“Smooth Ride?”
Contractor Performed Tests in the Quality Assurance Process:

The Nevada Experience

Presented by:
Steven Hale, P.E.
Outline

• Roadways maintained by NDOT

• NDOT’s Pavement Management System

• Smoothness specification
  - HMA pavements
  - PCC pavements
  - Bridge decks
Outline

• Contractor’s results for acceptance

• What NDOT field inspectors are taught

• Success of using contractor’s results
  – Smoothest interstates in 2003
  – National pavement conditions in 2007

• What the future holds
Roadways Maintained by NDOT

- Interstate (NHS) - 560 miles
- NHS Routes (except Interstates) - 1,545 miles
- STP Routes - 2,674 miles
- Other Routes - 670 miles
Roadways Maintained by NDOT

5,449 MILES
State System is 21% of all improved roads and streets in the state but carries 59% of all the traffic miles.

NHS - National Highway System
STP - Surface Transportation Program

NATIONAL HIGHWAY SYSTEM (except interstate)
1,545 MILES (28.4%)

INTERSTATE (NHS)
560 MILES (10.3%)

STP
2,674 MILES (49.1%)

ROADS NOT IN OTHER CATEGORIES
670 MILES (12.3%)

10/18/05
NDOT’s Pavement Management System

- How is ride data collected
  - NDOT uses a ride van
  - Collects 10,000 data points per second
  - Data is processed by proprietary software
NDOT’s Pavement Management System

• Frequency of ride testing:
  - Data is collected on NHS routes yearly
  - Data is collected on STP & HPMS in odd years

• Importance of ride data
  - Data assists in project prioritization
Smoothness Specification for Roadways
Smoothness Specification for Roadways

- Straightedge measurement
  - NDOT personnel perform measurement
  - Twelve foot straight edge is used
  - Measurements taken both parallel and perpendicular to centerline
  - Roadway surface shall not vary by more than 1/4 in. (1/8 in. for PCCP)
Smoothness Specification for Roadways
Smoothness Specifications for Roadways

- Profilograph measurement
  - Contractor provides California type profilograph
  - Contractor performs testing
  - Other types of profilographs can be used
  - NDOT oversees testing and evaluates results
Smoothness Specification for Roadways

- NDOT specifies three different smoothness types
  - Type A
  - Type B
  - Type C

*Only Type A smoothness used for PCCP*
Smoothness Specification for Roadways

- “Must Grind” specification
  - Corrective measures for dense-graded plantmix and PCCP
  - Corrective measures for an open-graded friction course
Smoothness Specification for Bridge Decks
Smoothness Specification for Bridge Decks

- **Straigtedge measurement**
  - NDOT personnel perform measurement
  - A 12 ft straight edge is used
  - Roadway surface shall not vary by more than 1/8 in. (Without overlay)
  - Roadway surface shall not vary by more than 1/3 in. (With an overlay > 1 in. thickness)
Smoothness Specification for Bridge Decks

• Profilograph measurement
  - Only concerned with “Must Grinds”

• “Must Grind” specification
  - Corrective measures for a bridge deck
Contractor’s Results for Acceptance

- NDOT does not perform profilograph testing
  - Lack of manpower
  - Initial cost of profilograph equipment
  - Maintenance costs associated with equipment
What NDOT Field Inspectors are Taught

- Prior to profilograph testing:
  - Review Standard Specifications
  - Review project’s Special Provisions
  - Entire length of each traffic lane is measured within 48 hours of each days placement
What NDOT Field Inspectors are Taught

- Assist in calibration of profilograph
- Wheelbase = 25’
- Tire pressure = 25 psi or manufacturer’s spec.
- Vertical height calibration
- Longitudinal distance calibration
- Check scale on computerized chart
- Check computer printout
What NDOT Field Inspectors are Taught

- During profilograph testing:
  - Be present during all operations
  - Use 12’ straightedge to perform spot checks
  - Testing performed in correct location
  - Testing performed in direction of travel
  - Check speed of the profilograph
What NDOT Field Inspectors are Taught

- After profilograph testing:
  - Test form is complete and accurate
  - Accuracy is especially important if ride incentive/disincentive specified on project
# NEVADA DEPARTMENT OF TRANSPORTATION

## Report of Profilograph Test

### Report Number: T-1-1  Contract No: 3265

**Lane Description:** Southbound  
**Date of Test:** 10/17/2005  
**Lot No:** N/A  
**Date of Placement:** 10/18/2005  
**Type of Material:** Plantmix-Type 2

### Smoothness Type: A

**Contractor:** Road & Highway Builders

**Type of Material:** SPF-95A

<table>
<thead>
<tr>
<th>Station to Station</th>
<th>Section Length (km or mile)</th>
<th>Counts (tenths of an inch)</th>
<th>High Point Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X ~ 93+00 to X ~ 96+76</td>
<td>0.071</td>
<td>2.8</td>
<td>96.76-9930=976/5280=0.171</td>
</tr>
<tr>
<td>X ~ 96+76 to X ~ 102+04</td>
<td>0.100</td>
<td>3.5</td>
<td>1/0.171=2.8 - 3.0 Counts</td>
</tr>
<tr>
<td>X ~ 102+04 to X ~ 107+32</td>
<td>0.100</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>X ~ 107+32 to X ~ 112+60</td>
<td>0.100</td>
<td>6.5</td>
<td>Fails to meet in./0.1mi Spec. Bump grind @ 112+37</td>
</tr>
<tr>
<td>X ~ 112+60 to X ~ 117+88</td>
<td>0.100</td>
<td>20.0</td>
<td>Fails to meet in./0.1mi Spec. Bump grind @ 117+96, 116+12, 115+20</td>
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<tr>
<td>X ~ 117+88 to X ~ 123+16</td>
<td>0.100</td>
<td>6.5</td>
<td>Fails to meet in./0.1mi Spec. Bump grind @ 118+64</td>
</tr>
<tr>
<td>X ~ 123+16 to X ~ 128+44</td>
<td>0.100</td>
<td>0.0</td>
<td></td>
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<tr>
<td>X ~ 128+44 to X ~ 133+72</td>
<td>0.100</td>
<td>4.0</td>
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<tr>
<td>X ~ 133+72 to X ~ 139+00</td>
<td>0.100</td>
<td>7.0</td>
<td>Fails to meet in./0.1mi Spec. Bump grind @ 136+44</td>
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<tr>
<td>X ~ 139+00 to X ~ 144+28</td>
<td>0.100</td>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

**TOTALS:** 0.971 58.3

**Average Profile Index:** 6.004

**PROFILE INDEX**

<table>
<thead>
<tr>
<th>Type</th>
<th>Counts (mm)</th>
<th>Smoothness Type</th>
<th>Metric: P.I. = 1 km/Length of profiles in km X counts in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>80 (5)</td>
<td>8 (0.5)</td>
<td>mm/km (in./mi)</td>
</tr>
<tr>
<td>B</td>
<td>110 (7)</td>
<td>11 (0.7)</td>
<td>mm/0.1km (in./0.1mi)</td>
</tr>
<tr>
<td>C</td>
<td>160 (10)</td>
<td>16 (1.0)</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**

**Resident Engineer:**  
**Inspector:**  
**Operator:**  

[Signature]

[NDOT 444-073]  
[REV 12/03]  

Distribution: Resident Engineer, District, Headquarters, Construction, Contractor
Success of Using Contractor’s Results

- Nevada ranked #1 in 2003
  - 75% of Interstates w/ “very smooth” condition
  - Georgia ranked second with 68%
  - Most states are well under 50%
Success of Using Contractor’s Results

• Nevada ranked #2 in 2007
  - 81% of its roadways in “good condition”
  - Georgia was ranked #1 with 92%
National Pavement Conditions

Pavement Conditions by State, 2007
Includes all Arterial Routes, including Interstates, freeways, and major urban routes

<table>
<thead>
<tr>
<th>State</th>
<th>Poor</th>
<th>Mediocre</th>
<th>Fair</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delaware</td>
<td>10</td>
<td>17</td>
<td>29</td>
<td>44</td>
</tr>
<tr>
<td>Florida</td>
<td>2</td>
<td>11</td>
<td>10</td>
<td>76</td>
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<td>Georgia</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>92</td>
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<tr>
<td>Hawaii</td>
<td>27</td>
<td>44</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>Idaho</td>
<td>11</td>
<td>14</td>
<td>18</td>
<td>57</td>
</tr>
</tbody>
</table>

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# National Pavement Conditions

## Pavement Conditions by State, 2007

Includes all Arterial Routes, including Interstates, freeways, and major urban routes

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</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>3</td>
<td>8</td>
<td>13</td>
<td>76</td>
</tr>
<tr>
<td>Nebraska</td>
<td>7</td>
<td>17</td>
<td>14</td>
<td>62</td>
</tr>
<tr>
<td>Nevada</td>
<td>5</td>
<td>8</td>
<td>14</td>
<td>81</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>13</td>
<td>14</td>
<td>13</td>
<td>60</td>
</tr>
<tr>
<td>New Jersey</td>
<td>46</td>
<td>32</td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>

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National Pavement Conditions

• The top five states:

1. Georgia – 92% (good condition)
2. Nevada – 81% (good condition)
3. Montana – 76% (good condition)
4. Florida – 76% (good condition)
5. Kansas – 75% (good condition)
What the Future Holds

- Continue using contractor’s results
- Develop profilograph workshop for inspectors
- Ride incentive/disincentive for PCCP
- Possible movement to a zero blanking band
- Possible movement to IRI
2011 RPUG Conference
Questions???
Thank you