Virginia Quiet Pavement Demonstration Program

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2015 RPUG Meeting - Raleigh
Virginia “Quiet Pavements” Program
(Code of Virginia § 33.1-223.2:21)

• Directs VDOT to:
  ➢ Expedite the development of quiet pavement (QP) technologies such that applicable contract solicitations include specs for QP technology if sound mitigation is a consideration.

• To that end, VDOT will:
  ➢ Construct demonstration projects to assess QP technologies.
  ➢ Monitor and report results of use of QP technologies in other states.
  ➢ Evaluate functionality/safety in Virginia's climate over four full winters.
“Quieter” Pavement

What it is:

- In General – a wearing surface that minimizes tire-pavement noise production and propagation
- Asphalt – “small-textured” porous mix (e.g., open-graded asphalt concrete)
- Concrete – negative-textured longitudinal grind and groove (e.g., “Next Generation Concrete Surface”)

What it isn’t:

- A universal substitute for noise barriers
Asphalt Projects

Plan View

SMA 9.5 (1.5 in)  PFC 9.5RM (1 in)

1 mile (typ.)

PFC 9.5 (1 in)  PFC 12.5 & PFC 12.5 RM (2 in)
Concrete Projects

Exist. Finish

1/2 mile (typ.)

Conv. Grind (CDG)

Next Gen. Concrete Surface (NGCS)

Exist. Finish

Plan View
Project Selection Criteria

- Characteristics that support tire-pavement noise as predominant traffic noise contributor
  - Higher speeds
  - Free flowing
  - Lower to limited access
Demonstration Projects 2011/12

1. SR 7 By-Pass in Leesburg (A)
2. SR199 west of Williamsburg (A)
3. SR 288 near Chester (A)
4. I-64 Virginia Beach (C)
5. SR 76 Richmond (C)
6. Fairfax County Parkway near Chantilly (A)
7. US 17 Near Marshall (A)
8. NCAT
Friction – GripTester

Ride Quality – Wide-footprint Profiler

Tire-Pavement Noise (OBSI)
QP Technology – Initial Additional Costs

- PFC9.5RM
- PFC 9.5
- PFC 12.5
- PFC 12.5RM
- CDG
- NGCS

Costs ($/SY)
Effectiveness
(Initial Noise Reduction)
Quieter Asphalt - VA

![Chart showing comparison of OBSI (dB(A)) for different materials and seasons.](chart.png)
Quieter Asphalt - NCAT

![Graph showing dB(A) vs. Equivalent Single Axle Loadings (ESALs) for different VA QP Materials: W10 PFC SBS, S1 PFC GTR, S12 SMA, N3 SMA, and N4 SMA. The graph illustrates the noise levels for each material at different loadings.](image-url)
Quieter Concrete - VA

Concrete (Typ.)

<table>
<thead>
<tr>
<th>OBSI [dB(A)]</th>
<th>CDG</th>
<th>NGCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter 3</td>
<td></td>
<td></td>
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<tr>
<td>Winter 4</td>
<td></td>
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</tbody>
</table>
Ride Quality

Inertial Profiler

IRI (in/mi)

SMA-9.5 | PFC9.5RM | PFC 9.5 | PFC 12.5 | NGCS
User Cost Savings – Case Study

2011 Demo Site 3

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>“Control” IRI</td>
<td>74 in/mi</td>
</tr>
<tr>
<td>QP IRI</td>
<td>62 in/mi</td>
</tr>
</tbody>
</table>

QP Costs (per 2-lane mile)

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<thead>
<tr>
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<tbody>
<tr>
<td>Most Expensive (QP1)</td>
<td>$180,224</td>
</tr>
<tr>
<td>Least Expensive (QP2)</td>
<td>$73,498</td>
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Cumulative Savings* (reduced fuel consumed)

<table>
<thead>
<tr>
<th>Year</th>
<th>Savings</th>
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<tbody>
<tr>
<td>Year 1</td>
<td>$28,463</td>
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<tr>
<td>Year 2</td>
<td>$57,780</td>
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<td>Year 3</td>
<td>$89,990</td>
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<td>Year 4</td>
<td>$123,166</td>
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<td>Year 5</td>
<td>$157,338</td>
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<tr>
<td>Year 6</td>
<td>$192,536</td>
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<tr>
<td>Year 7</td>
<td>$228,789</td>
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<tr>
<td>Year 8</td>
<td>$266,131</td>
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<tr>
<td>Year 9</td>
<td>$304,593</td>
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<tr>
<td>Year 10</td>
<td>$344,210</td>
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</tbody>
</table>

* Not Agency Savings
Quiet Pavement – Wet

SMA

Quiet Pavement

May 2014
Quiet Pavement – Winter

Quiet Pavement

Control

Feb 2014
“Cold Start”?
Distress triggered by line eradication
Summary of Findings

• QP technologies provide beneficial spray reduction and improved skid resistance – wet weather.
• For asphalt QPs (PFC) - Noise reduction levels are not noticeable compared to control surfaces after 4 winters (< 2dB)
• For concrete QP (NGCS) – Noise reduction levels are noticeable compared to control after 4 winters (~5dB)
• None of the technologies provided sufficient noise reductions to singularly meet federal regulations – Minimum of 7dB for single receptor and, minimum of 5dB for at least 50% of receptors.
Consider PFC’s for some traffic noise mitigation and improved wet-weather function when:

- Traditional noise barriers are not practical and/or desirable
- Tire-pavement interaction is the primary traffic noise source
- Alignment/cross-section meets Interstate-caliber geometric requirements
- Heavy winter maintenance activities are rarely necessary
  - deicing salts/brines a normal first approach
  - accumulating frozen precipitation is uncommon
- The existing pavement is structurally sufficient or will be made so
Site Selection:

• “Spot” applications are strongly discouraged. Establish natural project limits with uniformity for maintenance and use (under any weather conditions)

• Avoid facilities with poor geometrics

Construction considerations:

• Use very heavy tack-coat

• Make sure lay-down equipment is well heated – “waste” first load after passing through the material transfer vehicles (MTVs).

• Always “daylight”. Beware adjacent dense-graded shoulders, turn-lanes, or wide cross-overs.
Winter Maintenance!!:

- PFC surfaces require careful and constant monitoring during any winter event.
- Higher levels of salt and liquid anti-icing materials will be necessary (magnesium chloride solutions have proven effective).
- Use of abrasives will reduce porosity and substantially reduce functional service life.
For more information:
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Links to Interim Report to Virginia General Assembly:
http://leg2.state.va.us/dls/h&sdns.nsf/0/e0a4b50ad340248c8525787e0057d09a?OpenDocument

http://www.virgiiniadot.org/VDOT/Projects/asset_upload_file884_5721.pdf

Final Legislative Report – Soon!