NEXT-GENERATION CONCRETE PAVEMENT SURFACE

90th Annual Transportation Short Course Materials II Session
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NGCS is a term used to describe a longitudinal noise-attenuating texture treatment that can be utilized for both new construction and rehabilitation of existing surfaces. The surface is the quietest and smoothest concrete pavement surface measured to date while providing desirable friction characteristics.
Types of Surface Texture

- Transverse Tining
- Random Transverse Tining
- Astro Turf Drag
- Longitudinal Grooving
Focus On The Source

Typical Concrete Texture Types and Levels

- **Transverse Tine**
  - Conventional Diamond Grinding: 103-110dBA
  - Traffic: 103-110dBA
  - Twice as Loud

- **Longitudinal Tine**
  - Conventional Diamond Grinding: 101-106 dBA
  - Traffic: 101-106 dBA

- **Next Generation Concrete Surface**
  - Conventional Diamond Grinding: 99-101dBA
  - Traffic: 99-101dBA

*Twice as Loud*
The NGCS texture was developed through research on Purdue’s Tire Pavement Test Apparatus (TPTA).

The TPTA is unique in that it allows testing of multiple surfaces under controlled laboratory conditions.
Fin/Land Profile

- Texture in the upward (positive) direction
- Positive fin profile causes an increase in noise
- Textures with high fin/land variability produce higher noise levels
Conventional Diamond Grinding (CDG)

- CDG creates grooves with a positive fin profile
- High land variability

Conventional Diamond Grinding

- Width of diamond blades: (3.0 to 3.2 mm)
- Land area: - 2 mm for hard aggregate
  - 2.8 mm for soft aggregate
Texture In Negative Direction To Reduce Noise Level

- Reducing the macro texture to promote a uniform fin profile will reduce the overall noise level
- Texture in the downward (negative) direction
- Controlled land profile
NGCS Construction On US 290
### Projects

![Map of Projects](image)

<table>
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<tr>
<th>A</th>
<th>B</th>
<th>C-2</th>
<th>C-1</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<th>H</th>
<th>I</th>
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<td><strong>Project Limits</strong></td>
<td>FM 2920 to Badtke Rd</td>
<td>Badtke Rd to Bauer</td>
<td>Bauer Rd to Mason Rd</td>
<td>Mason Rd to Muehskie Rd</td>
<td>Muehskie to Telge Rd</td>
<td>Telge Rd to Eldige Pkwy</td>
<td>Eldridge Pkwy to FM 529</td>
<td>FM 529 to W. Little York</td>
<td>W. Little York to Pinemont</td>
<td>Pinemont to W. 34th St</td>
<td>US 290/IH 610</td>
<td>US 290/IH 610</td>
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<tr>
<td><strong>Contract Amount</strong></td>
<td>$60m*</td>
<td>$33m*</td>
<td>$37m*</td>
<td>$49m*</td>
<td>$85m*</td>
<td>$135m*</td>
<td>$58m*</td>
<td>$110m*</td>
<td>$153m*</td>
<td>$143m*</td>
<td>$107m*</td>
<td>$152m*</td>
</tr>
<tr>
<td><strong>% Complete</strong></td>
<td>45%</td>
<td>44%</td>
<td>61%</td>
<td>56%</td>
<td>69%</td>
<td>44%</td>
<td>55%</td>
<td>83%</td>
<td>44%</td>
<td>58%</td>
<td>85%</td>
<td>46%</td>
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- 13 active construction projects -- $1.27B under construction

*Actual Contract Bid*
NGCS Operations/Equipment

- NGCS is constructed with a multi-pass operation
- Conventional grinding equipment is used for construction
Two Step Process To Construct NGCS

- NGCS grinding is the first step
- Creates uniform controlled land profile

- NGCS grooving to create negative texture

Step 1

Step 2
Multi-pass Construction

Diamond Grinding Step 1  \rightarrow  NGCS Grinding Step 2  \rightarrow  NGCS Grooving Step 3
Conventional Diamond Grinding

- Prior to NGCS grinding
- CDG is used to remove existing/temporary tining that is too deep
- Different blade set-up
- Can open traffic after CDG with temporary striping
Temporary Carpet Drag

- Prior to NGCS grinding
- Used in lieu of temporary tining
- Save time/money
US 290 Monitoring

- Location of lanes surveyed
  - IH-610 North Loop between TC Jester and Ella (US 290 and IH-610 project)

- Data Collected (Sound Level, Skid Resistance, Ride Quality)
  - Pre-NGDG (next generation diamond grinding)
    - November 2014
  - Post-NGDG (approximately 3 months after opening to traffic)
    - March 2016
  - Post-NGDG (approximately 6 months after opening to traffic)
    - July 2016
Skid Resistance Equipment

- Locked-wheel skid trailer
- ASTM E 274
Skid Number Lane R1

Average SN

Lane R1
- Pre-NGDG
- Post-NGDG-3mo
- Post-NGDG-6mo

Distance from Starting Point (mi)

0.0 0.1 0.2 0.3 0.4 0.5 0.6
Skid Number Lane L1

Average SN

Lane L1

- **Pre-NGDG**
- **Post-NGDG-3mo**
- **Post-NGDG-6mo**

Distance from Starting Point (mi)

Distance from Starting Point (mi)
Ride Quality Equipment

- Inertial profiler for ride quality
- Test Procedure for Operating Inertial Profilers and Evaluating Pavement Profiles
- TxDOT Designation: Tex-1001-S
On-Board Sound Intensity (OBSI) Equipment

- Standard Reference Test Tires (SRTT)
OBSI Data

The chart shows the OBSI (dBA) levels for R1, R2, L1, and L2 pre- and post-NGDG.

- **R1**: Pre-NGDG = 101.8, Post-NGDG-3mo = 101.5, Post-NGDG-6mo = 101.3
- **R2**: Pre-NGDG = 107.6, Post-NGDG-3mo = 101.3, Post-NGDG-6mo = 101.1
- **L1**: Pre-NGDG = 107.8, Post-NGDG-3mo = 102.2, Post-NGDG-6mo = 102.1
- **L2**: Pre-NGDG = 107.6, Post-NGDG-3mo = 107.4, Post-NGDG-6mo = 101.3