Infrared Asphalt Repair

Mike Mussog, CEO

Charles Schwartz, Chairman and Professor of the Department of Civil Engineering
Overview

• What is Infrared Asphalt Repair?
• MIPS Project – Phase 1 – Quality Assurance
• MIPS Project – Phase 2 – State Certification
• Prince George’s County Pilot Program
• Other Municipal Infrared Repair Participants
What Is Infrared Asphalt Repair?
Infrared repair is a remedial asphalt technique

- Potholes
- Depressions
- Limited cracking
- Localized defects
- Around grates and manholes
Infrared Pothole Repair
Infrared Seam Failure Repair
Current Infrared Issues

In spite of the potential benefits, very little research has been done on infrared pothole patching. This inhibits the creation of robust QA/QC procedures.

- #1 - Optimum temperature control of the heater.
- #2 - Properties of asphalt materials post-patching.
- #3 - Proportioning and proper application of rejuvenators.
Infrared Versus Conventional Repair Methods

Bottom Line
Infrared Patching is cost effective and competitive

- Longevity of the repairs (14x throw and roll)
- Year long application potential

Improve Control of Production Process

• Provide suggestions for heating techniques based on field verified theoretical models.
• Provide recommendations on rejuvenator application.
• Develop in-the-field friendly QA/QC testing.
Confirm Material Integrity and Properties
• Provide experimental verification of patch properties.

Document Findings

Develop Model Specification
• Allows for the approved adoption and use by local, county and state agencies.
## Issue #2-Material Properties

### UMD-1

<table>
<thead>
<tr>
<th></th>
<th>Average Bulk Density</th>
<th>Avg. Dry ITT (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-situ Pavement</td>
<td>2.42</td>
<td>177.1</td>
</tr>
<tr>
<td>Heated in-situ Pavement</td>
<td>Na</td>
<td>180.9</td>
</tr>
<tr>
<td>New Patch</td>
<td>2.34</td>
<td>165.7</td>
</tr>
<tr>
<td>Joint</td>
<td>Na</td>
<td>177.7</td>
</tr>
</tbody>
</table>

### Main Points:
- Heated area is not effected.
- Joint has good thermal bonding.
- Two stage heating contributes to good thermal bonding with underlying layer.

### UMD-3 Site

<table>
<thead>
<tr>
<th>Location</th>
<th>Average Bulk Specific Gravity</th>
<th>Average Dry IDT (psi)</th>
<th>Average Wet IDT (psi)</th>
<th>TSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Pavement</td>
<td>2.38</td>
<td>316.9</td>
<td>83.9</td>
<td>0.26</td>
</tr>
<tr>
<td>I-Normal Patch</td>
<td>2.28</td>
<td>205.8</td>
<td>40.7</td>
<td>0.20</td>
</tr>
<tr>
<td>II-Heavy Compaction</td>
<td>2.28</td>
<td>198.9</td>
<td>51.8</td>
<td>0.26</td>
</tr>
<tr>
<td>III-Two Stage Heating</td>
<td>2.28</td>
<td>188.8</td>
<td>85.5</td>
<td>0.45</td>
</tr>
<tr>
<td>IV-Two Stage Heating</td>
<td>2.28</td>
<td>202</td>
<td>85.3</td>
<td>0.42</td>
</tr>
</tbody>
</table>
**Issue #3 Proper Rejuvenator Use**

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<table>
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<th>Average Bulk Specific Gravity</th>
<th>Average Dry IDT (psi)</th>
<th>Average Wet IDT (psi)</th>
<th>TSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-0% BW</td>
<td>2.28</td>
<td>213.6</td>
<td>78.9</td>
<td>0.37</td>
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<tr>
<td>VI-0.8% BW</td>
<td>2.22</td>
<td>133.9</td>
<td>39.7</td>
<td>0.30</td>
</tr>
<tr>
<td>VII-1.6% BW</td>
<td>2.26</td>
<td>156.9</td>
<td>85.2</td>
<td>0.54</td>
</tr>
<tr>
<td>VIII-2.4% BW</td>
<td>2.27</td>
<td>146.2</td>
<td>59.8</td>
<td>0.41</td>
</tr>
<tr>
<td>IX-3% BW</td>
<td>2.30</td>
<td>158.4</td>
<td>89.7</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Data From: Carruth, W. D., and Mejias-Santiago, M. “In-Place Asphalt Recycling for Small Airfield Repairs in Remote Locations”, 2014
AASHTO
- Compact with steel drum roller
- 18 month Warrantee period
- Allow to cool to 175°F before opening to traffic
- Clean area prior to heating
- Surface Temp not to exceed 350°F
- Depth of 2” heat penetration needed
- Heating is done when surface is workable with rake to 2” depth.
- Scarify the surface 3” around repair
- Compact to grade
- Rejuvenator is to be used
- Virgin HMA is added
- Compact edges first to ensure bond

Canon City, CO
- Use of wind shield if windy conditions
- Compact with vibratory roller

Somerset, NJ
- Surface Temp checked with a thermometer during heating
- Remove top 1/2”
- 6 month Warrantee period
- Entire process shall not take longer than 25 minutes to prevent excessive cooling
Codified in Publication

- Specified rejuvenator amount.
- Specified construction practices.
- Specified verification and warranty data.
- Construction documentation.
Maryland Industrial Partnership’s Response (Phase 2)

• Develop multi-solution decision support tool for pavement maintenance and repair.
  ➢ Infrared repair plus other repair strategies (e.g., full depth patching, surface sealing).
  ➢ "Road test" at commercial property chains (e.g., Wawa).
• Gain wider acceptance of infrared repair via spec adoption by Maryland State Highway Administration.
• Pursue wider promotion of infrared repair strategies through forums like the Maryland SHA Recycled Materials Task Force and similar.
### Infrared Pilot Program
#### Prince George’s County 2015-2016

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total repairs (April 2015 – August 2016)</td>
<td>1,350</td>
</tr>
<tr>
<td>Average repairs per day</td>
<td>16</td>
</tr>
<tr>
<td>Cost per repair</td>
<td>$375</td>
</tr>
</tbody>
</table>

- 8 assigned roads.
- On call infrared repairs.
Other Municipal Infrared Participants
2015 - 2017

**VDOT**
- 80 repairs
- Interstates 95, 495 and 64

**WSSC**
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