



Illinois Tollway's Success With Modified Asphalt

February 8, 2018

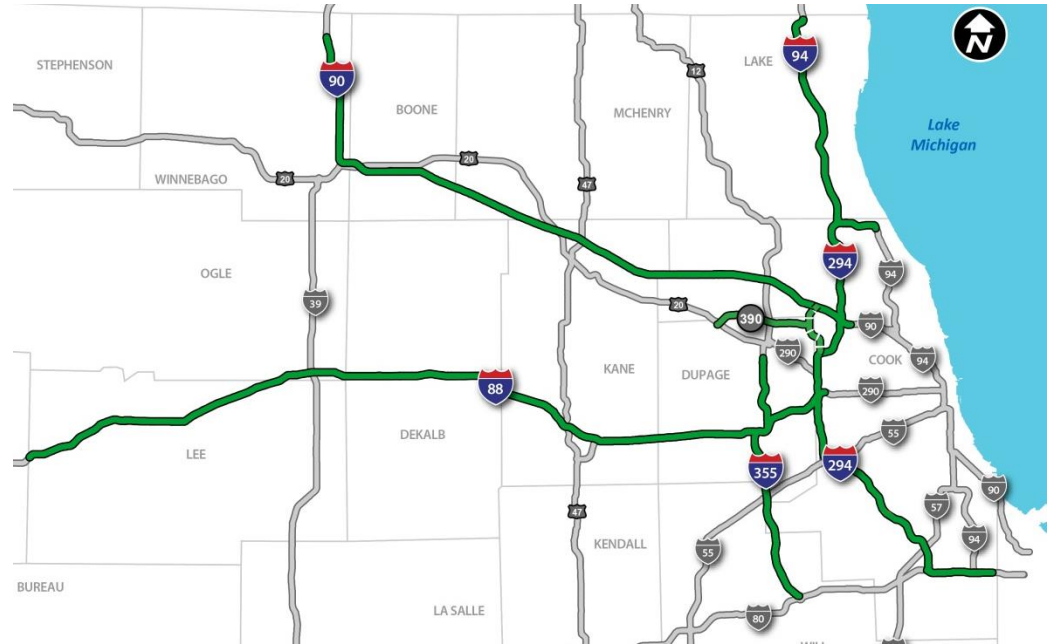
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About The Illinois Tollway

- **294-mile system comprised of five tollways**
- **Carries more than 1.6 million vehicles per day**
- **User-fee system**
 - Only customers who use the Tollway pay for the Tollway
 - No state or federal tax dollars used for maintenance and operations





Illinois Tollway – Recent History

Pre-2005 – Maintaining system

- Original concrete pavement
- Periodic asphalt overlays

2005 – *Congestion-Relief Program* - \$6.2 Billion

- Open road tolling
- Rebuilding and widening of 80+ center-line miles of interstate
- Opportunities for sustainability

2012 – *Move Illinois* - \$14 Billion

Roadbed Recycling

Base Aggregate



Base Aggregate and Mixes



Asphalt Mix Sustainability → Innovation



FRAP



WMA

GTR



RAS

How Innovations Were Implemented

Collaborative effort

- Management, contractors, suppliers, labs, industry, agencies, academia

Field production tests

Research results – no changes without proven performance



Jane Addams Memorial Tollway (I-90)

Reconstruct & Widen Project

2007 – FRAP test mixtures on widening and crossovers

2008 – Eastbound reconstruction

2009 – Westbound reconstruction

Contractor willingness to participate – vital



GTR Modified Asphalt



GTR evaluation

- Seneca Petroleum – local source
- Local agency study and coordination
- PG grade equivalent to SBS modification
- No fibers needed for SMA

More RAP With FRAP



I-90 field production – total industry effort

- SMA, dense-graded binder and surface mixes
- FRAP study – three PG binders, three levels of FRAP

Conclusion

- FRAP – Good source of sand RAP for SMA
- Softer PG, high FRAP = good performance

Brash With RAS – 2009



- **RAS experiment with Iowa State University**
 - Part of pooled-fund study
 - Test strips – construction – August 2009
 - Partnered with Illinois EPA to develop RAS production protocol – October 2009

Brash With RAS – 2009

- Numerous dense-graded test sections
- SMA test section
 - SBS PG 76-22
 - 5 percent RAS and 15 percent fine FRAP (36 percent ABR)
 - Goal: can shingles replace fibers in SMA using SBS polymers? (Yes!)



Tollway Asphalt Binder Replacement

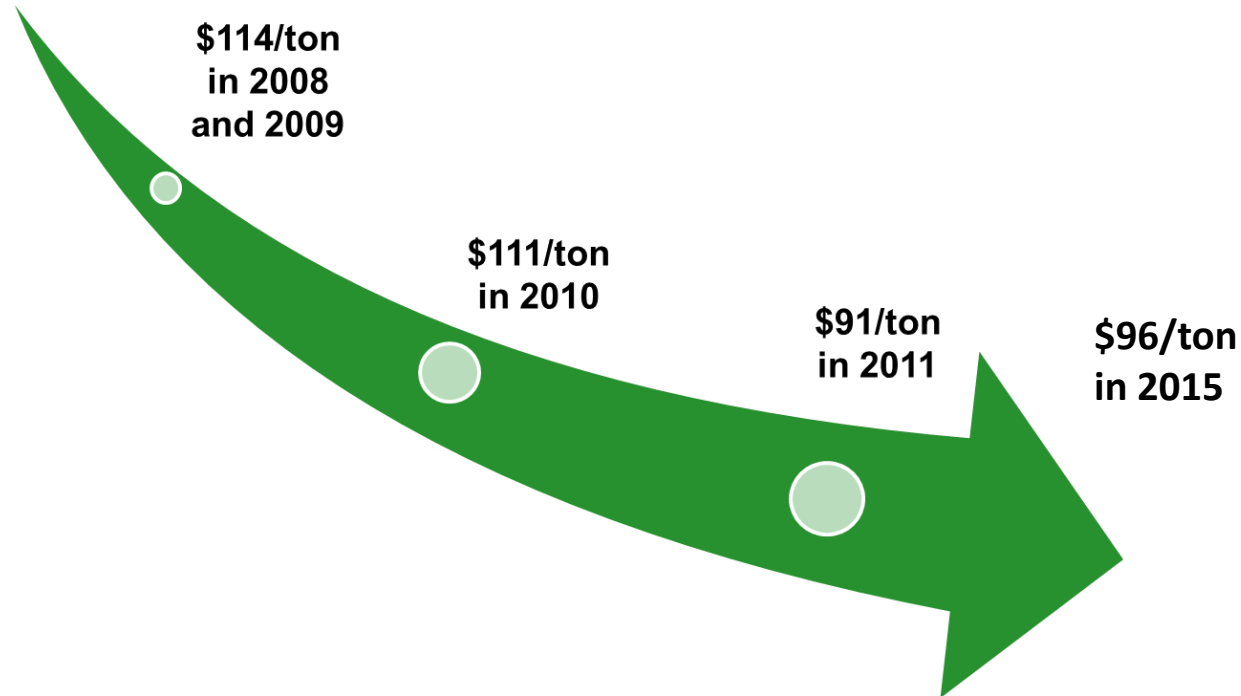


- **Finalized in 2012**

- SMA – 40 percent
- Shoulder Surface – 40 percent
- Shoulder Binder – 50 percent
- Asphalt Subbase – 65 percent

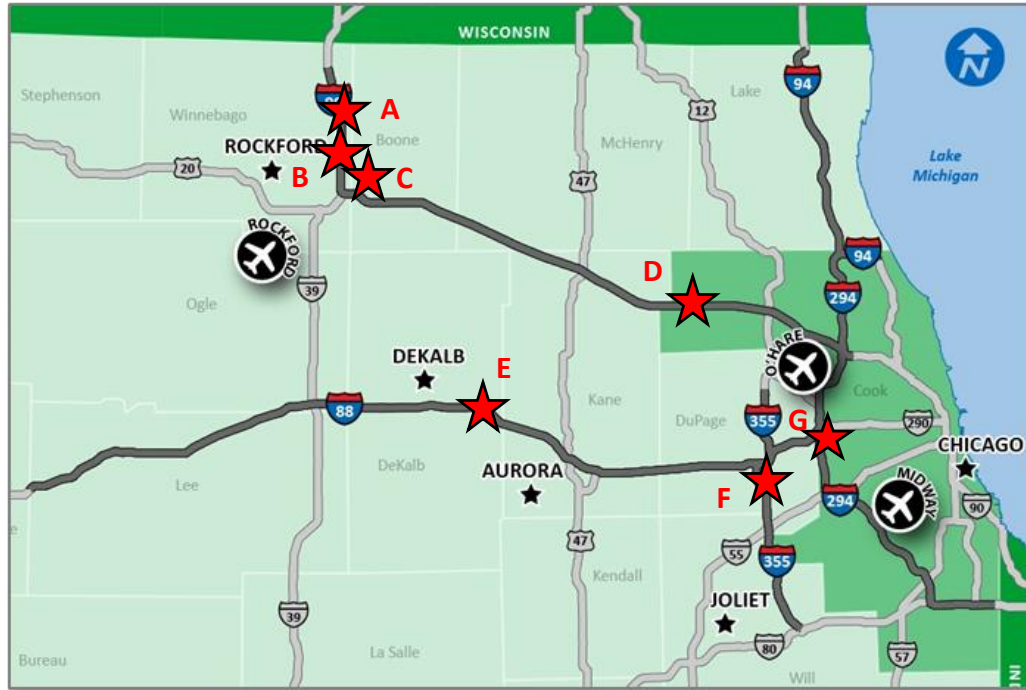
All mixes require WMA

Decreased Cost Of SMA Surface Mixes



SMA Mixture Evaluation

Seven Tollway
SMA Surface
Course Mixes
Placed 2008 –
2012
Sampled 2015



SMA Surface Mix Evaluation

Mix Location	Year Placed	AC Grade	ABR %	Surface Thickness	Coarse Agg. Type
A. I-90 WB	2009	PG 76-22 GTR	14	2"	Cr. Gravel
B. I-90 EB	2008	PG 76-22 GTR	16	2"	Diabase
C. I-90 EB	2009	PG 76-22 SBS	36*	2"	Quartzite
D. I-90 WB	2011	PG 70-28 SBS	33*	1.75"	Quartzite
E. I-88 EB	2012	PG 70-28 SBS	37*	1.5"	Cr. Gravel
F. I-355 NB	2009	PG 76-22 GTR	0	1.75"	Steel Slag
G. I-294 NB	2012	PG 70-28 SBS	31*	2"	Quartzite

* With RAS

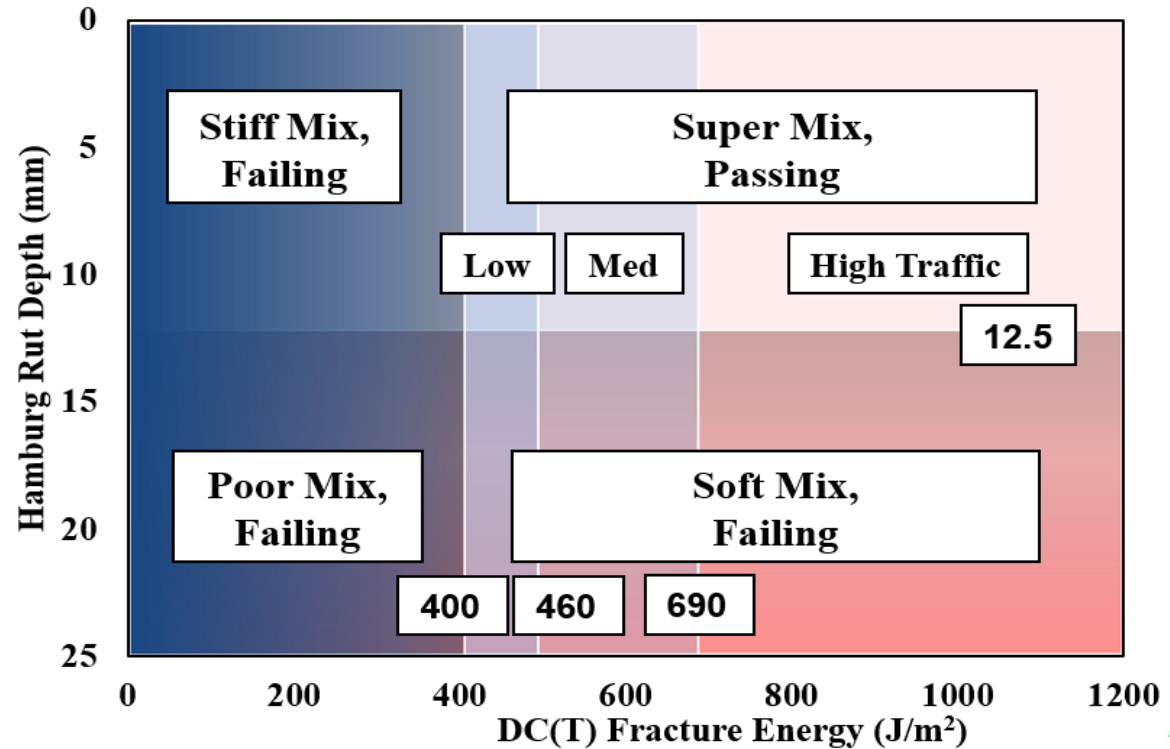
2015 Condition Rating (CRS) And Remaining Service Life (RSL)

Mix Location	Year Placed	ABR %	CRS for Contract Section	CRS at Core Location	RSL (Years)
A. I-90 WB	2009	14	8.0	8.1	15
B. I-90 EB	2008	16	7.9	7.8	12
C. I-90 EB	2009	36*	8.1	7.7	11
D. I-90 WB	2011	33*	N.A.	7.2(2014)	N.A.
E. I-88 EB	2012	37*	7.8	7.5	7
F. I-355 NB	2009	0	7.3	7.1	10
G. I-294 NB	2012	31*	6.9	6.5	5

* With RAS

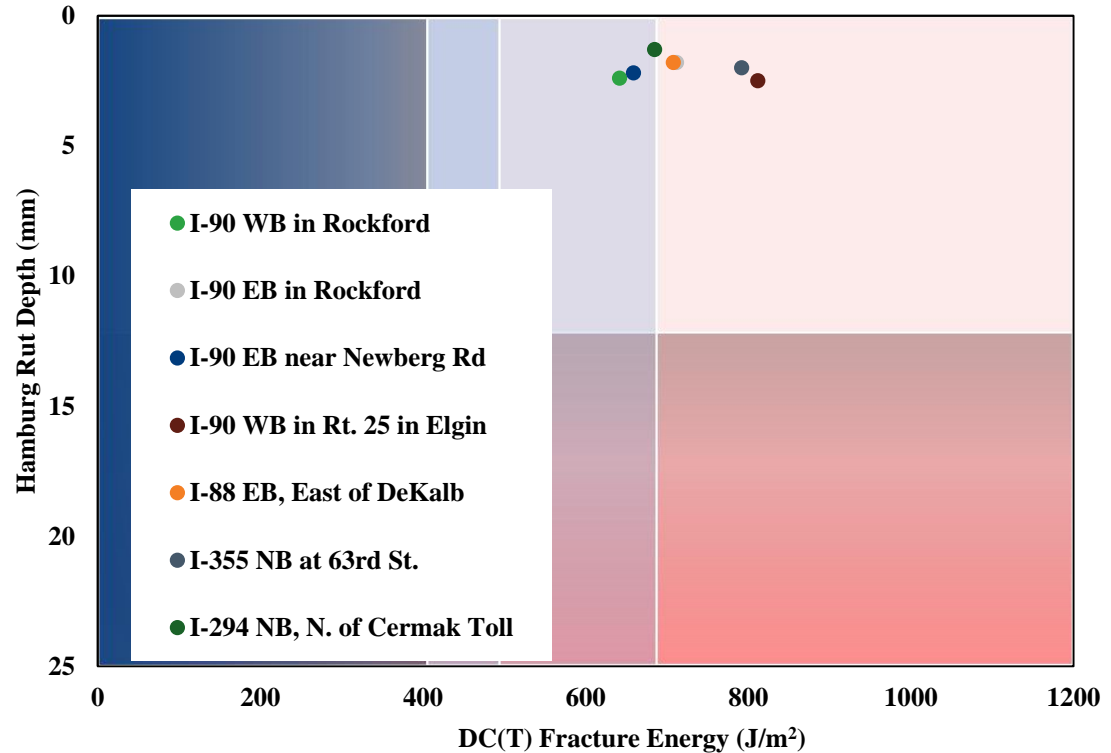
Performance-Space Diagram

Hamburg rut
depth
plotted with
DC(T) fracture
energy - thermal
cracking



Performance-Space Diagram

Tollway SMA
mixes



GTR Asphalt Modifier Evaluation

Goals:

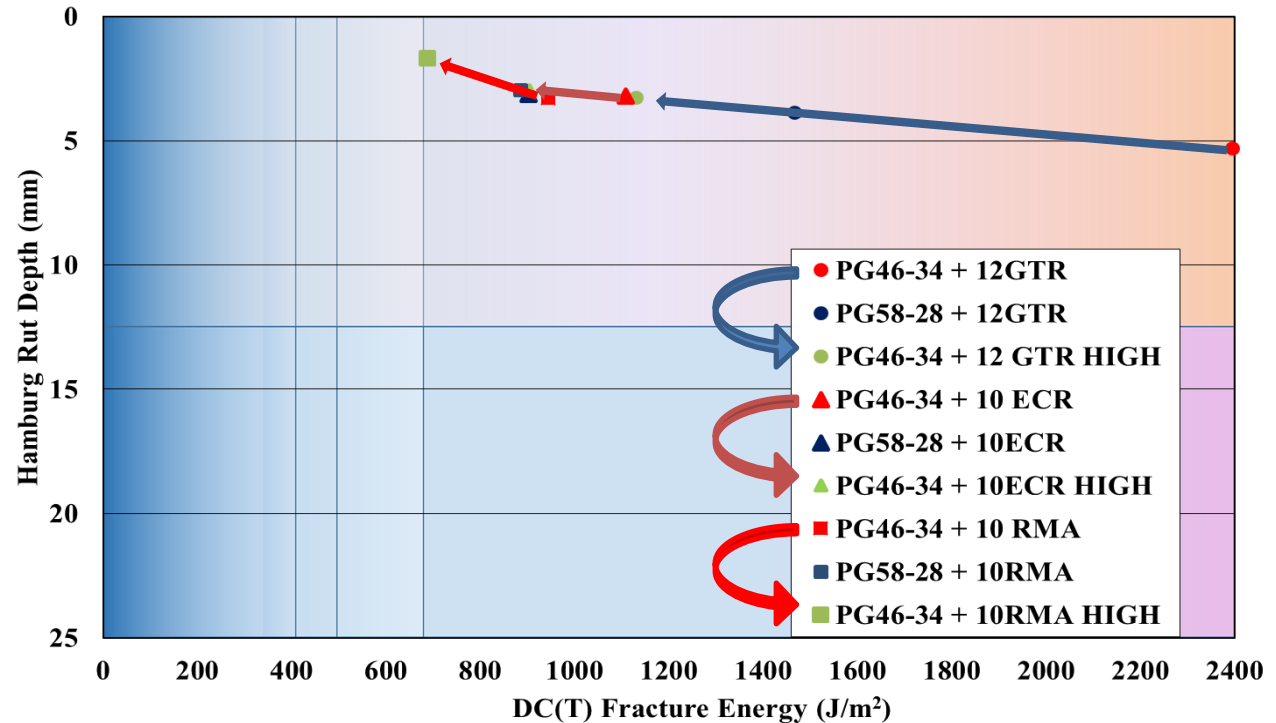
- Compare three GTR technologies on performance characteristics
- Review the effect of high recycled asphalt using a softer PG binder

SMA Mixture Matrix for I-88

Product	Base	Softer AC	Softer Binder AC & increase ABR*
Seneca GTR	PG58-28	PG46-34	PG46-34+12% GTR & increase ABR*
Elastiko 100	PG58-28	PG46-34	PG46-34+10% GTR & increase ABR*
Evoflex RMA	PG58-28	PG46-34	PG46-34+10% GTR & increase ABR*
*ABR increased during design to 47% by increasing RAS%			

Performance-Space Diagram

Tollway SMA
mixes – GTR
modification and
softer PG binder



Why SMA?





THANK YOU

