

# ILLINOIS TOLLWAY TECHNICAL UPDATE/INNOVATIONS

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# CONSOLIDATED SPECIAL PROVISIONS

## Mixtures and pavement construction

- Binder and surface course mixtures
- Mixture IL 4.75
- Full-depth pavement
- Shoulders
- Stabilized subbase
- Fine aggregate for asphalt mixtures
- Stone matrix warm-mix asphalt

## Reclaimed asphalt materials

- Reclaimed asphalt shingles (RAS)
- Reclaimed asphalt pavement (RAP)

## Illinois Tollway Manual of Test Procedures





# PERFORMANCE TESTING SPECIFICATIONS



## Updated DCT and Hamburg requirements

- Thresholds calibrated to field conditions and stress analysis, aging and variability
- Move to softer mixtures to prevent cracking
- Required in design and first day of production after an approved test strip

**“Development of Performance-Related Asphalt Mix Design Specification for the Illinois Tollway” available on Tollway website**

# DCT REQUIREMENTS

Mixture Type	Minimum Fracture Energy
SMA – Friction Surface	775 J/m <sup>2</sup>
SMA – Surface	700 J/m <sup>2</sup>
SMA – Binder	650 J/m <sup>2</sup>
Unmodified SMA	500 J/m <sup>2</sup>
IL 4.75	450 J/m <sup>2</sup>
<b>Mainline Binder Course N<sub>design</sub> &gt; N50</b>	425 J/m <sup>2</sup>
<b>Mainline Binder Course N<sub>design</sub> = N50</b>	450 J/m <sup>2</sup>
<b>Surface Course N<sub>design</sub> ≤ N70</b>	450 J/m <sup>2</sup>
<b>Shoulder Binder Course</b>	425 J/m <sup>2</sup>
Asphalt Stabilized Base	N/A



# HAMBURG REQUIREMENTS

Mixture Type	Maximum Rut Depth	Maximum Rut Depth Recorded at # Wheel Passes	Minimum # of Wheel Passes at <b>Stripping Inflection Point</b> <sup>1</sup>
SMA <sup>2/</sup>	6 mm	20,000	15,000
Unmodified SMA	9 mm	15,000	10,000
IL-4.75	12.5 mm	15,000	10,000
Mainline Binder Course N <sub>design</sub> > N50	12.5 mm	15,000	10,000
Mainline Binder Course N <sub>design</sub> = N50	12.5 mm	10,000	7,500
Surface Course N <sub>design</sub> ≤ N70	12.5 mm	10,000	7,500
Shoulder Binder Course	12.5 mm	7,500	5,000
Asphalt Stabilized Subbase	12.5 mm	7,500	5,000



# SMA COARSE AGGREGATE

Requirements for SMA coarse aggregate to get you started in the right direction on mix design and performance testing results

Quality Test	Test Method & Procedure	Coarse Aggregate Material		
		Crushed Gravel	Dolomite	Category I FRAP for SMA
Coarse Aggregate Angularity	ITP 5821	>98% two fractured faces		
Flat & Elongated	ITP 4791	≤ 10% (5:1)	≤ 10% (5:1)	
LA Abrasion	ITP 96	≤ 28.0%	≤ 28.0%	
Micro-Deval <sup>1/</sup>	ASTM D6928 or AASHTO T327	≤ 11.0%	≤ 11.0%	<9.0%

1/ All Micro-Deval testing must be performed by a laboratory with AASHTO Re: Source aggregate accreditation. The Engineer reserves the right to verify Micro-Deval testing."

# NEW FOR 2021: REJUVENATORS

**Allowed only on shoulders**

**Approved product list (includes trial Process) on Tollway website**

- Ingevity Evoflex CA-7
- Sripath ReLIXER

**Soften asphalt mixtures and improve performance**

**Mix design**

- Determine dosage that results in softening virgin binder one AASHTO M320 performance grade





# UNMODIFIED SMA

## Expanding use on Central Tri-State Tollway (I-294) Project

Less-stringent requirements than mainline SMA, but higher quality mix than N70 surface

- Neat asphalt (or)
- Neat asphalt plus rejuvenator
- Crushed gravel and dolomite
- Cat 2 FRAP (vs Cat 1)
- DCT and Hamburg – lower requirements





# FULL LANE SEALANT AND WMA OVERLAY

## Mile Long Bridge – before and after



# FULL LANE SEALANT AND WMA OVERLAY

## Challenges

- Overlay weight limit of 25 lbs./sq. ft.
- Maintain two lanes of traffic
- Complete overlay in one weekend

## Solutions

- Longitudinal joint sealant applied to seal deck from water infiltration
- Paved with 9.5mm SMA over the top





# LESSONS LEARNED

**Full lane sealant doesn't adhere as well to PCC as it does to WMA**

**Future overlays will require a WMA IL-4.75 mixture placed over the deck before the FLS is applied**

**Material placement sequence for future overlays**

- NTEA
- WMA IL-4.75 Asphalt Mixture
- FLSM
- FM02 Sand
- IL-9.5 or IL-12.5 SMA Friction Surface





# QC ADDENDUM

## Tollway Form A-81

- Forms for specific WMA items and includes additives
- Industry review complete
- Forms are electronically fillable
- Currently optional, will be required

### Illinois Tollway Quality Control (QC) Addendum for Warm Mix Asphalt (WMA) Production

A-81

WMA Quality Control Plan	
Contract Number	
Project / Route	
Mile Post	
Submittal Date	
Prime Contractor	
WMA Producer	
Contractor Performing Placement	

This Quality Control Addendum provides contract specific information to supplement the Producer's HMA Annual QC Plan. If multiple WMA producers (companies) will be utilized for specific items of the work on a single contract, a separate QC Addendum shall be submitted for each company.

#### Endorsement

This plan must be approved by the Prime Contractor's Quality Representative and the WMA QC Manager to comply with the plans, specifications, and special provisions for production of WMA during construction activities.

#### Contractor's Quality Representative (QR)

Print Name	Title	Company	Phone	Email

Signature	Date

# E-TICKETING

## E-Ticketing Pilot Project

- Industry best practice – replace traditional paperwork
- Special provision to detail requirements
- Required training for contractors and Tollway staff
- Focus on big ticket items including WMA and PCC

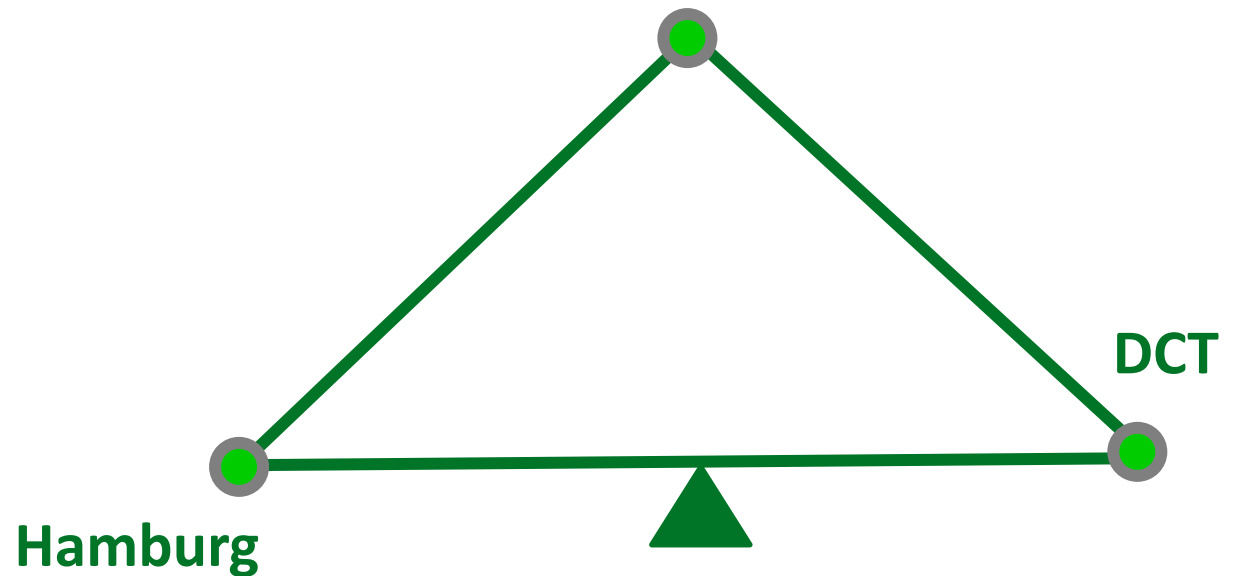


# PERFORMANCE-BASED BALANCED MIX DESIGN

Where we are going....  
you won't need  
volumetrics!



## Recovered PG Binder Testing





# RECOVERED PERFORMANCE GRADING (PG)

**With many contractor options, need to analyze the final product**

**Three years of data collected**

## **Mixture testing**

- Current low grade of -22
- -28 low grade being considered to meet 98 percent reliability at surface

## **FRAP and RAS testing**

- ABR from RAS will stiffen a mix more than the same amount of ABR from FRAP
- Mixes without RAS show the best  $\Delta T_c$ , a value used for cracking potential



# RECOVERED PERFORMANCE GRADING (PG)

To continue moving towards performance-based mix design, a trial is needed

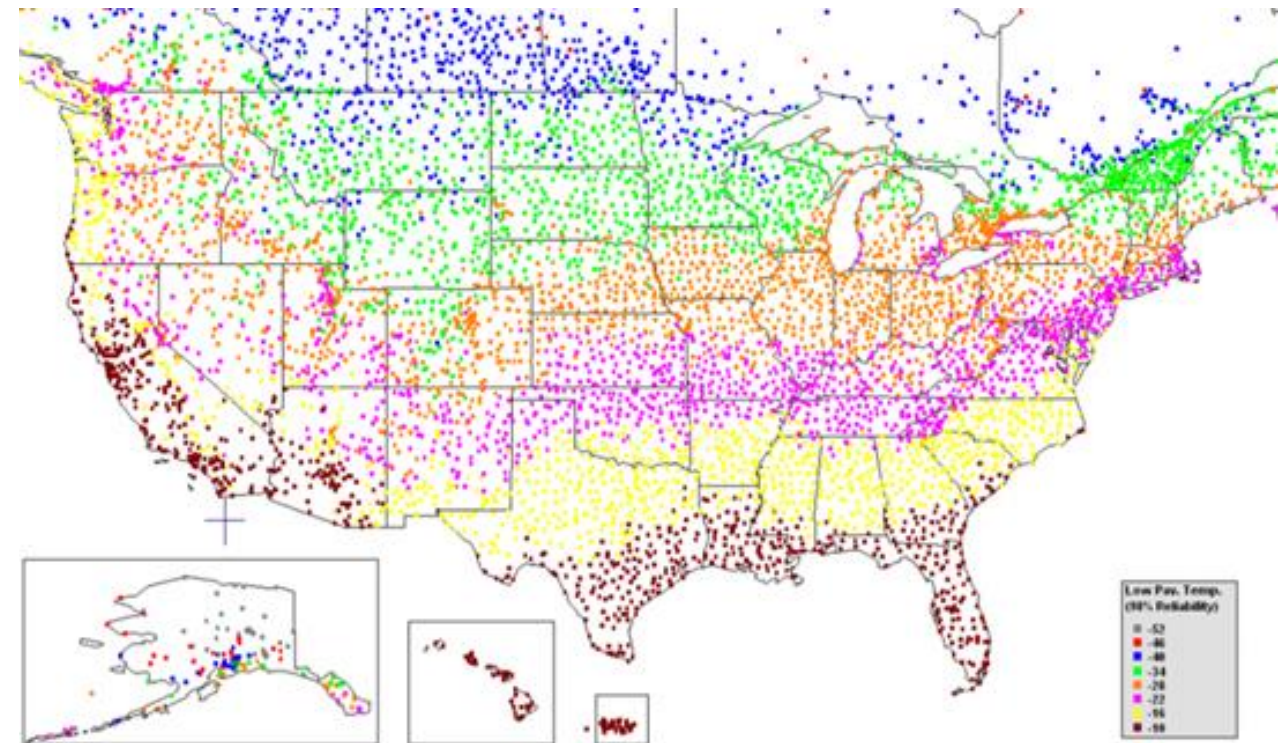
## Goal

- More freedom in mix design, BUT mix must meet performance tests (DCT, Hamburg, Recovered PG)

## Trial parameters

- ABR limits removed
- Asphalt binder – Free to use any approved product
- Air void design target allowed a +/-0.5 percent range

Contact the Tollway to participate



98% Reliability Map of Low PG (LTPPBind)

# FOURIER TRANSFORM INFRARED (FTIR) SPECTROSCOPY

Reveals chemical composition of  
solids, liquids and gasses

Possible application in identifying  
asphalt binders, additives and  
contaminants

Capable of building libraries of  
chemical fingerprints







THANK YOU