Experience in Indiana with UBWC and Spray Pavers

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Indiana Specifications

- **Standard Specification Section 414**
  Ultrathin Bonded Wearing Course, Warranted

UBWC Mixture

Aggregate Materials

- High quality and angular coarse aggregate
- Gap gradation

Asphalt Materials

- <10,000,000 ESALS
  - PG 64-22 binder
- ≥10,000,000 ESALS
  - PG 70-22 binder
  - Elastic recovery requirement

Emulsion

- ~ 0.20 gal/sys application
  - Elastic recovery requirement

<table>
<thead>
<tr>
<th>Mixture Designation – Control Point (Percent Passing)</th>
<th>12.5 mm</th>
<th>9.5 mm</th>
<th>4.75 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/4 in. (19.0 mm)</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>1/2 in. (12.5 mm)</td>
<td>85.0 - 100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>3/8 in. (9.5 mm)</td>
<td>55.0 - 80.0</td>
<td>85.0 - 100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>No. 4 (4.75 mm)</td>
<td>22.0 - 38.0</td>
<td>22.0 - 38.0</td>
<td>22.0 - 38.0</td>
</tr>
<tr>
<td>No. 8 (2.36 mm)</td>
<td>19.0 - 32.0</td>
<td>19.0 - 32.0</td>
<td>20.0 - 32.0</td>
</tr>
<tr>
<td>No. 16 (1.18 mm)</td>
<td>15.0 - 24.0</td>
<td>15.0 - 24.0</td>
<td>15.0 - 24.0</td>
</tr>
<tr>
<td>No. 30 (600 µm)</td>
<td>11.0 - 18.0</td>
<td>11.0 - 18.0</td>
<td>11.0 - 18.0</td>
</tr>
<tr>
<td>No. 50 (300 µm)</td>
<td>8.0 - 14.0</td>
<td>8.0 - 14.0</td>
<td>8.0 - 14.0</td>
</tr>
<tr>
<td>No. 100 (150 µm)</td>
<td>5.0 - 10.0</td>
<td>5.0 - 10.0</td>
<td>5.0 - 10.0</td>
</tr>
<tr>
<td>No. 200 (75 µm)</td>
<td>4.0 - 5.5</td>
<td>4.0 - 5.5</td>
<td>4.0 - 5.5</td>
</tr>
<tr>
<td>Binder Content, %,</td>
<td>4.6 - 6.1</td>
<td>4.8 - 6.1</td>
<td>5.0 - 6.3</td>
</tr>
<tr>
<td>Plan Lay Rate (lb/sq yd)*</td>
<td>90</td>
<td>75</td>
<td>65</td>
</tr>
</tbody>
</table>

* Plan lay rates are based on 100 lb/sq yd/in. using a mixture with a specific gravity of 2.5. Mixtures with different specific gravity will require an adjusted equivalent lay rate.
UBWC Mixture

Recycled Materials

- 25% Binder Replacement

- RAS
  - 100% passing the 1/2 in. sieve.

- RAP
  - 100% passing the 3/8 in. sieve
  - 95 to 100% passing the #4 sieve.

3-Year Warranty Acceptance

<table>
<thead>
<tr>
<th>Distress</th>
<th>Single Location</th>
<th>Multiple Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delamination/Raveling</td>
<td>1/2 sq yd</td>
<td>1 sq yd/mi</td>
</tr>
<tr>
<td>Rut Depth</td>
<td>1/4 in.</td>
<td>average 1/4 in./mi</td>
</tr>
<tr>
<td>Friction Number</td>
<td>no less than 30</td>
<td>average 35</td>
</tr>
</tbody>
</table>
Spray-Paving Equipment

- Three spray-paver machines are in operation: Vogele, Roadtec and Midland
- Two spray-paver manufacturers currently exist: Vogele and Roadtec
- The Roadtec spray-paver requires a MTD and can pave the widest at ~19.5 feet.
- The Vogele and Midland spray-pavers can pave the narrowest at ~8 feet.
- The spray bars for all spray-pavers are linked with screed extension movement.
- Emulsion storage ~2,000 gallons.
Since 2009...

42 contracts constructed thru 2015 totaling ~ 46,000,000 sys
11 contracts constructed in 2013 alone totaling ~ 11,500,000 sys
8 contracts to be constructed totaling ~11,000,000 sys

<table>
<thead>
<tr>
<th>Type</th>
<th>DISTRICT</th>
<th>Constructed</th>
<th>Interstate</th>
<th>Non-Interstate</th>
<th>Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBWC</td>
<td>West Central</td>
<td>11</td>
<td>0</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>UBWC</td>
<td>North East</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>UBWC</td>
<td>East Central</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>UBWC</td>
<td>North West</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>UBWC</td>
<td>South East</td>
<td>8</td>
<td>1</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>UBWC</td>
<td>South West</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>42</strong></td>
<td><strong>3</strong></td>
<td><strong>39</strong></td>
<td><strong>8</strong></td>
<td></td>
</tr>
</tbody>
</table>
East Central District (SR-28)

2002 UBWC

2013 UBWC w/ Seal Coat

First UBWC Constructed atop HMA
South West District (SR-145)

Friction Reduction (Bleeding)

Damage (Farm Implement)

Warranted Item

Non-Warranted Item
Reflective Cracking

Case Studies
East Central District (SR-1)

2011 Pre-UBWC Surface

2014 UBWC Surface
South West District (SR-37)

2012 Pre-UBWC Surface  

2014 UBWC Surface
Surface Preparation

Fine Mill

2x - Cutting Teeth
Post-Mill / Pre-Overlay Crack Filling

Overbanded PG 64-22 atop HMA Fine Mill
West Central District (US-52)

2015 PCCP Fine Mill

2015 UBWC atop PCCP Fine Mill

First UBWC Constructed atop PCCP
“I know you believe you understand what you think I said, but I am not sure you realize that what you heard is not what I meant.”

** Alan Greenspan **
Experience in Indiana with UBWC and Spray Pavers

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Questions?