Florida Department of
TRANSPORTATION

RAP/RAS Team Update

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Background

- Previous Asphalt Mixture ETG Task Team reviewed PP 53 and MP 15; made a number of revisions
  - PP 53 “*Design Considerations When Using Reclaimed Asphalt Shingles (RAS) in Asphalt Mixtures*”
  - MP 15 “*Reclaimed Asphalt Shingles for Use in Asphalt Mixtures*”
- Provisional standards were modified and subsequently sunset by AASHTO;
  - Reissued as PP 78 and MP 23
- Main issues to be addressed by the Task Team:
  - RAS asphalt binder availability
  - Binder grade adjustment guidelines

Issues

- How to address the stiffness/brittleness of the RAS binder?
  - Quality of binder
- How much of the RAS binder becomes effective asphalt binder?
  - Quantity of binder

Existing Approach

- Current approach:
  - Use a RAS Binder Availability Factor of 0.70 – 0.85
  - Use Binder Grade Adjustment Guidelines:

Recommended Virgin Asphalt Binder Grade	RAS or RAS + RAP Binder Percentage
No change	<15
One grade softer	15 to 25
Use blending charts	>25

Alternative Approach

- Focus on the brittleness of the blended binder:
  - Estimate brittleness of the blended binder with the Bending Beam Rheometer (BBR)
    - Stiffness (S) and Relaxation (m-value)
  - BBR testing is done at two temperatures bracketing the specification requirements from which the temperature where the criteria are met can be interpolated.

BBR DATA

For stiffness (S):

$$T_c = T_1 + \left[\frac{Log(300) - Log(S_1)}{Log(S_1) - Log(S_2)}\, x\, (T_1 - T_2)\right] - 10$$

For Relaxation (m-value):

$$T_c = T_1 + \left[\frac{0.300 - m_1}{m_1 - m_2}\, x\, (T_1 - T_2)\right] - 10$$

CRITICAL TEMPERATURE DIFFERENCE (ΔT_C)

ΔT_c = Stiffness critical temp (S) – the Relaxation critical temp (m-value)

Previous work by Mike Anderson and Tom Bennert indicates that when ΔT_c "exceeds" -5°C there is a significant loss of cracking resistance.

Assumptions

- Assumes "worse case" scenario (from a binder perspective)
  - If blending is less than complete, the impact of the aged binder on stiffening and relaxation is less than the laboratory would predict
  - If blending is completely homogeneous, the impact on stiffening and relaxation would be accounted for.

Pro's

- Relatively simple approach
- Easy for states to make an informed decision on setting RAS limits based on available virgin binders and existing RAS materials

Con’s

- Doesn’t address mixture issues (VMA) if the RAS binder does not become fully blended
  - Binder volume would be less than calculated
  - Binder availability of 0.70 would result in a VMA reduction of ~ 0.50%
    - Could have a mix with better quality binder but not enough of it
- Some potential issues with virgin binders meeting the -5°C criteria

Proposal

- To simplify the process further, the Task Team is looking at setting maximum Recycle Binder Ratio (RBR) for mixtures with RAS
  - Possibly a RBR of ~0.10
  - Corresponds to roughly 3% RAS with ΔT_c = -5°C
- States that want to exceed this amount would need to evaluate ΔT_c
- Possible Tiered approach

Summary

- ΔT_c is a relatively simple way of addressing impact of RAS on binder quality
- -5°C is a possible recommended starting point
- Task Team looking at setting maximum Recycle Binder Ratio (RBR) for mixtures with RAS
  - Based on ΔT_c
  - Possibly 3% RAS with RBR of 0.10
- RAP complicates things…
- Need feedback and data to refine the idea further.

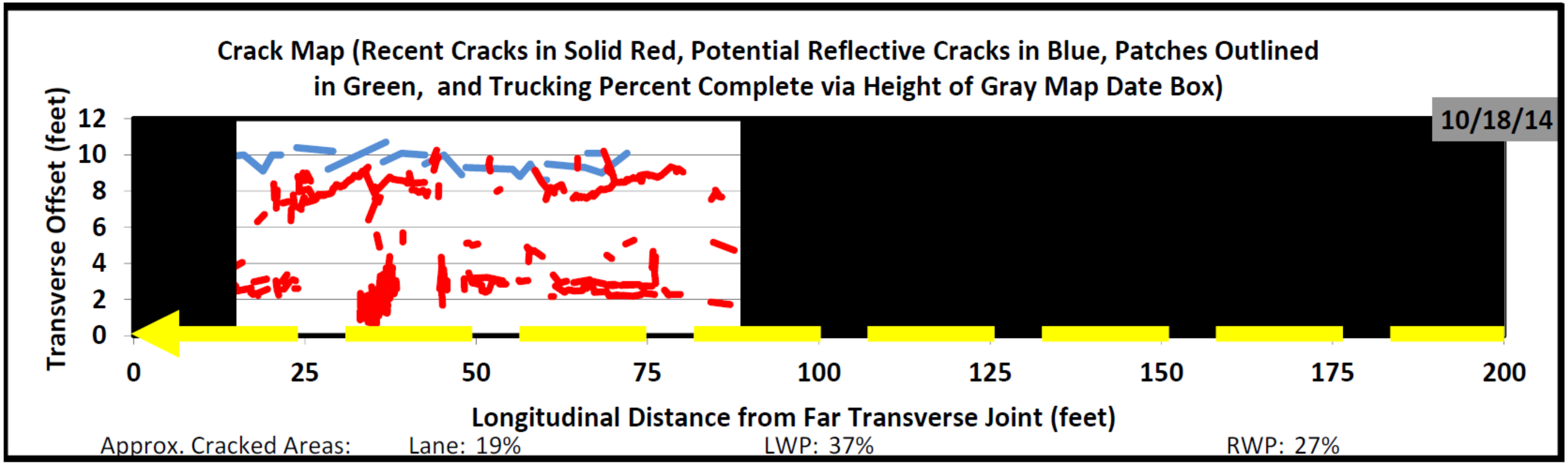
Action Items/Timeline

- Task Team to revise PP 78 and MP 15 to reflect the ΔT_c criteria
  - Include Tiers? Y/N?
  - Target date March 2016
- Task Team to continue to address:
  - Volume of effective binder issue
  - Recommended performance test (maybe)

PRIMUM NON NOCERE

First, do no harm

25% RAP W/PG 76-22



20% RAP, 5% RAS W/PG 76-22