Predicting Bumps in HMA Overlays:  
Research in progress – LRRB Inv. 843

The use of hot mix asphalt (HMA) overlays is common in Minnesota. However, while overlaying pavements with sealed cracks, bumps tend to form in the overlay resulting in decreased overlay smoothness and poorer ride quality. Hypotheses as to why (or how) these bumps are caused include:

- Thermal expansion of sealant during overlay
- Roller slip or slide as it rolls over sealed crack
- Differential melting points of the sealant and asphalt binder
- Vertical compression of sealant under roller.

Prior research (LRRB Investigation 802) studied the thermal expansion hypothesis. Results showed that sealant materials may soften during overlay placement but not expand. It appears likely that the bumps may be formed during rolling operations; either by compression of the sealant or by slipping or sliding of the HMA material. This project conducted field testing to examine these issues, evaluate the probability of the occurrence of bumps, and look at ways of mitigating any bumps that do occur.

Test Sections

The project used two types of sites for monitoring construction and performance – those for CRACK SEALANT METHODS AND MATERIALS, and those for CONSTRUCTION METHODS. Construction of the overlays occurred in 2007, and was followed by two years of performance monitoring.

Bump Severity levels were established for the purpose of comparing the bump formations with respect to height differences. Classifications were Low, Medium, or High Severity bumps, determined by the vertical deviation of the bump as follows:

- Low severity: < ¼-in.
- Medium severity: < ½-in.
- High severity: >½-in.

Bump severity was checked after construction and during long term monitoring.

Analysis of the sections found that bumps were significantly affected by rout geometry, sealant type, and surface temperature.

<table>
<thead>
<tr>
<th>CM Section</th>
<th>Low</th>
<th>Medium &amp; High</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
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<tr>
<td>3</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>0</td>
</tr>
</tbody>
</table>

For More Information:
James Wilde, Ph.D., P.E. j.wilde@mnsu.edu
Department of Mechanical and Civil Engineering
Minnesota State University, Mankato, MN

Ed Johnson, eddie.johnson@state.mn.us
Mn/DOT Office of Materials & Road Research
www.dot.state.mn.us/materials/research

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