FULL LANE SEALANT

Kelly Morse, Chief Chemist, Central Bureau of Materials

WHY FLS?

- Observation that Hot Mix Asphalt (HMA) performs better at the centerline joints that used Longitudinal Joint Sealer (LJS) vs. the rest of the pavement
- Expectation that HMA pavements exceed the design life uniformly across the full width of the pavement
- Currently LJS is used to improve the performance of center line joints –moving forward propose Full Lane Sealant (FLS) to improve the performance of the entire pavement

EVIDENCE

Over 13 years of in place LJS

FULL LANE SEALANT (FLS)

- Hot Applied, Highly Polymerized Asphalt Material
- Distributes and Flows Well
- Cools in less than 5 minutes to a Track Free Condition
- Migrates or Melts up into the Subsequent Layer of HMA
- Used as a Tack Coat or an Interlayer

FULL LANE SEALANT (FLS)

- FLS Pavement Durability Improvements
  - Decreased Permeability
  - Increased Bond
  - Increased Density
  - Increased Flexibility
  - Minimize Typical Pavement Distresses

FULL LANE SEALANT (FLS)

- Implementation:
  - Central Bureau of Materials Specification
  - Experimental Feature Workplan
  - District Test Sections
  - Install Material per Specification
  - Monitor Performance of FLS vs. Control Sections

CENTRAL BUREAU OF MATERIALS (CBM) SPECIFICATION

- Comprehensive Specification
- Longitudinal Joint Sealant Backbone
- Experimental Feature Criteria
- Testing Parameters

CBM SPECIFICATION

- FLS Material Requirements:

Test	Test Requirement	Test Method
Dynamic shear @ 88°C (unaged), $G^*/\sin\delta$, kPa	1.00 min.	AASHTO T 315
Creep stiffness @ -18°C (unaged), Stiffness (S), MPa m-value	300 max. 0.300 min.	AASHTO T 313
Elastic Recovery, 100 mm elongation, cut immediately, 25°C, %	70 min.	ASTM D 6084 (Procedure A)
Separation of Polymer, Difference in °C of the softening point (ring and ball)	3 max.	ITP Separation of Polymer from Asphalt Binder"

- No Filler!

CONSTRUCTION HIGHLIGHTS

- Cleaning
  - Air Blasting or Regenerative air vacuum sweeping
- Weather
  - No Moisture 24 Hrs.
- Track Free < 5 Minutes

EXPERIMENTAL PLACEMENT

Section	Length	Applied Material	Residual Rate
Control Section 1	¼ mile	SS-1h	0.05 lb/sq ft
Test Section 1	¼ mile	FLS Tack	0.13 lb/sq ft
Control Section 2	¼ mile	SS-1h	0.05 lb/sq ft
Test Section 2	¼ mile	FLS Tack	0.17 lb/sq ft
Control Section 3	¼ mile	SS-1h	0.05 lb/sq ft
Test Section 3	¼ mile	FLS Interlayer	0.20 lb/sq ft
Control Section 4	¼ mile	SS-1h	0.05 lb/sq ft
Test Section 4	¼ mile	FLS Interlayer	0.25 lb/sq ft
Control Section 5	¼ mile	SS-1h	0.05 lb/sq ft
Test Section 5	¼ mile	FLS Interlayer	0.30 lb/sq ft

SAMPLING AND TESTING

- Full-Depth Cores
  - Center of Lane
  - Midpoint of Control and Test Sections

EXPERIMENTAL FEATURE WORKPLAN

- Plan of Study – 5 Years
  - Pre-Construction
  - Construction
  - Initial Testing
  - Long Term Monitoring

EXPERIMENTAL FEATURE WORKPLAN

- Pre-Construction
  - CBM Conducts Pavement Distress Survey
  - District Collects Cross Section Information
  - Collect 3 Cores per Section

EXPERIMENTAL FEATURE WORKPLAN

- Initial Testing
  - HMA Production Sampling and Testing
  - Three 6” Full Depth Cores
    - Permeability, Bond Strength, I-FIT, Migration

EXPERIMENTAL FEATURE WORKPLAN

- Ongoing Testing Performed Annually
  - Condition Rating Survey (CRS)
  - Pavement Distress Survey (PDS)
  - Three 6" Full Depth Cores

EXPERIMENTAL FEATURES

- Current Project Locations
  - District 2- IL 2, Ogle County-Chad Pink
  - District 5- US 45, Douglas County-Ron Wagoner

D2 EXPERIMENTAL FEATURE

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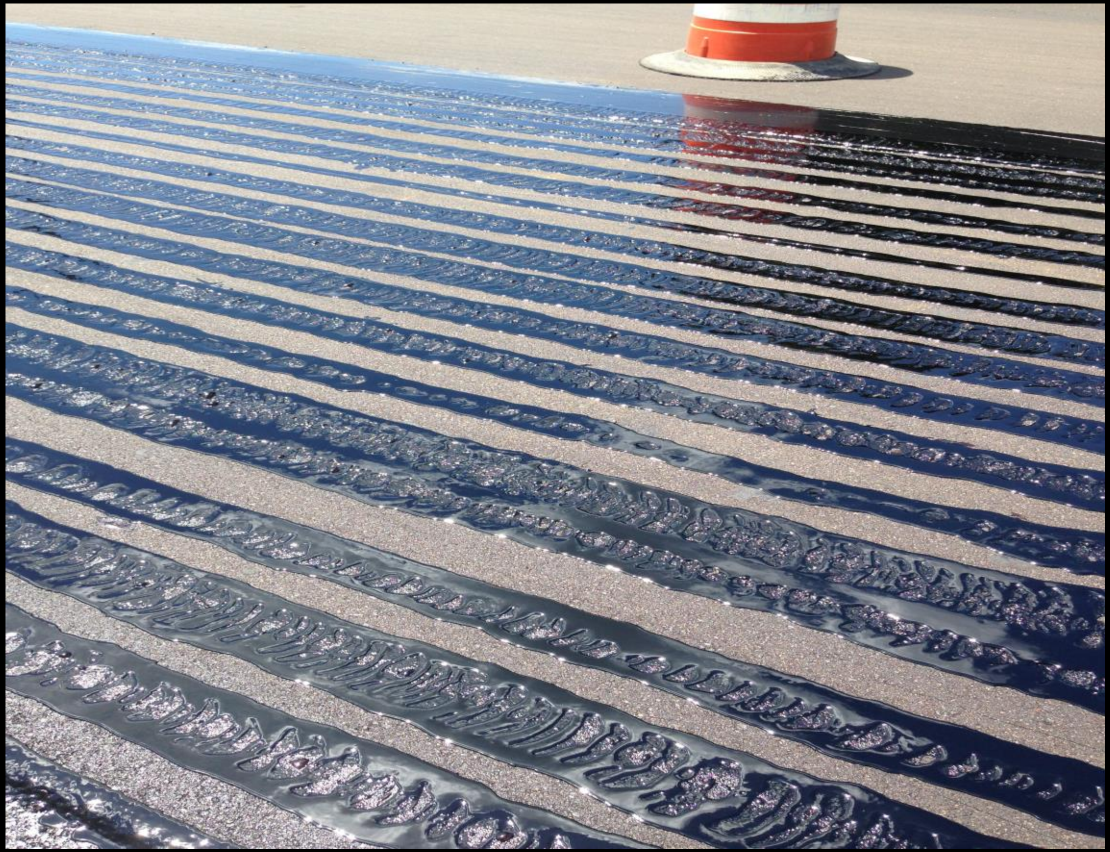


IN PLACE AIR VOIDS

Section	Avg. Air Voids (%)
SS-1h	8.2
0.13 FLS	5.1
0.17 FLS	4.2
0.20 FLS	5.2
0.25 FLS	5.3
0.30 FLS	4.6

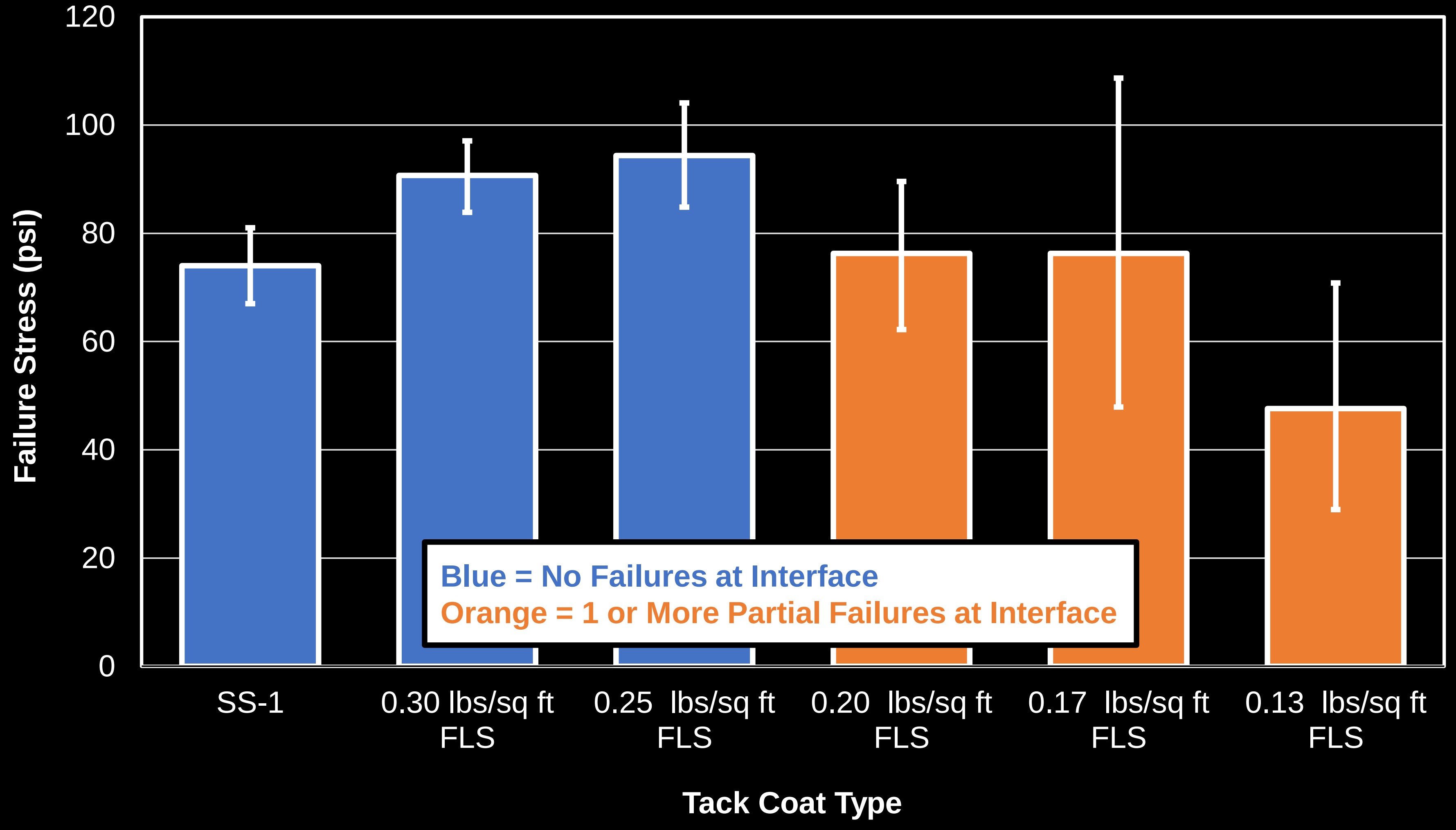
I-FIT DATA RESULTS

Section	Corrected FI	Avg. Corrected FI
SS-1h	44.6	36.7
	28.7	
0.13 FLS	56.1	48.2
	40.3	
0.17 FLS	36.7	35.2
	33.7	
0.20 FLS	41.6	37.6
	33.6	
0.25 FLS	38.3	57.3
	76.2	
0.30 FLS	37.9	47.6
	57.3	

LAB PERMEAMETER RESULTS

Section	Permeability (cm/sec x 10^{-5})
SS-1h	206.0
0.13 lbs/sq ft FLS	10.0
0.17 lbs/sq ft FLS	0.0
0.20 lbs/sq ft FLS	0.0
0.25 lbs/sq ft FLS	1.0
0.30 lbs/sq ft FLS	0.0

PULL-OFF TEST RESULTS



D5 EXPERIMENTAL FEATURE

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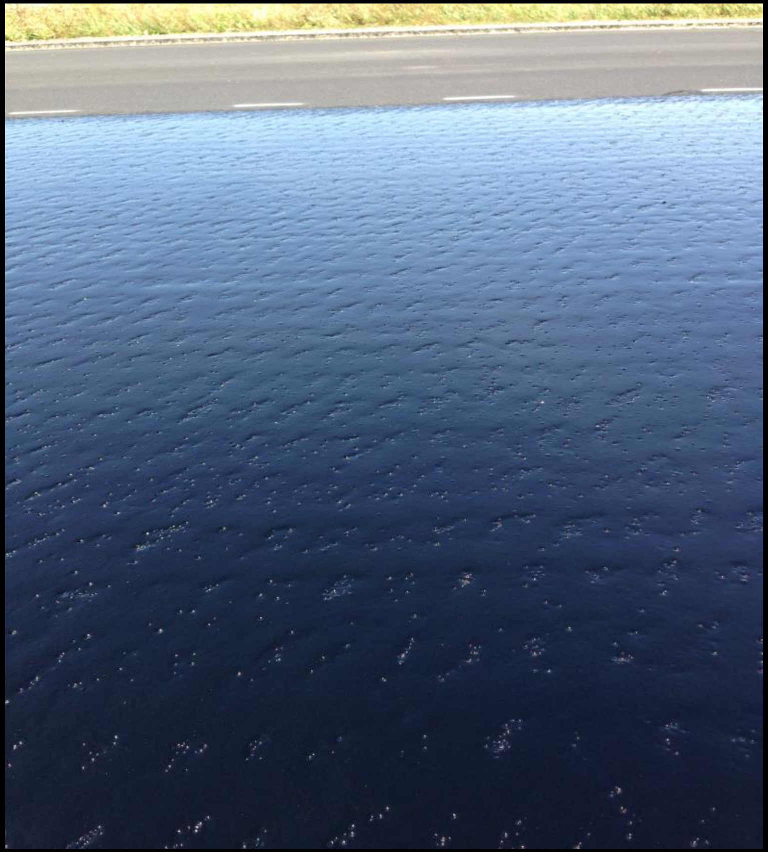

D5 EXPERIMENTAL FEATURE

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IN PLACE AIR VOIDS

Section	Air Voids (%)
SS-1h	8.1
0.12	7.4
0.15	9.1
0.18	7.8
0.27	8.3
0.31	7.2

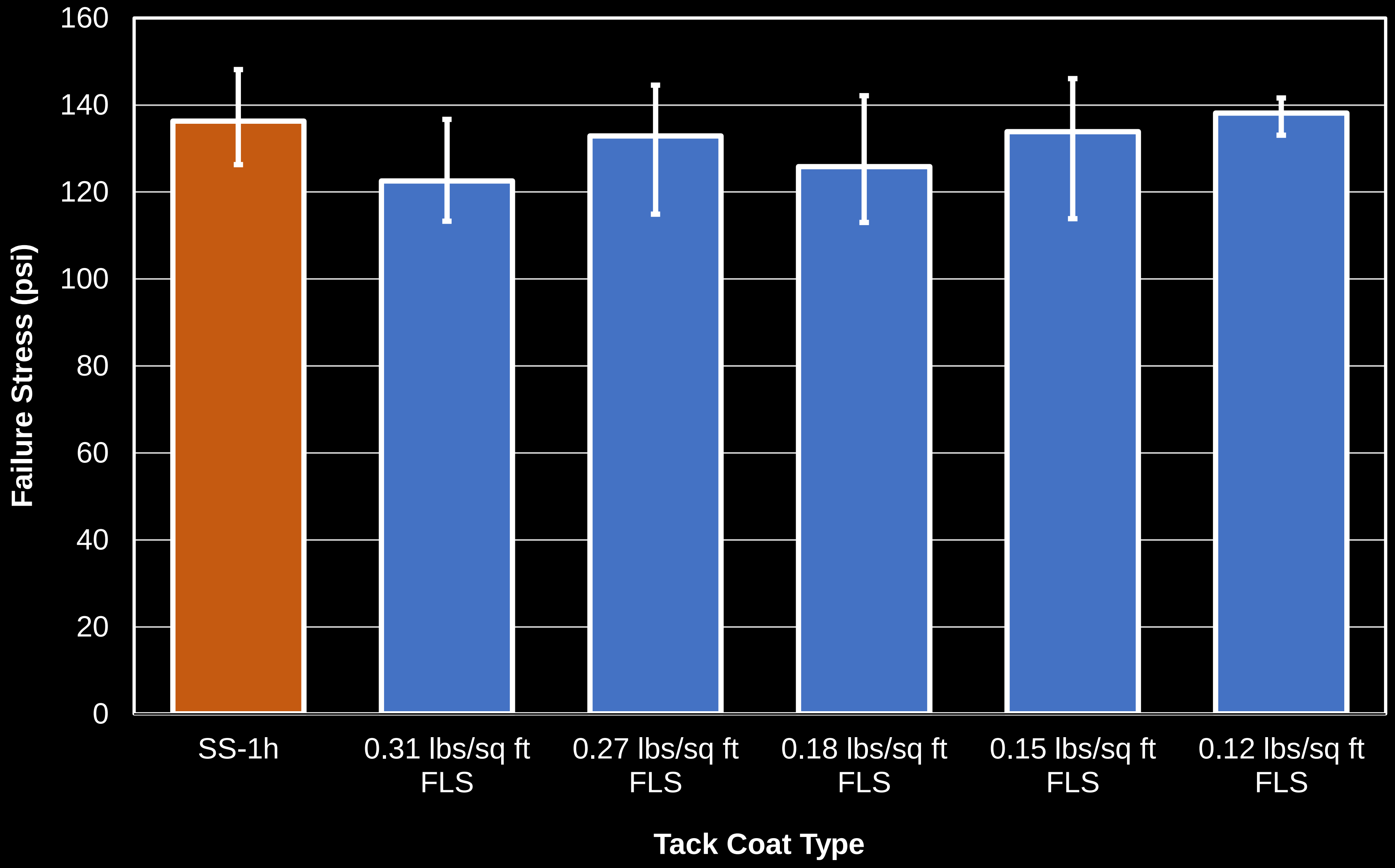
I-FIT DATA RESULTS

Section (lbs/ft^2)	Corrected FI	Avg Corrected FI
SS-1h	47.8	45.7
	43.6	
0.12	71.7	64.3
	56.8	
0.15	85.3	67.1
	48.9	
0.18	80.5	73.6
	66.6	
0.27	107.4	99.2
	91.0	
0.31	141.9	111.6
	81.4	

LAB PERMEAMETER RESULTS

Section	Air Voids (%)	Permeability (cm/sec x 10^{-5})
SS-1h	6.7	9.0
0.12 lbs/sq ft FLS	7.7	0.0
0.15 lbs/sq ft FLS	6.4	0.0
0.18 lbs/sq ft FLS	7.9	0.0
0.27 lbs/sq ft FLS	6.8	0.0
0.31 lbs/sq ft FLS	7.6	0.0

PULL-OFF TEST RESULTS



EXPERIMENTAL FEATURE

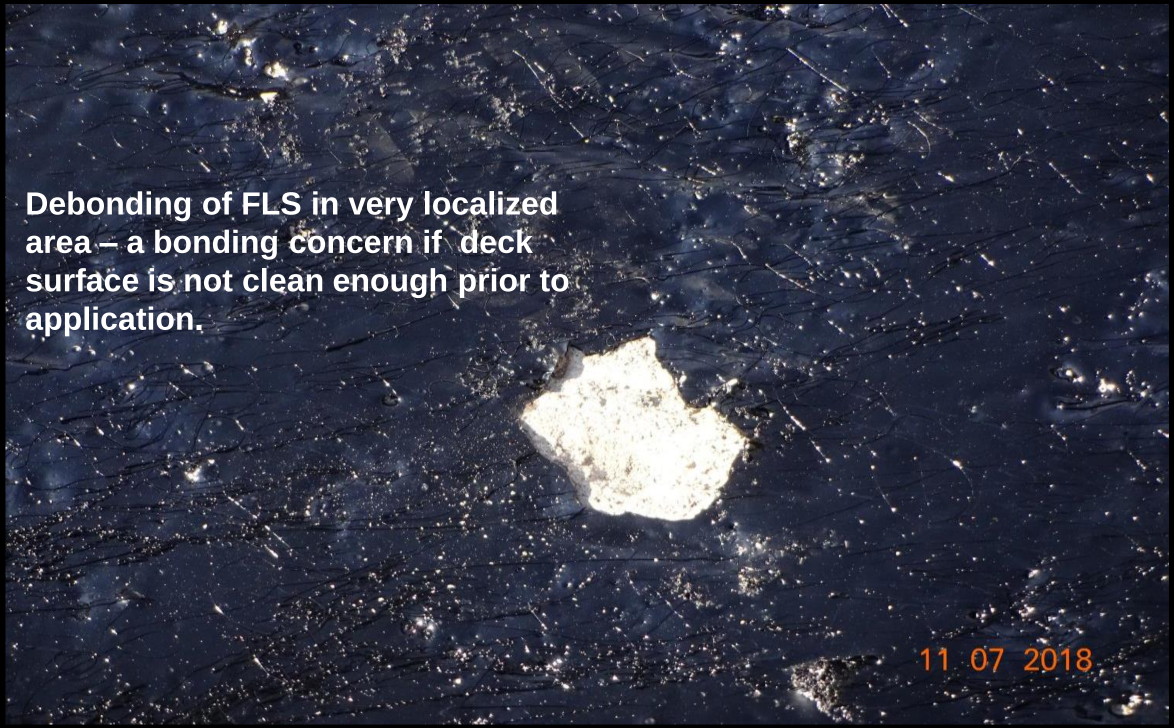
- FLS Waterproofing System
  - Alternate to Waterproofing Membrane System (581)
  - District 8, US 40, Madison County, Structure 060-0230

EXPERIMENTAL FEATURE

- FLS Waterproofing System
  - Traditional Tack Coat (0.05 lb./sq. ft)
  - 0.25 lb./sq. ft FLS
  - 0.75” Lift of IL 4.75 HMA
  - 0.15 lb./sq. ft FLS
  - 1.5” Lift of IL 9.5 FG Surface Course

EXPERIMENTAL FEATURE

The cleanliness of the deck surface is vital for success, especially if traditional tack coat is not used.



EXPERIMENTAL FEATURE

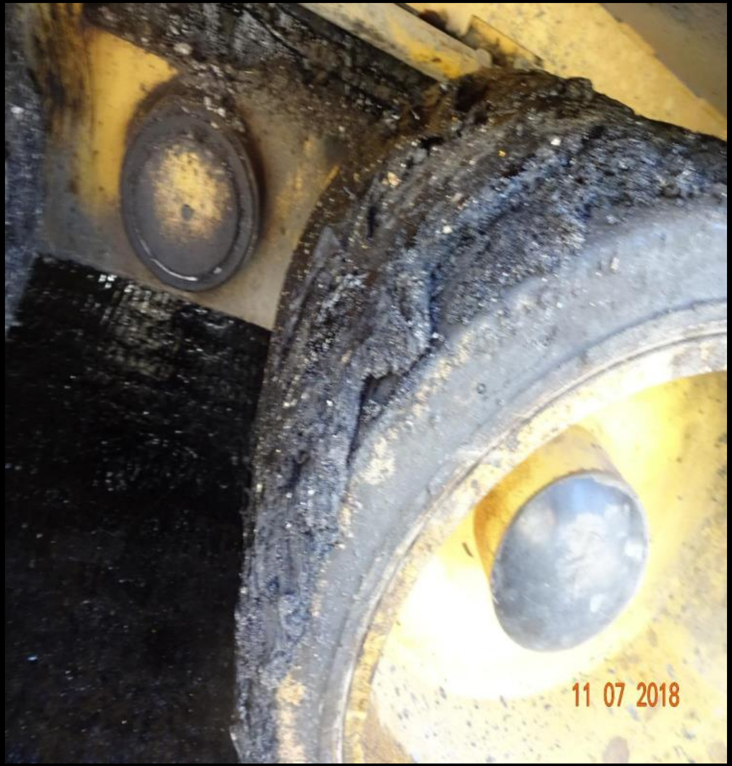
Turning movements on the FLS application should be minimized

EXPERIMENTAL FEATURE

Initial placement of 4.75 mm HMA

EXPERIMENTAL FEATURE

Water should be supplied to paving wheels to prevent FLS pickup



EXPERIMENTAL FEATURE

Second application of FLS to 4.75

Application of 9.5 FG surface course. Paver without auger extensions.

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Second application of FLS to 4.75

Application of 9.5 FG surface course. Paver without auger extensions.

EXPERIMENTAL FEATURE

- Lessons learned
  - Traditional tack coat (emulsion) should be used
  - No moisture on the bridge deck and the cleanliness of the surface are important to success
  - Temperature of mixes and deck should be monitored and maintained
  - Tracking of FLS on paver wheels can be mitigated with water
  - Minimize turning movements on FLS
  - Touch up of missed or light areas should be addressed
  - Extension of FLS onto parapets to seal edges may be added

QUESTIONS?