IDOT Technical Update

Illinois Asphalt Pavement Association
82nd Annual Meeting

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Transportation Asset Management
Pavement Working Group

Illinois Department of Transportation

Pavement Improvement Selection

- **Four Categories:**
  - **Reconstruction**
  - **Rehabilitation**
  - **Preservation**
  - **Contract Maintenance**

Interstate TAMP Category Selection Criteria - Pavements

Category	Subcategory	Treatments	Service Life	CRS
Reconstruction [1]		Replacement of entire cross-section, Unbonded Concrete Overlay, HMA Overlay of Rubblized PCC	30-40	< 4.0
Rehabilitation	Major	Structural HMA Overlay, Structural PCC Overlay (Requires a Design Exception) [4]	10 - 15	4.0 - 4.5
	Minor	Standard HMA Overlay, Bonded PCC Overlay on Asphalt, Structural Cold In-Place Recycling (Requires a Design Exception) [4]	10 - 15	4.6 - 5.4
Preservation	High	SMART Overlay, Longitudinal Joint Partial-Depth Repair, Ultra-Thin Bonded Wearing Course, Load Transfer Restoration (Transverse Cracking) [4], Cross-Stitching (Longitudinal Cracking) [4],	7 - 12	5.5 - 6.5
	Low	Micro-Surfacing	3 - 7	6.6 - 7.5
	Proactive Maintenance	Crack and Joint Filling / Sealing, Fog Seal [4], Cold/Micro-Milling, Diamond Grinding / Grooving	2 - 5	> 6.0
Contract Maintenance	Reactive Measures	Low Preservation as a Stop-Gap [2]	Varies	< 5.5 [3]

Notes:

(1) Interstates with ADT < 15,000 will receive a Major Rehabilitation Treatment in lieu of Reconstruction.

(2) High Preservation activities of Full-depth Repairs and Longitudinal Joint Partial-Depth Repair are allowed as Reactive Measures. HMA Surface Mill and Replacement will be approved on a case by case basis.

(3) For localized failures, any CRS value may be considered (patching, centerline failures, intermittent locations of surface repairs).

(4) Treatment will require an experimental feature according to Construction Memo 02-2.

Standard HMA Overlay

- Two Lifts
  - Single lift may be approved as an exception
- Thickness Ranges
  - Interstate: 3.00 – 4.25 inches (previously 3.75)
  - Non-Interstate: 2.00 – 2.75 inches (previously 2.25)

Mixture Options

Mixture	Lift Thickness (in.)
IL-19.0 (Interstate binder only)	2.25
IL-9.5	1.50
IL-9.5FG	1.25
IL-4.75* (binder only)	0.75 – 1.00
SMA 12.5	2.00
SMA 9.5**	1.75

*Increase to 1 inch when used over bare PCC.

**District 1 is using this mix successfully and need to add to the specifications as an option.

The milling depth should remove the entire existing surface lift, unless it is rated fair or better.

If there are constraints such as curb and gutter or other profile limits, core to better define milling depth and required HMA lift thickness.

Avoid milling within 0.50 inches of a lift line whenever possible to eliminate scabbing.

Illinois Flexibility Index Test Updates

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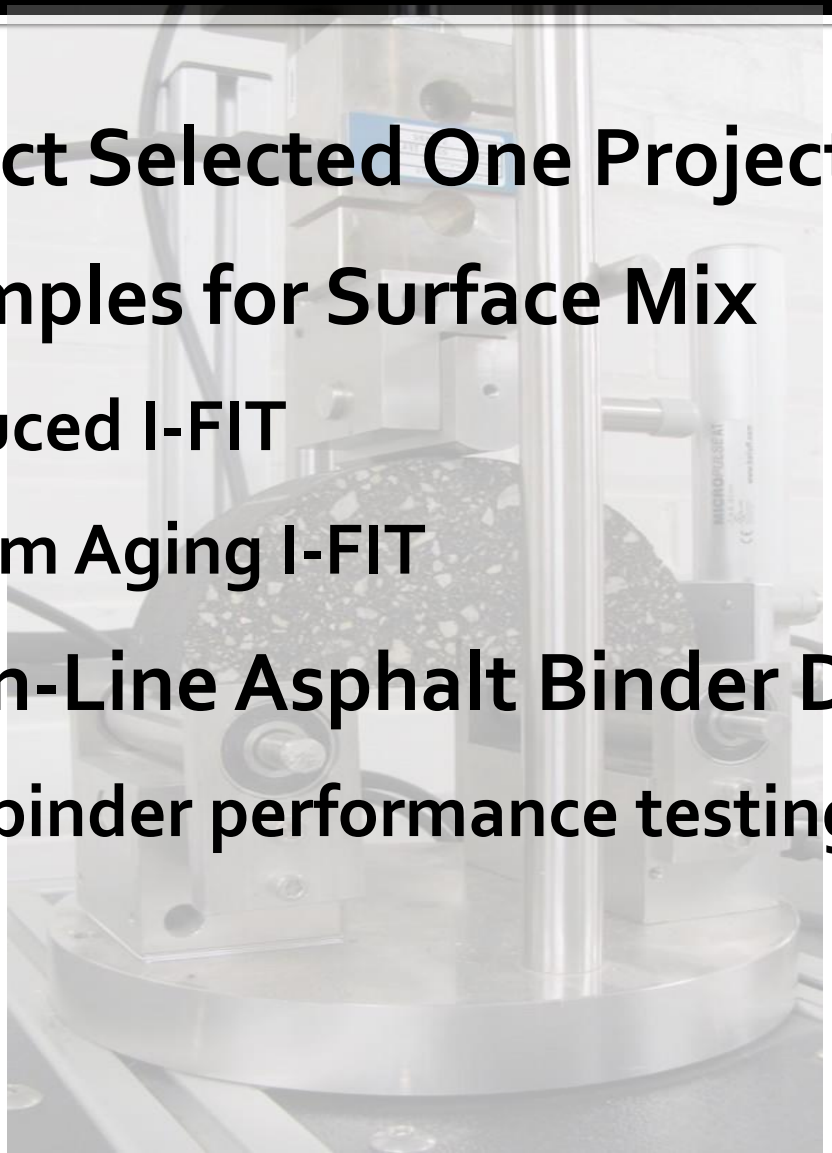
I-FIT Long Term Aging (LTA) Protocol

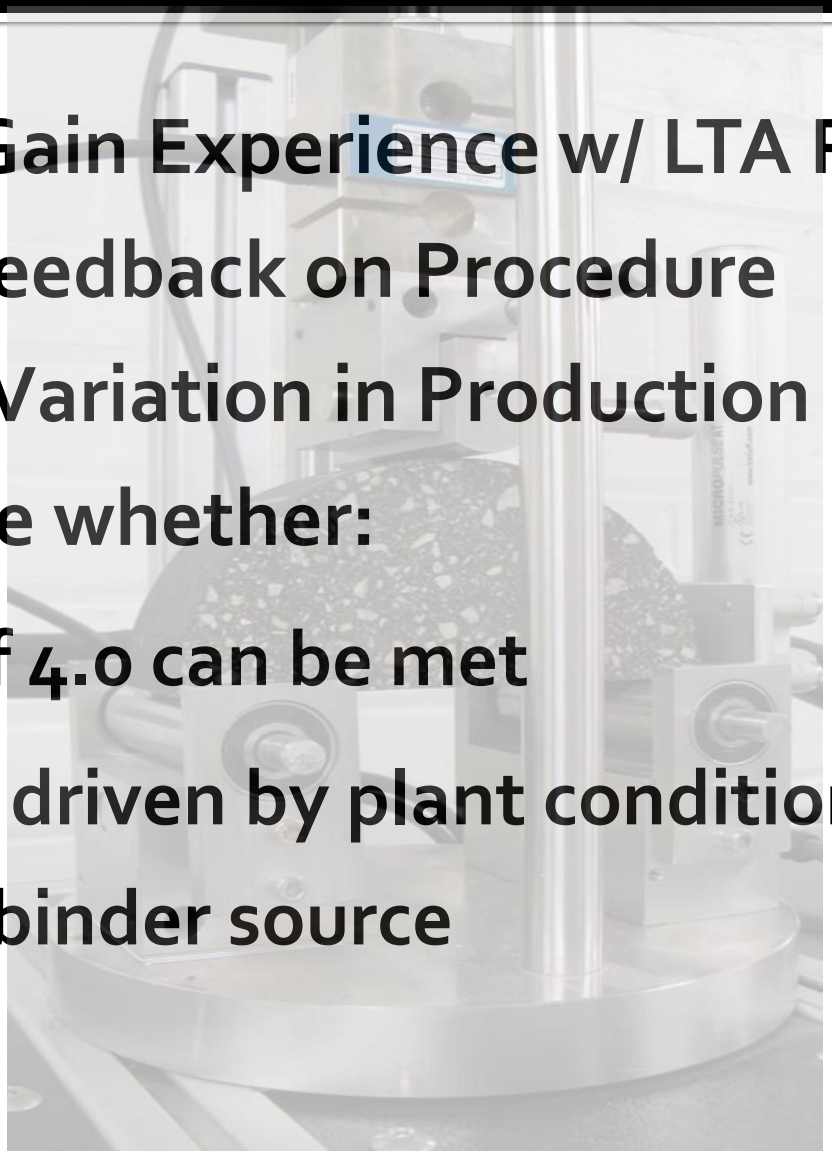
- Developed through ICT Research Project
- Surface Mixes
- Specimens Aged for 3 Days at 95 C
- Simulates ≈ 8± Years of Field Performance
- Screening Tool for Asphalt Modifiers
- Added to Manual of Test Procedures (R 30)

2019 I-FIT Shadowing Exercise



- Each District Selected One Project
  - Daily Samples for Surface Mix
    - As Produced I-FIT
    - Long Term Aging I-FIT
  - Sample In-Line Asphalt Binder Daily for CBM
    - Asphalt binder performance testing

2019 I-FIT Shadowing Exercise



- Districts Gain Experience w/ LTA Prior to 2020
- Provide Feedback on Procedure
- Quantify Variation in Production FI
- Determine whether:
  - LTA FI of 4.0 can be met
  - LTA FI is driven by plant conditions or asphalt binder source

Perpetual Mix Designs

- With HW and I-FIT, No Need to Verify Every 3 Yrs
- New Mix Designs Verified by District Labs
- Mix Design G_{sb} Values Updated Annually
- No Expiration Unless Significant Changes
  - Clarification to be sent soon
- MTP Updated

I-FIT Implementation

- 2019: I-FIT on all Interstates (10 projects)
  - Also 18 off-Interstate projects
  - 5% higher ABR with I-FIT
- 2020: I-FIT on all HMA projects
  - Higher FI threshold for SMA
  - Long Term Aging for surface mixes
  - Begin allowing modifiers in asphalt binders

Explore FI Moving Average Concept

- Add Production Testing Frequency?
- Moving Average ≥ 8.0
- Establish Control Limits for Individual
- Prevent Shutdown on Individual < 8.0
- Wait until 2021 to Determine District Testing Capability

AASHTO
Proficiency Sample Program (PSP)

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AASHTO re:source Proficiency Sample Program (PSP)

- **Intent:**
  - Compare individual labs with large pool of results
  - Verify testing apparatus and operator
  - Opportunity to identify and correct problems
  - Allow Illinois to align w/ the rest of the Country
- **AASHTO provides results rating sheet**
  - Good Rating = 3, 4, or 5
  - Low Rating = 2 or less

Disputing Individual Test Results

- PFP Method 2 Dispute Resolution
  - Contractor Lab maintain PSP Rating ≥ 3
  - Individual parameters may be disputed
- All District Labs Participate in PSP
- Central Materials Lab for 22+ Years

PSP Observations

- All private & IDOT labs received good scores on Gyratory Bulk Gravities (G_{mb})
- A few labs on both sides had issues w/ Max Gravities (G_{mm}) that warranted investigation, corrective action & retesting
- Illinois as a whole was light on the Gyratory Bulk Gravities (G_{mb})

Update on ICT Research: Evaluation of Data Trends and Variability in the QCP and PFP Programs

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QCP and PFP Evaluation

- Statistical Analysis of QCP and PFP Data from 2015-2017
- Differences Between Results for G_{mm}, G_{mb}, VMA, and Voids
- Shadowing in Each District: Jobsite, Plant, and Both Labs
- Final Report Expected in December 2019

Paver Segregation Process Review

Paver Segregation – I-72

Paver Segregation – I-55

Google Maps

Paver Segregation Process Review

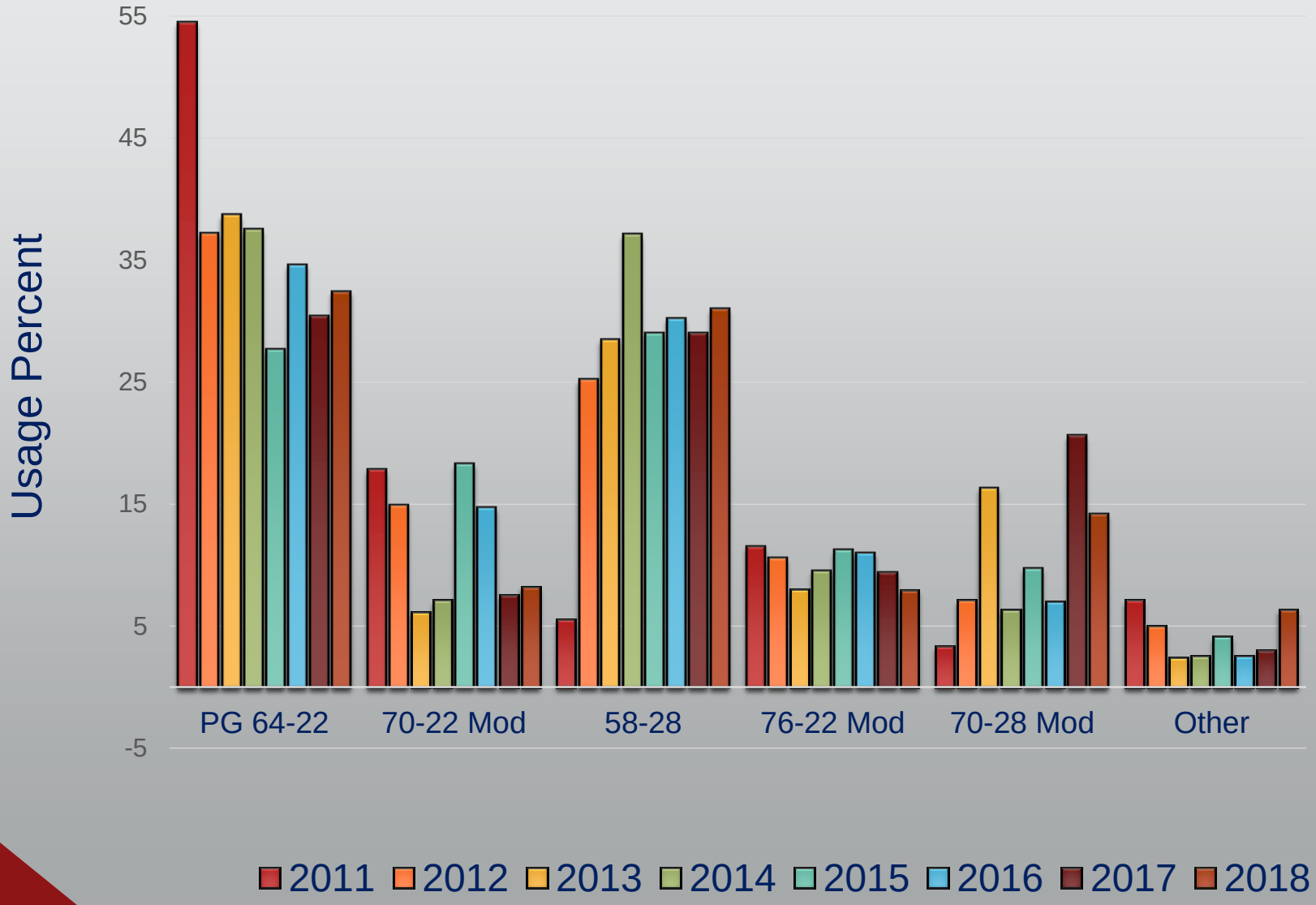
- Districts Provided Locations, Looking for Others
- Core Locations in Each District
  - asphalt content
  - gradation
  - lab permeability
  - I-FIT
- Collect Anti-Segregation Component Literature from Paver Manufacturers

PG 58-28 for Overlays in D1 – D6

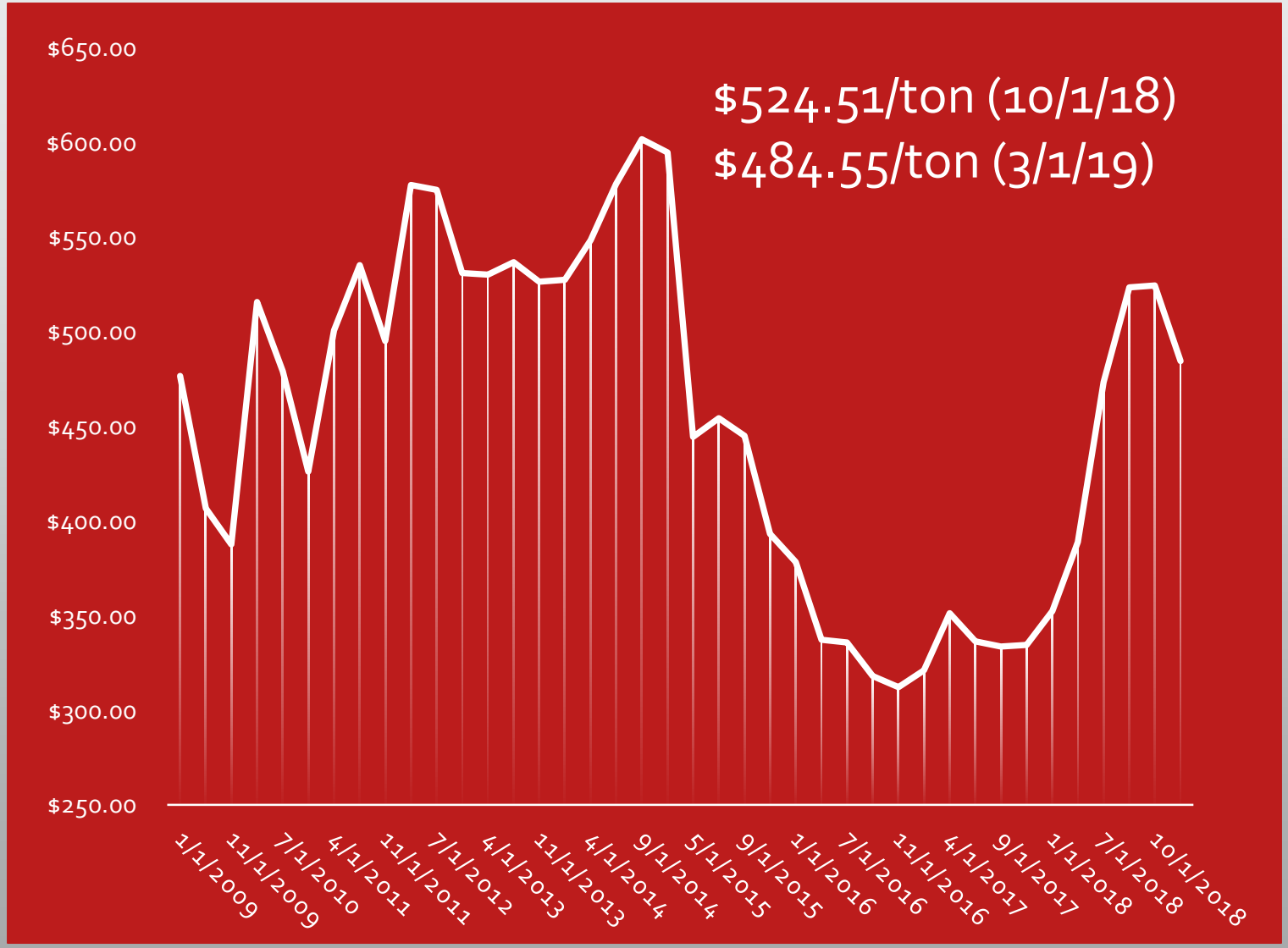
Type of HMA Pavement	Layer	Illinois N_{design} Number	Design ESALs[1] (million)	PG Binder Grade[2][3] Traffic Loading Rate		
				Standard[4]	Slow[5] or High ESALs[5]	Standing[7]
IL-4.75	Surface[8] and Binder	50	≤ 10	SBS PG 70-22	SBS PG 70-22	SBS PG 70-22
			> 10	SBS PG 76-22	SBS PG 76-22	SBS PG 76-22
SMA Overlay of PCC or Composite Pavement	Surface and Binder	50	≤ 10	SBS PG 76-22	SBS PG 76-22	SBS PG 76-22
		80	> 10	SBS PG 76-22	SBS PG 76-22	SBS PG 76-22
SMA for Full-Depth Pavement and Overlays of Full-Depth Pavement	Surface and Binder	50	≤ 10	SBS PG 76-28	SBS PG 76-28	SBS PG 76-28
		80	> 10	SBS PG 76-28	SBS PG 76-28	SBS PG 76-28
Overlay of PCC or Composite Pavement	Surface or Binder	30	≤ 0.3	PG 58-22	PG 64-22	PG 64-22
		50	> 0.3 to 3	PG 64-22	SBS PG 70-22	SBS PG 76-22
		70	> 3 to 10	PG 64-22	SBS PG 70-22	SBS PG 76-22
		90	> 10	SBS PG 70-22	SBS PG 70-22	SBS PG 76-22
Districts 1-6 Full-Depth Pavement and Overlays of Full-Depth Pavement	Surface and Top Binder	All	All Levels	SBS PG 64-28[9]	SBS PG 70-28	SBS PG 76-28
	Lower Binder	All	All Levels	PG 64-22	PG 64-22	PG 64-22
Districts 7-9 Full-Depth Pavement and Overlays of Full-Depth Pavement	Surface and Top Binder	All	All Levels	PG 64-22[9]	SBS PG 70-22	SBS PG 76-22
	Lower Binder	All	All Levels	PG 64-22	PG 64-22	PG 64-22

PG Binder Usage

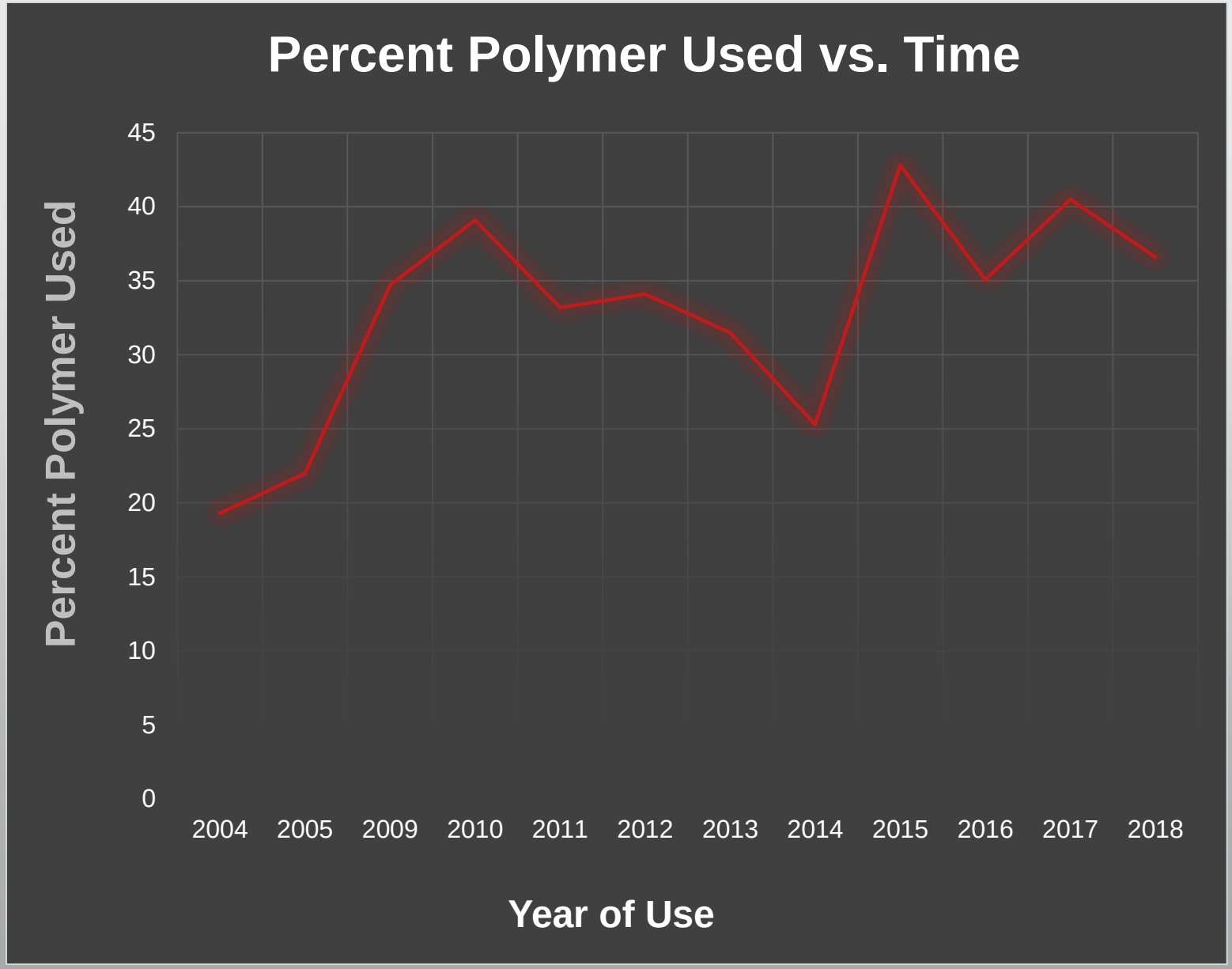
2011 to 2018 Grade Usage



Bituminous Price Index



http://www.idot.illinois.gov/doing-business/procurements/construction-services/construction-bulletins/transportation-bulletin/price-indices


Percent Polymer Used vs. Time
Percent Polymer Used
45
40
35
30
25
20
15
10
5
0
2004
2005
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year of Use

Asphalt Binder Performance Testing

Illinois Center for Transportation

Rheology/Chemical Based Procedure to **Evaluate Additives/Modifiers** used in Asphalt Binders for Performance Enhancements (Phase 2)

Research Objective

Develop advanced screening protocol w/ long-term aging & rheological/chemical characterization methods for modified binders.

- **Effect of modifiers on binder chemistry & performance**
- **Validate & fine-tune preliminary thresholds**

Identify and Collect Modifiers

- Up to 10 Available in Illinois
- Asphalt Binders to be Collected & Tested
  - 64-22’s (Base Binders), 58-28, 52-34, 46-34
- Formulas, Mix Ratios & Blending Requirements Provided by Suppliers

Field Core Selection

- Typical Surface Mixtures, 5-10+ Yrs. Old
- Working w/ Districts & Tollway to Identify Core Locations
- Test Extracted Binder
- Set Baseline for Developing LTA Protocol

Experimental Features

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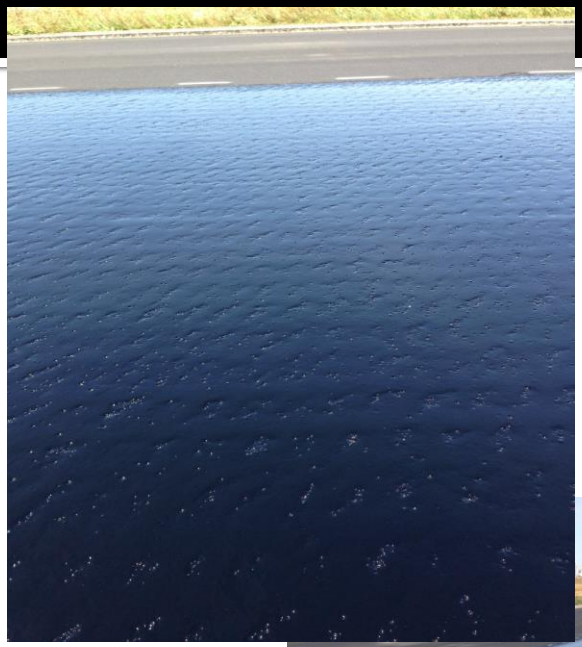
Full Lane Sealant (FLS)

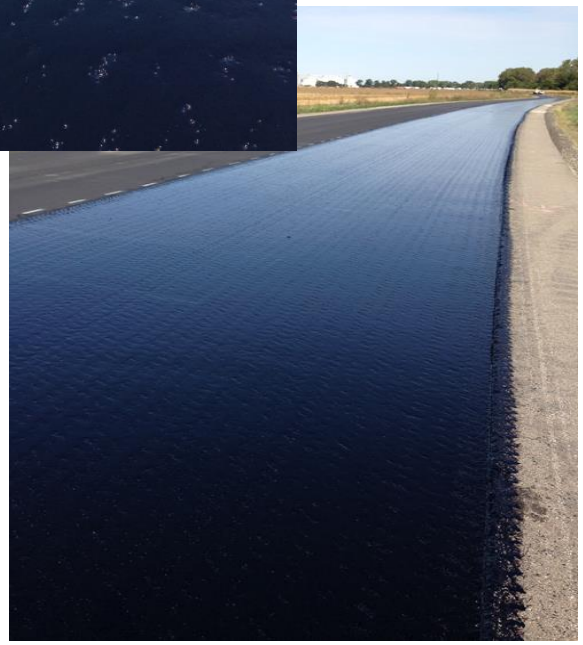
- Pavement Durability Improvements
  - Decreased Permeability
  - Increased Bond, Density, Flexibility
  - Minimize Typical Pavement Distresses
  - Reduced Wait-Time to Pave (≤ 5 minutes)

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

Experimental Feature, Dist. 5





FLS Experimental Features

- Plan of Study – 5 Years
  - Pavement Distress Survey
  - Collect 3 X 6" Full Depth Cores per Section
  - Permeability, Bond Strength, I-FIT, Migration

FLS Waterproofing for Bridge Decks

- Experimental Feature Alternative to 581 Spec
  - 0.05 lb/ft² emulsion
  - 0.25 lb/ft² FLS
  - 0.75 inch IL-4.75 HMA
  - 0.15 lb/ft² FLS
  - 1.5 inch 9.5 SMA (or Fine Graded 9.5)

Questions