

19.0mm High RAP WMA Binder Leveling Course

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PA Asphalt Pavement Association



Why High RAP Mixes?

- PennDOT focus on low volume roadway network
- RoadMap initiative - \$70 million dedicated funding
- Excess RAP in urban areas
- Alternative to Dept. 100% cold recycled mix program



Deputy Secretary Direction

- Focus on binder/leveling course
- Up to 50% RAP in WMA
- Modify mix design requirements to simplify and speed mix approvals
- Looking for cost savings on low volume roadways
- <5000 ADT, ~~<750 trucks~~ 3/25/19 <300 ADTT



High RAP Task Force(Pro Team)

- Joint effort between PAPA and Department
- PennDOT - Garth Bridenbaugh, Tim Ramirez, Neal Fannin, Andy Firment, Steve Koser, Larry Ligon, Kim Martin
- PAPA – Gary Hoffman, Tom Abbey, Martin Libertini, John Savastio, Greg Brouse, Jeff Frantz (folks w/ experience in High RAP)



Specification Development

- Binder evaluation – looked at historic LTS RAP results for average binder grades
- Final Spec – 3 tiers (Bid all 3 – Award Lowest)
 1. Up to 15% RAP (follow 409 spec)
 2. >15% to 30% RAP, PG 64-22
 3. >30% to 50% RAP, PG 58-28
- Contractor option to test for binder grade at >30% RAP



Binder Data From 40 RAP Stockpiles

PAPA SURVEY DATA

	HIGH TEMP	LOW TEMP
AVERAGE	84.5	-18.8
STD DEV	5.07	7.62
MAX	96.0	-11.2
MIN	75.9	-24.6



Mix Volumetrics

- 50 gyrations
- Lower air voids for higher RAP contents
- Air voids Final spec – 3 tiers
 - Up to 15%, 4.0% air voids (normal)
 - >15% to 30% RAP, 3.5 to 4.0% air voids
 - >30% to 50% RAP, 2.5 to 3.2% air voids

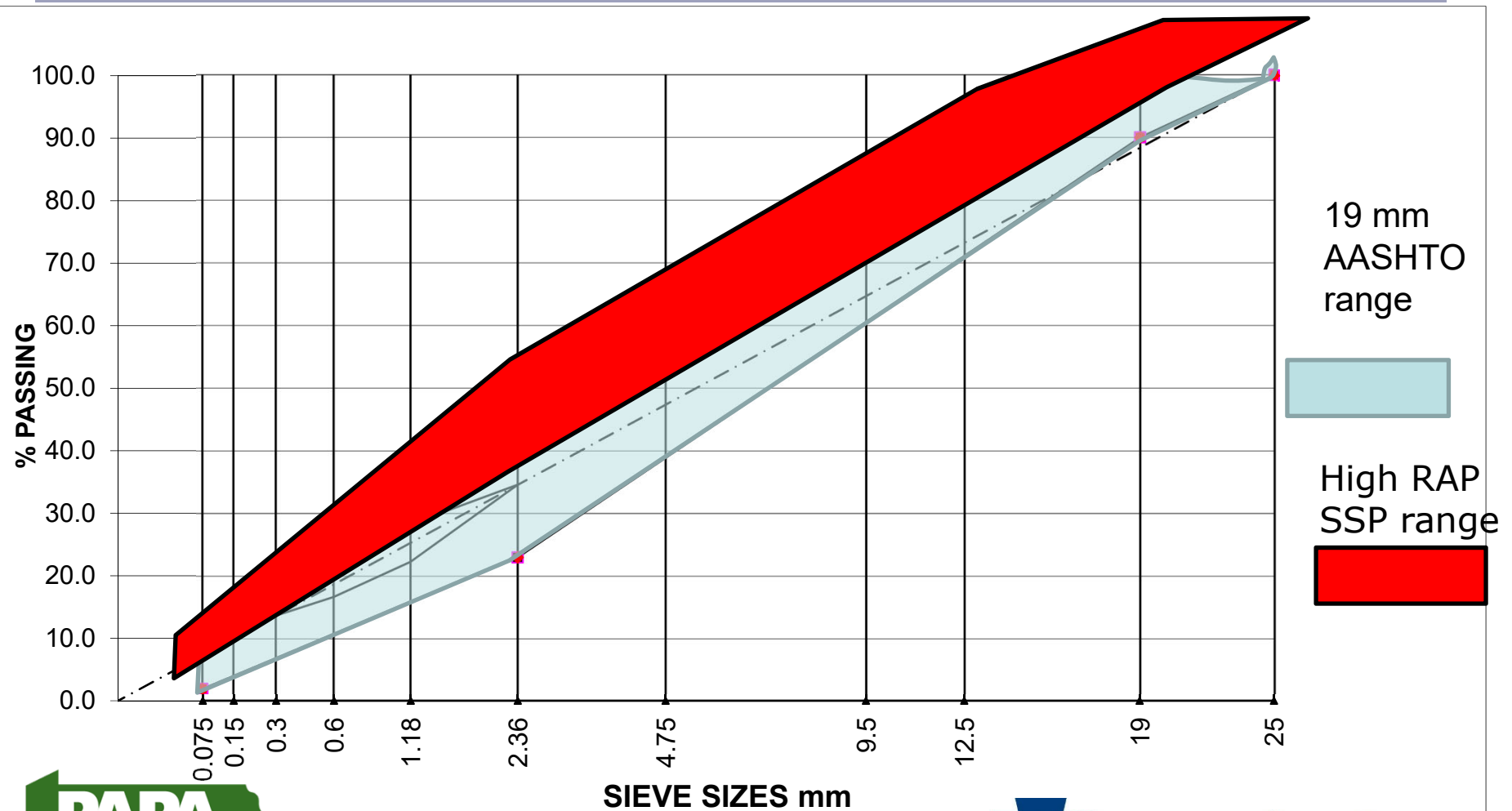


Mix Gradation

- Due to leveling nature of application, wanted a fine graded 19 mm mix
- Final spec – 32% min. passing #8 sieve
- Modified F/A ratio for $>30\%$ to 50% to allow up to 1.3



0.45 Power Chart 19.0 mm



Project Use and Acceptance

- Mix acceptance by certification
- Density acceptance by optimum rolling pattern
- Samples may be lifted for information
- 2 1/2" minimum average depth
- Must apply a surface over (no SRL)



Implementation

- May 7, 2018 Use Guidelines issued for ECMS contracts & Revised March 25, 2019

STANDARD SPECIAL PROVISION

Detail

Index or Category: Provisional Specification Related

Status: Pending

Sequence ID: 4111

District: CO

Version: A

Provision Name: c0411 ITEM 4411-0010 SUPERPAVE ASPHALT MIXTURE DESIGN, WMA BINDER COURSE (LEVELING), – HIGH RAP

Usage Information

Measurement: English-IP

Edit Body: No

Include on all projects: No

Edit Header: No

Include on all federally funded projects: No

Edit Project Specific Details: No

Include on all 100% State funded projects: No

Instructions for Usage: For use on projects with 100% State Funds Only.
Not for use on NHS

Use in accordance with the letter titled "Use Guidelines for 19.0 mm Warm Mix Asphalt High RAP Mixtures for Low Volume Roadways" dated May 7, 2018 found in ECMS file cabinet

408 Section: 411

Effective From: 05/07/2018

To: 01/01/2199

District 10 initial use

- District 10 Jefferson County project bid in May 2018 - bid two alternates high RAP vs. up to 15% RAP
- High RAP alternate \$4 lower per ton

Jefferson Co "Paving" results 12,000 Ton

<u>Low Bid Supplier</u>	<u>Version 1 - over 15% Rap</u>		<u>Version 2 - 15% Rap mix</u>	
Glenn O. Hawbaker, Inc.	\$44.45/ton	\$ 533,400.00	\$48.45/ton	\$ 581,400.00

Jefferson Co "Mill and Fill" results 16,200 Ton

<u>Low Bid Supplier</u>	<u>Version 1 - over 15% Rap</u>		<u>Version 2 - 15% Rap mix</u>	
Glenn O. Hawbaker, Inc.	\$42.45/ton	\$ 687,690.00	\$46.45/ton	\$ 752,490.00

\$112,800 reduced initial cost with high RAP 19 mm mix

Jefferson County Paving



Jefferson County Paving



2018 19mm High RAP Usage

District	Supplier Company	Tons
9	Keystone Lime	17,603.01
10	Glenn O. Hawbaker	30,702.15
11	Lindy Paving	26,558.75
	statewide total	74,863.91



Somerset County SR 2017



PennDOT Early Feedback

- Mix looked adequately “rich” on site
- Achieved compaction quickly
- Density cores for information and gauge correlation 95% to 96% range (D10)
- PennDOT happy with early taste of product
- Initial cost savings are encouraging



Cost Comparison*

2018 Cost Comparison - High RAP 19mm vs Regular 19mm	
High RAP 19 mm (3 Counties)	Statewide Average 19 mm
\$45.19/ton delivered	\$52.96/ton delivered

* Based on sampling of 2018 maintenance bid awards with quantities >1000 tons



Tips for bidding

- Make sure to use SSP, this takes into account all of the mix design issues
- Check for other SP's dealing with mix design or high RAP that might conflict
- Remember that "regular" mixes up to 15% RAP still meet this special provision also



ECMS Project Use

- 45,450 tons bid in ECMS (as of 1/7/2019)
- 6 projects (D1, D10 and D11)
- Based on District Regional Meeting Presentations, PennDOT Projects 200,000 tons+ in 2019



25.0mm Efforts

- 25.0mm Spec developed & out for comment





Questions?



2019 PAPA/PENNDOT BUS TOUR

9.5mm WMA HIGH RAP MIX
for Low Volume Roads

Jay Sengoz

OBJECTIVE

1. Reasonable cost savings
2. Product that will perform on low volume routes

CHALLENGES

- Skid Resistance Level (SRL)
- Colder Regions
- Dust / Binder Ratio
- Max RAP%
 - 50%???

SRL

A D T	S R L
20,000 and above	E
5,000 to 20,000	E, H, Blend of E & M, or Blend of E & G.
3, 000 to 5,000	E, H, G, Blend of H & M, or Blend of E & L
1,000 to 3,000	E, H, M, G, Blend of H & L, or Blend of G & L OR Blend of E & L
1,000 and below	A N Y

AADT AND ADTT

AADT < 2000

ADTT < 250

MAX RAP %

50%?

MAX RAP %

~~50%~~
↓
40%

VIRGIN BINDER REQUIREMENT

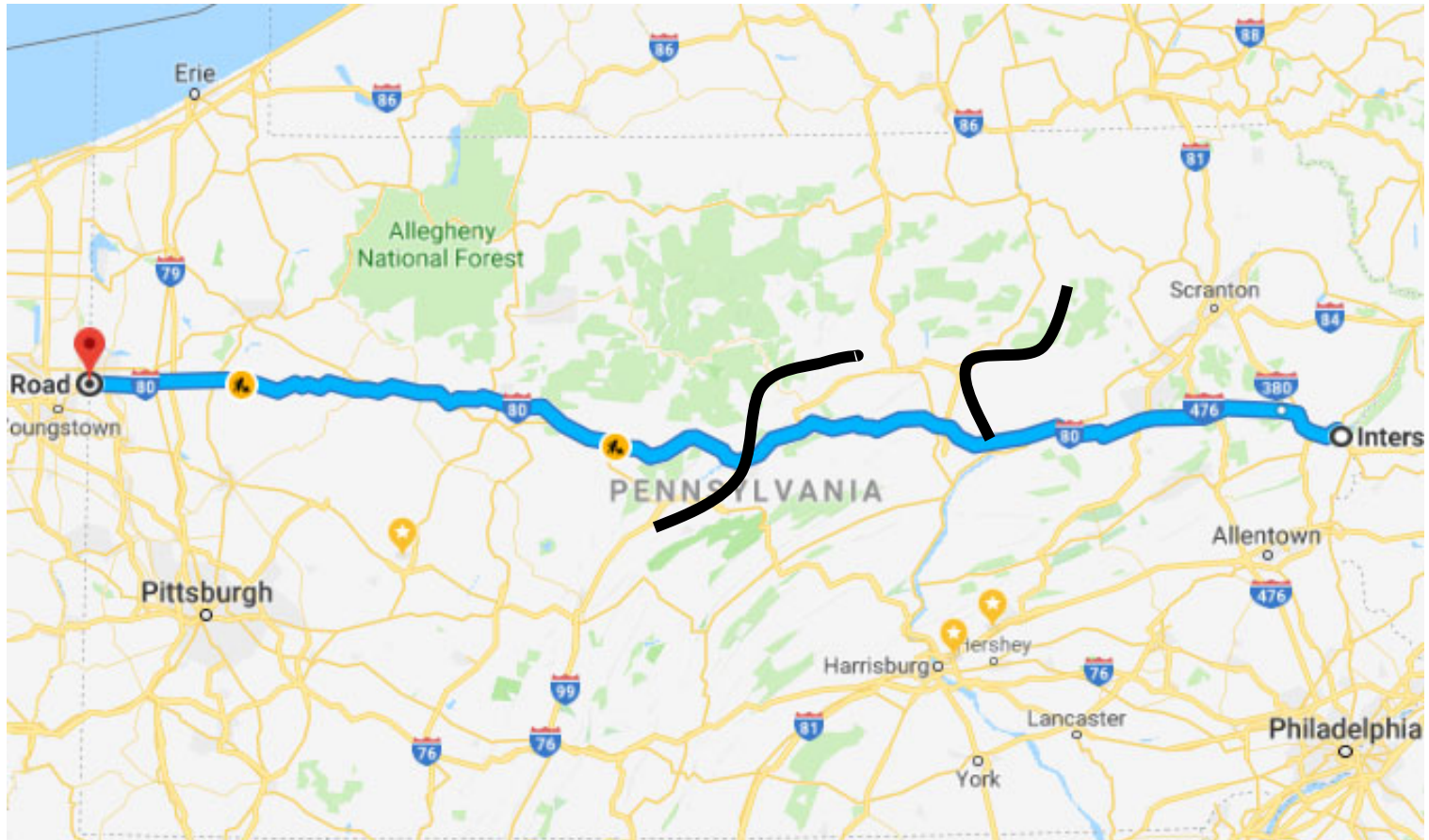
$$25\% \geq \text{RAP}\% > 15\%$$

- PG 64-22
 - PG 58-28*
- *Either binder can be used (*Exception)*
 - *No blending evaluation necessary*

COLDER REGIONS



COLDER REGIONS



VIRGIN BINDER REQUIREMENT

$$25\% \geq \text{RAP}\% > 15\%$$

PG 58-28

For roadways that cross or span I-80

$25\% \geq \text{RAP}\% > 15\%$ RANGE

- $N_{\text{design}} = 50$
- % Air Voids @ N_{design} (Min 3.5%, Max 4.0%)
- PCS (#8) → Min 42%, Max 67%
- F/A Ratio → Min 0.6, Max 1.2%
- VFA → Min 73%, Max 80%

VIRGIN BINDER REQUIREMENT

$$40\% \geq \text{RAP}\% > 25\%$$

PG 58-28**

** A different grade of virgin asphalt may be approved if the contractor chooses to have the asphalt binder in the RAP evaluated by LTS, and that evaluation shows that blending will achieve a PG 64-22 grade at the proportions in the JMF.

40% ≥ RAP% > 25% RANGE

- $N_{\text{design}} = 50$
- % Air Voids @ N_{design} (Min **3.0%**, Max **3.5%**)
- PCS (#8) → Min 42%, Max 67%
- F/A Ratio → Min 0.6, Max **1.3%**
- VFA → Min **77%**, Max **83%**

NEXT STEPS

- DRAFT SOL Need update from Jay Sengoz
- REVIEW SOL
- REQUEST/RECEIVE APPROVAL FHWA
- FINALIZE THE SSP
- PERFORM PILOT PROJECTS/MIX
PERFORMANCE TESTING

QUESTIONS?

Jay Sengoz

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