Shingle Creek Porous Pavement Paired Intersection Study

21st Transportation Research Conference
April 28, 2010

Wenck
City of Robbinsdale
Shingle Creek
Overview of Study

- Funded $282,000 Section 319 Research Grant
- Chloride TMDL Implementation
- Reduce need for road salt
- Construct two test porous asphalt sections on residential streets
- Compare performance to adjacent controls
1. Estimate the effectiveness of porous asphalt on residential streets in reducing the need for salt as a deicer.

2. Determine whether porous asphalt is a BMP that can hold up to rigors of regular city street use.

3. Determine short term and likely long term maintenance requirements.

4. Measure the water quality and quantity benefits of porous asphalt in a residential street application in both sandy and clay/loam subgrades.
Study Schedule

- Two paired intersections: Robbinsdale and Plymouth
- Different subgrade conditions
- Robbinsdale: 2009, Plymouth: 2010
- Monitor for 2 years
- Study complete by 2012
Zenith Ave Control Section
Abbott Ave Test Section
Porous Asphalt Spec Summary

- 10 year contractor experience
- Porous Mn/DOT spec 2360
- Reservoir layer 1.5” to 2.5” 40% void
- Choker layer 0.5” to 1.0”
- Porous aggregate 0.25” to 0.75”
- Cellulose fiber added
- Mineral filler added
- Draindown less than 0.3%
Porous Asphalt added as a Change Order
Porous Subgrade Preparation
Porous Subgrade Ready for Paving (150ft x 32ft)
September 25, 2009
Midwest Asphalt
68°F Air, Overcast, No Wind
September 25, 2009 8:00AM
Asphalt Temp 285°F
Porous Asphalt Placement
Single Layer of Porous
Rolling started at 9:25AM
Surface ~ 150°F, Internal
205°F, Stopped at One Pass
Started Pass # 2 at 10:10AM, Surface ~120°F
# Porous Asphalt Test Report

## Material Proportions

<table>
<thead>
<tr>
<th>Material</th>
<th>Proportion</th>
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<tbody>
<tr>
<td>OGC Gravel CA-50</td>
<td>42.7%</td>
</tr>
<tr>
<td>Martel 1/2&quot; Granite</td>
<td>27%</td>
</tr>
<tr>
<td>Kramer 0.5&quot; Lime</td>
<td>22%</td>
</tr>
<tr>
<td>Kramer 3/8&quot; Mica</td>
<td>5%</td>
</tr>
<tr>
<td>Interflex Calotow Fiber</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

## Job Mix Formula

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
</tr>
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<tbody>
<tr>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>99</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>85</td>
</tr>
<tr>
<td>4&quot;</td>
<td>10</td>
</tr>
<tr>
<td>6&quot;</td>
<td>0</td>
</tr>
<tr>
<td>#9</td>
<td>8.1</td>
</tr>
<tr>
<td>#200</td>
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## Design Limits

<table>
<thead>
<tr>
<th>Design Limits</th>
<th>100</th>
<th>95-100</th>
<th>55-75</th>
<th>50-75</th>
<th>5-10</th>
<th>2-4</th>
</tr>
</thead>
</table>

## 2. Mix Design Information

<table>
<thead>
<tr>
<th>Item</th>
<th>Results</th>
<th>Range</th>
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<tbody>
<tr>
<td>Total SAC</td>
<td>8.1</td>
<td>5.5% minimum</td>
</tr>
<tr>
<td>Maximum Specific Gravity</td>
<td>2.68</td>
<td>10% minimum</td>
</tr>
<tr>
<td>Bulk Specific Gravity**</td>
<td>2.66</td>
<td></td>
</tr>
<tr>
<td>Air Voids</td>
<td>16.3%</td>
<td>PG 64-22</td>
</tr>
<tr>
<td>Asphalt Binder</td>
<td>8.9%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Effective Asphalt</td>
<td>0.5</td>
<td>0.3% Max.</td>
</tr>
<tr>
<td>Fines to Effective Asphalt</td>
<td>0.1%</td>
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</tr>
<tr>
<td>Draindown Test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Bulk Specific Gravity by Calculation ASTM D 3203

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** Midwest Asphalt Corporation **

[Signature]

Timothy J. Muehle, Q.C. Manager
Instrumentation and Monitoring

- Thermocouple tree
- Pressure transducer
- Television cameras
- Automatic samplers
- Pavement observation
Overflow Pipe to Automatic Sampler
Instrumentation Conduit
Thermocouple Tree Diagram

- Pairs at 8 elevations
- 1,2,3,5,6,7,12&18” deep
Thermocouple Tree
Len Palek of MnDOT Hard at Work
Thermocouple Tree Installation
Thermocouple Tree Ready Wiring to Jobox
Dave Dickson (Robbinsdale) Protecting Pressure Transducer Installation
Pressure Transducer Wiring
10’ -6” PVC Overflow Pipe
Cameras
Jobbox Housing
Automatic Sampler
Abbott, test
1/17/10

Zenith, control
1/17/10
Credit to

- Richard McCoy, City Engineer, Robbinsdale
- Richard Wolters, Executive Director, MAPA
- Len Palek, MnDOT
- Matt Lebens, MnDOT
What we’ve learned

- Insulating property of porous section
- Less refreezing of melted snow and ice with the right sunlight and air temperature in porous
What we’re learning

- Application as a BMP for salt reduction
- Pavement durability
- Sunlight and slope orientation for best results
- Photo data management and instrumentation
- Porous pavement specification updates