement Surface	Within 150 mm of Pavement Surface	Excluding SMA
A, B	40%	40%	20%
C, D	40%	20%	20%
E	40%	20%	20%

- For FC1 and FC2 surface course the lithology of the fine aggregate fraction is specified

RAP in OPSS.MUNI 1151

Allowable RAP Proportions by Mass

Traffic Category	Binder Course Mixes	Surface Course Excluding 12.5 FC 1, 12.5 FC 2 and SMA	12.5 FC 1, 12.5 FC 2 and SMA
A, B, C and D	30% or 40%	15% or 20%	0%
E	30%	15%	0%


- for OPSS 1150 – 0% in HL 1, DFC and HDBC, 15% for surface and 30% for binder; in App D – 0% for HL 1, DFC and HDFC, 20% for surface and 40% for binder and 30% for MDBC

OHMPA's ABCs of Asphalt Pavement Recycling (2007)




- Reasons for using RAP
- HMA is the Best and Highest Use
- Production and Stockpiling
- NCHRP Rpt 452 for RAP in Superpave mixes
- AC selection for RAP use
- Use of a RAP Gator to control lumps
- Air scavenger system to collect moisture and dust
- The Economic Case
- Available online under the Publications tab

NCAT Study on RAP




- Is RAP variable? Is it truly a GOK pile?
 - NO – surveyed 70 RAP stockpiles and 60 crushed stone stockpiles in 6 states
 - Found that the processed RAP pile was more consistent than the aggregate stockpiles (lower standard deviation on the median and finest sieve)
 - Why – all the material comes from road pavements so it has already been processed
 - “Mix as you feed” procedure during the processing of raw RAP into the active stockpile results in further uniformity

NCAT Study on RAP




- Is fractionation necessary for quality?
 - Not necessarily – fractionation provides many more options for the HMA process but does not necessarily improve variability
 - It involves extra costs and therefore it may not be suitable in areas where RAP utilization is low
 - Most suppliers crush to one size and use it appropriately in their mixes
 - Over crushing can produce fines that are detrimental

NCAT Study on RAP



- How do we access the quality of RAP?
 - Over 75% of the HMA producers surveyed sample their stockpile while it is being built at a frequency of 1 test every 1,000 tonnes
 - 43% take one test every 500 tonnes
 - Ignition oven used for AC content and gradation about 70% of the time

How is RAP changed by fractionation



- Fractionation changes the asphalt cement content of RAP
 - Finer fractions have proportionately more of the AC
- Fractionation allows for greater control on the final gradation
 - More bins give more control, just like any aggregate
 - Become more important as RAP content increases
- Prevents over processing to get to a finer size
 - Reduces the generation of fines

What might be coming

- NCHRP Report 752 – *Mixes with High RAP*
- Randy West (NCAT) was PI
 - Incorporated a lot of the NCAT study
 - Control of working stockpile is critical
 - Choosing how to process the bulk pile for uniformity
 - Testing requirements as outlined
- RAP stockpile maintenance
 - Conical to shed water or cover
 - On sloped (6%) paved surface to promote drainage and prevent contamination

AASHTO Requirements



- AASHTO specs are referenced in MTO specs but not directly implemented
- Typically, the implications of new AASHTO specs are discussed with the various MTO-OHMPA task groups for implementation
- In the end, as it deals with contracts, all discussions regarding implementation of new specs resides with ORBA
 - OHMPA is asked for technical advice about asphalt related specifications

AASHTO M 323-13 (Spec)

AASHTO R 35-12 (Method)

- Change in calculation of AC from RAP
 - Use % RAP by mass in the past
- New calculation method allowed
 - Binder Replacement (Binder Ratio)
 - Proportion of binder from RAP
- Affects when the AC Grade transition is done
 - Currently 20% RAP by mass
 - Will be 20% Binder Ratio

AASHTO M 323-13 (Spec)

AASHTO R 35-12 (Method)

- Blending Charts are required above a limit
 - Procedure for blending charts given in appendices
 - Requires continuous grading of the RAP binder
 - Equipment limitations
- Asphalt Institute recommends that Blending Charts are the best approach, particularly if the details of the RAP are not known
 - Typically not the case in Ontario

Black Rock Debate

(APSHALTopics Fall 2013)



- Does AC from RAP blend with virgin AC?
- Hotly debated for about 20 years – what's the answer?
- Research by Pavel Kriz (Imperial Oil) that shows that RAP and virgin binder in HMA will blend by diffusion before compaction is complete
- BUT – film thickness must be 0.5 mm, and AC locked in voids will never blend
- No true for WMA

A few comments on RAS



- RAS has a substantially higher asphalt cement content
- AC in RAS is not paving grade asphalt (much stiffer)
- In Ontario, we allow for that by equating 1% RAS with 10% RAP
- Blending charts are required
- MP 23-14 reduced RAS from 12.5 mm max to 9.5 mm max size (non-extracted)

Questions & Discussions



Plant has 4 RAP Bins
(one for processed shingles)