I-90 / I-39 Full Depth Asphalt – 7 Year Performance

Steve Gillen
Illinois Tollway

Illinois Asphalt Pavement Association
March 9, 2015
Nearly $5 Billion Committed

80% complete

- Completed Rebuild & Widen Projects systemwide
- Built 12.5-mile I-355 South Extension
- Converted 20 barrier toll plazas to Open Road Tolling
The I-90 Corridor Has Progressed

Full Depth Asphalt Started the Latest Progression of the Corridor
Summary of I-90 /I-39 Full Depth Asphalt

➤ Pre-Stage construction work started in 2007
Summary of I-90 /I-39 Full Depth Asphalt

- Pre-Stage construction work started in 2007
- Eastbound lanes reconstructed and widened in 2008
Summary of I-90 /I-39 Full Depth Asphalt

- Pre-Stage construction work started in 2007
- Eastbound lanes reconstructed and widened in 2008
- Westbound lanes reconstructed and widened in 2009
Summary of Total Asphalt Production

- Jane Addams MP 62 to MP 77 (7 Contracts over 3 years)
  - 12” Full-depth HMA (281,838 sq. yds)
  - 15” Full-depth HMA (388,944 sq. yds)
  - 6-in HMA Shoulders (235,728 sq. yds)
  - 9-in HMA Shoulders (227,242 sq. yds)
  - Other mixes (81,769 tons)
  - Total asphalt production of tons (801,674 tons)
Tollway’s Green Initiatives With I-90 / I-39 Full Depth Asphalt Pavements

- Recycling concrete
- Rubblization of existing concrete
- RAP grindings for capping stone
- Fractionation for increased RAP in mixes
- Ground tire rubber use in SMA mixes
- Warm mix additives in SMA mixes
- Recycled shingles
Contractor Cooperation and Industry Support Was Critical – Thank You!
### Examples of Asphalt Mixtures Applied to I-90

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>AC Grade</th>
<th>FRAP %</th>
<th>Total FRAP %</th>
<th>Max RAP% Allowed</th>
<th>Approx ABR %</th>
<th>Coarse Agg. Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMA Binder, N80</td>
<td>GTR 76-22</td>
<td>15 / 0</td>
<td>15</td>
<td>0</td>
<td>15</td>
<td>Gravel</td>
</tr>
<tr>
<td>SMA Surface, N80</td>
<td>GTR 76-22</td>
<td>15 / 0</td>
<td>15</td>
<td>0</td>
<td>15</td>
<td>Trap Rock</td>
</tr>
<tr>
<td>SMA Surface, N80</td>
<td>GTR 76-22</td>
<td>15 / 0</td>
<td>15</td>
<td>0</td>
<td>15</td>
<td>Steel Slag</td>
</tr>
<tr>
<td>HMA Binder, N70</td>
<td>PG 58-22</td>
<td>25 / 15</td>
<td>40</td>
<td>20</td>
<td>38-42</td>
<td>Gravel &amp; Stone</td>
</tr>
<tr>
<td>HMA Surface, N70</td>
<td>PG 64-22</td>
<td>15 / 10</td>
<td>25</td>
<td>10</td>
<td>23-27</td>
<td>Dolomite</td>
</tr>
<tr>
<td>HMA Binder, N50</td>
<td>PG 58-28</td>
<td>10 / 30</td>
<td>40</td>
<td>25</td>
<td>38-42</td>
<td>Dolomite</td>
</tr>
<tr>
<td>HMA Binder, N50</td>
<td>PG 58-22</td>
<td>10 / 30</td>
<td>40</td>
<td>15</td>
<td>38-42</td>
<td>Dolomite</td>
</tr>
<tr>
<td>HMA Base Course, N50</td>
<td>PG 58-28</td>
<td>10 / 30</td>
<td>40-50</td>
<td>40</td>
<td>38-52</td>
<td>Dolomite</td>
</tr>
<tr>
<td>HMA Base Course, N50</td>
<td>PG 58-22</td>
<td>10 / 30</td>
<td>40-50</td>
<td>20</td>
<td>38-52</td>
<td>Dolomite</td>
</tr>
</tbody>
</table>
High ABR SMA’s Tested in Eastbound Lanes

- 400 tons of surface course SMA w/ slag, 15% fine FRAP & 5% RAS (36% ABR) placed in lane 3 north of I-39 exit ramp in 2009

- 440 tons of surface course SMA w/ quartzite & high FRAP (19% ABR) placed on I-39 ramp in 2009
Condition Rating Survey (CRS)

- Pavement rating methodology used to assess the overall functional condition of a highway surface
- Computerized model used to calculate CRS value
  - Inputs include visual distresses, roughness, rutting, and faulting
- CRS values can range from 1.0 (totally failed) to 9.0 (new pavement)

<table>
<thead>
<tr>
<th>CRS Range</th>
<th>General Pavement Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0 – 7.5</td>
<td>Excellent</td>
</tr>
<tr>
<td>7.4 – 6.6</td>
<td>Acceptable</td>
</tr>
<tr>
<td>6.5 – 6.0</td>
<td>Transitional</td>
</tr>
<tr>
<td>5.9 – 4.5</td>
<td>Fair</td>
</tr>
<tr>
<td>4.4 – 1.0</td>
<td>Poor</td>
</tr>
</tbody>
</table>
Video: EB I-90 MP 16.5-17.5
Condition of Mainline I-90 Pavements: MP 2.5-18

- **CRS (2010-2014)**
  - **Eastbound** (diabase aggregate, 2.5-18)
    - Decreased from 8.3 to 7.8
  - **Westbound** (standard aggregate, 18-7.5)
    - Decreased from 8.7 to 8.1
  - **Westbound** (slag aggregate, 7.5-2.5)
    - Decreased from 8.7 to 8.1
Condition of Mainline I-90 Pavements: MP 2.5-18

- IRI (2010-2014)
  - Eastbound (diabase aggregate, 2.5-18)
    - Increased from 63 to 74
  - Westbound (standard aggregate, 18-7.5)
    - Increased from 49 to 58
  - Westbound (slag aggregate, 7.5-2.5)
    - Increased from 56 to 65
Condition of Mainline I-90 Pavements: EB MP 2.5-18

- Distresses
  - Minor transverse and longitudinal cracking
  - Minor to moderate longitudinal joint cracking/seam separation
  - All longitudinal joints to be routed & sealed in 2015

Minor longitudinal joint cracking & separation
Condition of Mainline I-90 Pavements: WB MP 18-7.5

- Distresses
  - Standard aggregate
    - Minor & isolated transverse cracking
    - Minor to moderate longitudinal joint cracking/separation

Minor transverse cracking
**Condition of Mainline I-90 Pavements: WB MP 7.5-2.5**

- **Distresses**
  - **Slag aggregate**
    - Minor transverse and longitudinal cracking
    - Minor to moderate longitudinal joint cracking/separation

![Minor longitudinal cracking](Image)
RAS and FRAP Combined in Numerous Test Strips and Evaluated

- HMA dense graded high ABR mixes placed on WB outside shoulder for 4 miles
- SMA high ABR surface friction course mix placed on EB I-90 to SB I-39 exit ramp
- Performance of many lab and all field mixes tested at Iowa State University and U of I

<table>
<thead>
<tr>
<th>Mix</th>
<th>FRAP %</th>
<th>RAS %</th>
<th>Approx ABR %</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FRAP – RAS Mixes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binder Course, N50</td>
<td>35</td>
<td>5</td>
<td>55</td>
<td>Shoulder</td>
</tr>
<tr>
<td>Base Course, N50</td>
<td>35</td>
<td>5</td>
<td>57</td>
<td>Shoulder</td>
</tr>
<tr>
<td>Base Course, N50</td>
<td>40</td>
<td>5</td>
<td>66</td>
<td>Shoulder</td>
</tr>
<tr>
<td>Base Course, N50</td>
<td>25</td>
<td>5</td>
<td>44</td>
<td>Shoulder</td>
</tr>
<tr>
<td>Surface, N70</td>
<td>20</td>
<td>5</td>
<td>37</td>
<td>Shoulder</td>
</tr>
<tr>
<td>SMA Surface, N80</td>
<td>15</td>
<td>5</td>
<td>30</td>
<td>Mainline</td>
</tr>
<tr>
<td><strong>Control Mixes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Course, N50</td>
<td>40</td>
<td>0</td>
<td>25</td>
<td>Shoulder</td>
</tr>
<tr>
<td>Binder Course, N50</td>
<td>40</td>
<td>0</td>
<td>25</td>
<td>Shoulder</td>
</tr>
<tr>
<td>Surface, N70</td>
<td>15</td>
<td>0</td>
<td>10</td>
<td>Shoulder</td>
</tr>
</tbody>
</table>
5 percent RAS in each mix; varying percentages of FRAP

* FRAP only
Condition of RAS test strips on WB 1-90 outside shoulders: MP 7.5-4.0

- **Distresses**
  - Minor but consistent transverse and longitudinal cracking
  - Minor to moderate longitudinal joint cracking/spalling

Moderate longitudinal joint cracking/spalling

Map Cracking
Video: WB I-90 MP 7.75-4.0
Initial WMA Test Bed Project Placed on I-90 / Irene Road Ramp in 2008

- GTR modified fine FRAP SMA surface course (15% ABR) used
- Evotherm chemical additive used
- 600 tons produced and compacted at 2 temperatures (230°F to 305°F) with no problem
- Plant samples bagged and shipped to U of I for long term performance analysis
Condition of I-90 WB Exit Ramp at Irene Road

- **Distresses**
  - **2009:** No visible distresses
  - **2012:** Minor longitudinal cracking in a couple of spots

Minor longitudinal cracking
Video: I-90 WB Exit Ramp at Irene Road
Cost Savings

- $114/ton in 2008 and 2009
- $111/ton in 2010
- $91/ton in 2011
- $96/ton in 2015
Thank you