Tollway Update on Green Initiatives

IAPA Annual Meeting
March 8, 2010
2005-2016 Congestion Relief Program

AWARDS TO DATE (thru December 2009)

$3.78 Billion construction

$729.4 Million engineering

$160.5 Million other (utilities, ROW, misc.)

<table>
<thead>
<tr>
<th>Program Element</th>
<th>Current Obligations</th>
<th>Current Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Road Tolling (ORT)</td>
<td>$705.7</td>
<td>$729.3</td>
</tr>
<tr>
<td>Tri-State Tollway (I-294/I-94/I-80)</td>
<td>$</td>
<td>$2,293.8</td>
</tr>
<tr>
<td>Jane Addams Memorial Tollway (I-90)</td>
<td>$</td>
<td>$772.7</td>
</tr>
<tr>
<td>Reagan Memorial Tollway (I-88)</td>
<td>$</td>
<td>$1,077.8</td>
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<tr>
<td>Veterans Memorial Tollway (I-355)</td>
<td>$</td>
<td>$124.4</td>
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<tr>
<td>Veterans Memorial Tollway (I-355 South Extension)</td>
<td>$720.3</td>
<td>$729.2</td>
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<tr>
<td>Systemwide Improvements (including Program Management Services)</td>
<td>$</td>
<td>$689.1</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>$</td>
<td><strong>$6,386.0</strong></td>
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<tr>
<td>Reimbursements (Local, Municipalities, State)</td>
<td>$</td>
<td>$115.0</td>
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<tr>
<td><strong>Program Total</strong></td>
<td><strong>$6,129.0</strong></td>
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</table>
Jobsite is Tollway’s Materials Research Laboratory
Green and Implemented

IDOT / Tollway
- Recycling Concrete as Aggregate
- Rubblization of Existing Concrete
- RAP Grindings for Capping Stone

Tollway
- Fractionated RAP
- Ground Tire Rubber in SMA
Jane Addams Memorial Tollway
2007-2009

- Contractors’ cooperation vital
- 2007 Advance work
- Research test strips - short life and temp. sections
- 2007-2008: Used ½ million Tons of recycled materials
Jane Addams Laboratory

- 250K Tons recycled PCC
- GTR – >200K tires
- FRAP - >200K Tons millings
- RAS
- Alternate friction aggregate
- WMA demonstration
Veterans Memorial Tollway
2008-2009

- 25% FRAP in 4.75 mm Modified Level Binder
- GTR AC in SMA’s
- Superb smoothness
Option to Fractionate RAP

- Better control
- Higher percentages
Ground Tire Rubber (GTR) AC

- $$ \approx $$ SBS-modified binder
- No draindown on SMA; Saves fiber $
- Convenient - Terminal blended

**FUTURE**

- Optional in SMA or Open Graded Friction Courses (OGFC)
- SBS with fiber reinforcement other option
Tollway Looking for More Green

- RAS - Recycled Asphalt Roof Shingles
  - Focus on Tear-offs
- WMA - Warm Mix Asphalt additives in Modified HMA mixes
- Quieter pavements
RAS – Recycling Green Trash

- Crude oil - $40 to $140
- Shingle Landfill Fees - $15-$120/T
- Lime dust (~20%) as anti-strip agent
- Replaces virgin AC
- Replaces fibers in SMA
- Quality fine aggregate for higher mix VMA
Mining Tear Off Shingles

- 20+% Hi Quality Asphalt Cement
- 30+% High Quality Fine Aggregate
- Mineral/Organic Fibers
- ~ 20% Lime Dust / Mineral Filler
Controlled RAS Processing

- Remove Non-Shingle material
- <1.5% Deleterious
- <1% Asbestos
- Grind and process for HMA
2009 RAS Demonstration Projects

- Dense Graded, low traffic mixes
- Each with RAS + FRAP
- 3.5 miles outside shoulder I-90
- July-August 2009
- 8 test sections + 3 control sections
- 850 to 1300 tons each
Tollway Demonstration Projects
High FRAP + RAS

- 5 mix designs
  - 5% RAS each
  - 20-45% FRAP
- 3 control mixes
- Lab and plant mixes analyzed for performance and field properties
- Supports Iowa State & FHWA Pooled Fund Study
## Mix Design Details

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>% FRAP</th>
<th>% RAS</th>
<th>Control Mix</th>
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<tbody>
<tr>
<td>Base Mix</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>N50</td>
<td>25%</td>
<td></td>
<td>N50 Base Cse. 40% FRAP</td>
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<tr>
<td>2% voids</td>
<td>35%</td>
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<td></td>
</tr>
<tr>
<td>PG 58-28</td>
<td>45%</td>
<td>5%</td>
<td></td>
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<tr>
<td>Shoulder Binder</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>N50, 3% voids</td>
<td>35%</td>
<td></td>
<td>N50 Binder Cse. 40% FRAP</td>
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<tr>
<td>PG 58-22</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Shoulder Surface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N70, PG 58-22</td>
<td>20%</td>
<td></td>
<td>N70 Surface 25% FRAP</td>
</tr>
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</table>
## Planning Pays Off

<table>
<thead>
<tr>
<th></th>
<th>Standard Shoulder Surface</th>
<th>RAS Shoulder Surface</th>
<th>Standard Shoulder Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25% FRAP</td>
<td>5% RAS / 20% FRAP</td>
<td>25% FRAP</td>
</tr>
<tr>
<td>RAS Subbase</td>
<td>5% RAS / 25% FRAP</td>
<td>5% RAS / 35% FRAP</td>
<td>5% RAS / 45% FRAP</td>
</tr>
<tr>
<td>RAS Shoulder Binder</td>
<td>5% RAS / 35% FRAP</td>
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</table>
SMA Surface/RAS Demonstration

- SMA Surface Course, IL-12.5 mm, N80 mix
- 5% RAS - No fiber reinforcement
- 15% fine portion FRAP
- SBS PG 76-22 binder
- Diabase coarse friction aggregate
- U of IL performance testing
Performance Tests on RAS Test Mixes

- Binder extraction and grading of residual asphalt.
- Dynamic Modulus
- Flow Number
- Beam Fatigue
- Disc Compact Tension (Fracture)
Status of RAS
Research Results (Iowa State)

- Binder extraction / testing not effective for determining binder grade
  - Portion of shingle binder not like asphalt binder
  - Does not capture the value of fibers

- Mix Testing
  - Dynamic modulus (complete with positive results)
  - Flow number (in progress)
  - Beam fatigue (in progress)
  - Disc compact tension (near future)
Mainstreaming RAS
Tollway + IEPA

- Illinois was not a “RAS State”
- 3-month Concentrated Task Force Effort
- Now Accepted by IEPA
- Details on Tollway Web-site
- Public Workshop March 12th
Tollway OK’s RAS

- Permit in Polymer-AC SMA as a substitute for virgin fiber reinforcement
- Optional for nearly 250,000 tons of HMA in 2010. Much more in 2011.
- RAS Special Provision - Sets limits for total binder replacement with RAS and/or RAP
Next Big Green Step
Warm Mix Asphalt
Pros of WMA

- Performance as advertised
- Lower temps / Lower energy
- Lower emissions
- Wider window for compaction
- Minimal plant modification
WMA Plant Modification
WMA Questions

- Develop workable specification
- Evaluate methods
  - Additive
  - Foam
  - Wax
- Evaluate extra costs
- Research moisture damage potential
- Study early rutting potential
GTR+FRAP+RAS+WMA = All Green SMA
Tollway Green SMA Mix

- Fine portion FRAP (up to 20%?)
- Ground Tire Rubber (GTR) Modified AC
  - No fibers required
- RAS option as fiber source (with SBS-Modified AC)
- Friction aggregate options
- Tollway 2009 prices $105-112/T
- Look at WMA to extend season
Tollway/UI Study
WMA Early Age Rutting Potential

- Field Lab for immediate sampling
- Compact specimens within 4 hrs of production without reheating
- Follow up with tests 2 hr, 4 hr, 8 hr, 24 hr, 3 days, and 7 days after compaction
- Evaluate rutting, fracture, and moisture susceptibility
- Propose optimum curing (opening) time