Issues that Impact HMA Performance

- End of Load Segregation
- Rutting/Shoving/Stripping
- Premature Failure of Longitudinal Joint
FIXED
(with use of MTD)

FIXED
(with use of better mix designs and better tack coat)
Why is the joint bad?

1st Pass

2nd Pass

Low Density – High Permeability

Existing Pavement
Typical Density Across the Mat

![Graph showing typical density across the mat with bars ranging from 82% to 94%.]

Effect of In-Place Voids on Life
Washington State DOT Study

![Graph showing the effect of in-place voids on service life. The graph indicates a decrease in percent service life as the in-situ air voids increase. At 93%, the percent service life is close to 100%, while at 89% it decreases to nearly 0%.]

Percent Service Life

In-situ Air Voids, %

93% 92% 91% 90% 89%

Compaction Level
Negative Effects of High Permeability

*High permeability is a problem because it allows water and air to penetrate the mix.*

- Water Influx $\uparrow$ = Potential for Stripping of AC $\uparrow$
- Air Influx $\uparrow$ = Potential for Oxidation of AC $\uparrow$

*Stripping and oxidation weaken the mix, which ultimately leads to deterioration.*

Damp Longitudinal Joint
HMA Surface Course is impermeable < $100 \times 10^{-5}$ cm/sec

Permeability

- Project 1
- Project 4
- Project 9
- Project 10

$y = 0.0481x^{0.7796}$

$R^2 = 0.7662$

92.5%
What’s Been Tried Already?

1. Notched Wedge Joints
2. Supplemental Joint Compactors
3. Joint Sealants
4. Joint Heaters
5. Joint Cutters
6. Various Other Methods
7. Longitudinal Joint Spec.
IL 17 One-Lift Job

First Pass Surface Course 1½"

Second Pass Surface Course 1½"

Existing Pavement

IL 17 Joint Treatment
Cost of this Method?

3” of HMA per mile = 12.3 tons
12.3 tons @ $83/ton = $1021/mile
3” milling @ $0.45/sy = $66/mile

$8150/$1.3M total job = 0.6% contract increase

IL 26 Two-Lift Job

1st Pass Surface Course 1 1/2”
IL 4.75 Level Binder 1/4”
Existing Pavement

2nd Pass Surface Course 1 1/2”
IL 4.75 Level Binder 1/4”
Why is IL 26 so much better?

1. Built on 100% flexible base. No 9-6-9 concrete pavement.
2. Excellent draining sand sub-base.
3. Two lift job. Does the IL 4.75 sand mix make a difference in joint performance?
Cost of this Method?

3” of HMA per mile = 12.3 tons
12.3 tons @ $84/ton = $1033/mile
Additional 3” milling ≈ $1000/mile

≈ $18300/$3.0M total job = 0.6% contract increase

Additional Projects with Joint Treatment

Summer 2013, IL 9 from Canton to Banner
(one lift job, 4” removal, joint matching device)

Spring 2014, US 150 from Kickapoo to IL 78
(two lift job, 4” removal, joint matching device)
How Much to Remove???

3” → 4” → 6”?

Then apply Rapid Penetrating Emulsion as additional protection???
Matching Shoe instead of Ski

Good Match

Bad Match

Good Match

Bad Match

Good Match
Potential Joint Damage and Deterioration

1st Pass

2nd Pass Low

1st Pass

2nd Pass Flush

1st Pass

2nd Pass High

Good Match

Bad Match

Good Match
Best Practices for Specifying and Constructing HMA Longitudinal Joints

A Cooperative Effort between Asphalt Institute & FHWA

Jury is still out...

(but for the $$, it looks pretty good)
Questions???