Friction and Texture Retention of Concrete Pavements after Diamond Grinding

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Overview

• Background to Diamond Grinding
• ALDOT’s Experience
• Current Research
• Bumps in the Road
• Future work
What is Diamond Grinding?

Concrete Pavement Rehabilitation Technique

www.dot.state.oh.us

www.pavementinteractive.org
# Grinding Specifications

![Diagram of grinding specifications](image)

<table>
<thead>
<tr>
<th>Blades/Grooves per Foot</th>
<th>Range of Values</th>
<th>Hard Coarse Aggregate</th>
<th>Soft Coarse Aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Area (in.)</td>
<td>50-60</td>
<td>55-60</td>
<td>50-54</td>
</tr>
<tr>
<td>Groove Width (in.)</td>
<td>0.06 – 0.14</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>Groove Height (in.)</td>
<td>0.08 – 0.16</td>
<td>0.10-0.16</td>
<td>0.10 – 0.16</td>
</tr>
<tr>
<td></td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
</tr>
</tbody>
</table>
ALDOT’s Experience

ALDOT diamond ground pavements in the 70’s and 80’s

• Pavements with limestone coarse aggregates lost friction

• ALDOT banned the use of limestone coarse aggregate in mainline concrete pavement
Current Work by UA

ALDOT looking to update grinding specs and allow limestone aggregates again.

- Find a way to diamond grind pavements with limestone coarse aggregate and not lose friction. Two possible solutions:
  1. Change diamond grinding dimensions
  2. Combine limestone and granite aggregates
Texturing and Friction Testing

- TWPD Wearing Path (Up to 160K cycles)
- Direction of grinding / grooving / traffic
- Dynamic Friction Tester (DFT)
- British Pendulum Tester
Diamond Ground Textures

Increase or decrease the land area width

- 60 blades/ft (narrow)
- 52 blades/ft (wide)

Diamond Grinding + Grooving

NGCS
Aggregate Selection

Wanted aggregates from Alabama
• Granite coarse and fine
• Two limestone coarse

<table>
<thead>
<tr>
<th>Aggregate</th>
<th>LA Abrasion</th>
<th>Micro Deval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2012</td>
</tr>
<tr>
<td>Hard</td>
<td>18</td>
<td>7.3</td>
</tr>
<tr>
<td>Soft</td>
<td>30</td>
<td>17.5</td>
</tr>
</tbody>
</table>
## Aggregate and Texture Combinations

<table>
<thead>
<tr>
<th>Coarse Aggregate Combination</th>
<th>Texture Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Siliceous</td>
<td>Unground</td>
</tr>
<tr>
<td>100% Hard Limestone</td>
<td>60 Blades per foot</td>
</tr>
<tr>
<td>100% Soft Limestone</td>
<td>52 Blades per foot</td>
</tr>
<tr>
<td>75% Hard Limestone + 25% Siliceous</td>
<td>60 Blades per foot + Grooving</td>
</tr>
<tr>
<td>50% Hard Limestone + 50% Siliceous</td>
<td>52 Blades per foot + Grooving</td>
</tr>
<tr>
<td>25% Hard Limestone + 75% Siliceous</td>
<td>Next Generation Concrete Surface</td>
</tr>
<tr>
<td>75% Soft Limestone + 25% Siliceous</td>
<td></td>
</tr>
<tr>
<td>50% Soft Limestone + 50% Siliceous</td>
<td></td>
</tr>
<tr>
<td>25% Soft Limestone + 25% Siliceous</td>
<td></td>
</tr>
</tbody>
</table>
Bumps In the Road

BPT Problems:

• Rubber slider too wide for wear path
• Drag path will not always be on the worn surface

Solution:

• Reduce width of slider
  – from 3.0 in to 1.25 in
Bumps in the Road
Moving forward

Complete texture and friction testing

Establish correlation between aggregate properties and post grinding friction performance

Integrating results with UT Austin

Field trials
Questions?