DEVELOPMENT AND USE OF THE NEXT GENERATION CONCRETE SURFACE (NGCS)

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Presentation Outline

- What is a Quiet Concrete Pavement
- What is NGCS
- Some Noise Basics First
- Development of the NGCS
- Use of NGCS
- NGCS LITE
- Noise Performance of NGCS
- Frictional Performance of NGCS
# What Is a Quiet Pavement?

**NCHRP 10-67—Texturing Concrete Pavements (NCHRP Report 634) (ARA-2009)**

## Noise Level (OBSI – dBA)

<table>
<thead>
<tr>
<th>Level</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>&lt;102</td>
</tr>
<tr>
<td>Fairly Low</td>
<td>102 to 104</td>
</tr>
<tr>
<td>Moderate</td>
<td>104 to 106</td>
</tr>
<tr>
<td>Fairly High</td>
<td>106 to 108</td>
</tr>
<tr>
<td>High</td>
<td>&gt;110</td>
</tr>
</tbody>
</table>
NGCS is a term used to describe a category of texture(s) that have or will evolve through current research. The term may apply to several textures that evolve for both new construction and rehabilitation of existing surfaces. The desirable characteristics of such textures will be a very smooth profile coupled with good micro texture and excellent macro texture.
What it Looks Like Currently
Noise Measurement Device (OBSI)
Methods for Mitigating Highway Noise

Controlled At the Source

70% - 90%
Growing Old Or “Acoustic Longevity”

Changing Performance Over Time

- Noise Level (dBA)
- Pavement Age (Yrs)
- Asphalt
- Concrete
TNM RESULTS (Noise Mitigation)
Don’t Forget Pavement Preservation
Good Joint Design

- Joint Opening Width
- Joint Reservoir Depth
- Sealant Level
- Faulting
What is NGCS and Where Did it Come From

Back to the Future Again
Purdue Research—Tire Pavement Test Apparatus (TPTA)
NGCS is a Diamond Grinding Procedure
NGCS Construction

Positive Texture Removal

Grooved
NGCS Surface

Grooves for Macro Texture

MicroTexture
Concrete Texture Types and Levels

Transverse Tining

Conventional Diamond Grinding

Twice as Loud

Traffic

103 – 110 dBA

100-104 dBA

99-101 dBA

101-106 dBA

Next Generation Concrete Surface

Longitudinal Tining
Current and Future NGCS Sites
Noise Results (OBSI)
MnROADs Test Sections
Kansas I-70 Results

Sound Intensity Level, dBA

<table>
<thead>
<tr>
<th>Pavement Section</th>
<th>Sound Level, dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGCS Long Groove</td>
<td>100.6</td>
</tr>
<tr>
<td>Long Groove</td>
<td>101.4</td>
</tr>
<tr>
<td>Drag</td>
<td>102.1</td>
</tr>
<tr>
<td>CDG Long Tined After</td>
<td>102.3</td>
</tr>
<tr>
<td>Long Tined Before</td>
<td>102.7</td>
</tr>
<tr>
<td>Exposed Aggregate</td>
<td>104.3</td>
</tr>
</tbody>
</table>

106
104
102
100
98
96
94

Pavement Section
Friction Testing
Friction Testing ASTM E274

Test Speed = 40 MPH
MnROADs Friction Testing of NGCS

Friction (SN40) as a Function of Surface Texture and Time

- Ribbed Tire (SN40R)
- Smooth Tire (SN40S)
- Next Generation Concrete Surface
- Conventional Diamond Grinding

Shadow effect indicates testing at construction

Year:
- 2007
- 2008
- 2009
- 2010
- 2011
KDOT I-70 Friction Results

Longitudinal Tining
- 2009: 40.5
- 2010: 33.2
- 2009: 35.6
- 2010: 51.9

Conventional Diamond Grining
- 2009: 52.2
- 2010: 58.3

Turf Drag With Longitudinal Grooving
- 2009: 44.7
- 2010: 46.5

Turf Drag
- 2009: 49.1
- 2010: 57.4

NGCS
- 2009: 39.1
- 2010: 59.4

Exposed Aggregate
- 2009: 42.2
- 2010: 47.0

Ribbed Tire
- 2009: 40.5
- 2010: 41.8

Smooth Tire
- 2009: 40.2
- 2010: 45.8
Anisotropic Friction Testing
Anisotropic Friction Behavior

Friction Index Relative to Friction in Direction of Travel as a Function of Deviation from the Direction of Travel

- Un-Corrected for Cross Slope
- CDG
- Random Transverse Tined
- Astro Turf
- Grooved
Back to the Future Again

Current NGCS

Future NGCS LITE?

1960’s California Texture
Summary

- You Can Build Quiet Concrete Pavements!
- NGCS has Been Placed in 10 States at 22 Locations with the Oldest Being 5 Years
- All the Surfaces Have Produced Consistent Results
- Contractors are Gaining More Experience and More Confidence with NGCS
- The NGCS LITE is Intended to be an Economical Renewable Surface Texture
- Diamond Grinding Costs are Not as Subject to Inflationary Forces
Thank you-

Questions?

www.IGGA.net  www.NGCS.info