Pavement Warranties

An Industry Perspective*

James A. Musselman, P.E.
14 August 2018
*Disclaimer*
CRH Americas Materials
(Formerly known as Oldcastle Materials)

The leading vertically integrated supplier of aggregate, cement, asphalt, ready mixed concrete and paving and construction services in North America.

- No. 1 in asphalt production and paving (51.2 million tons)
- No. 1 in aggregate production (184.4 million tons)
- No. 2 in ready mixed concrete production 12.4 million cubic yards

- 24,100 employees
- 1,300 operating locations
- 44 US states
- 6 Canadian provinces
CRH Americas Materials Operations

- Aggregate Mines (605)
- Asphalt Plants (441)
- Ready Mix Plants (351)
Warranty Benefits
(Primarily Agency Perspective)

- Eliminate construction specifications & requirements
  - Impossible to write perfect specs
- Reduce inspection costs (big $$)
- Potentially allow for more innovation by the Contractor
  - SMA, Superpave, Polymers, European mixes, etc.
  - Speed up construction
- Reward high quality Contractors
  - Hold low quality Contractors more accountable
- Perfect World: 15 to 20 year Warranty Period
  - Ride, rutting, cracking, friction - main performance indicators
Warranty Risks
(Primarily Industry Viewpoint)

- Pavement design and pavement condition
  - Who’s doing the design?
  - New construction vs. milling & resurfacing
  - Underlying materials, reflective cracking, etc.
- Loading/traffic predictions
- Liability
- Bonding
  - Extended warranty period a problem for Sureties
    - “Contingent Liabilities”
- There is no “magic button” for good performance
- Impact on smaller Contractors
Experiences in Florida

Background:

- 1980’s & Early 1990’s: History of premature rutting problems in Florida
- High volume projects (Interstate Highways)
- Numerous pavement failure investigations (and Inspector General investigations)
- Widespread attention:
  - FDOT Management; FHWA; Industry; Media
Experiences in Florida

Background (Cont’d):

- **Mid-1990’s:**
  - Limited softer aggregate materials
  - Began controlling volumetrics
  - Still had rutting problems
    - Generally the same contractors

- **Late 1990’s:**
  - Began discussions on pavement warranties
  - More rutting problems
  - More warranty discussions

- **October 2002**
  - Pavement Warranty Committee formed
Goal: Develop a warranty/guarantee system for Design-Build and Design-Bid-Build projects

▪ Representation from FDOT, Industry and FHWA
  - FDOT: Construction, Materials, Design and Pavement Management

▪ Target date: January 2004 Letting
Development of the Warranty Specification
“Value Added Asphalt Pavement Specification”

- Initially established warranty period at five years for Design-Build projects
  - Revised to three years for all Design-Bid-Build asphalt projects

- Tied to Contractor’s prequalification
  - No bonding requirements

- Established pavement categories:
  - **Category 1**: Mainline roadways with a design speed 55 mph and greater.
  - **Category 2**: Mainline roadways with a design speed less than 55 mph
  - **Category 3**: Other areas
Established basic warranty criteria
- Rutting
- Ride
- Cracking
- Other (raveling, potholes, delamination, slippage, etc.)
- Stayed away from pavement friction – liability concerns

Performance determined through FDOT’s Pavement Condition Survey Program, along with observations by the Engineer.

Established a Statewide Dispute Review Board
- Specializing in asphalt

Established threshold levels and remedial actions
- Considered historical data of good-performing projects

Identified exclusions
Threshold Levels - Rutting

- 11 Good-Performing Interstate projects built in 1996
- All Marshall mix projects – No Superpave
- Projects evaluated in 0.1 mile lots – High Speed Profiler
- 1242 lots, three years old:
  - Avg. Rut = 0.12 in.
  - Std. Dev = 0.071
- Threshold Level: >0.25 in.
  - 4.7% exceeds value
## Example of Rutting Data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53002</td>
<td>NUMBER</td>
<td>199</td>
<td>197</td>
<td>197</td>
<td>198</td>
<td>197</td>
<td>196</td>
</tr>
<tr>
<td>I-10</td>
<td>LOW</td>
<td>0.04</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>0.000 – 10.252</td>
<td>MEAN</td>
<td>0.14</td>
<td>0.12</td>
<td>0.14</td>
<td>0.11</td>
<td>0.14</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>HIGH</td>
<td>0.23</td>
<td>0.26</td>
<td>0.27</td>
<td>0.27</td>
<td>0.26</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>STD DEV.</td>
<td>0.0369</td>
<td>0.0486</td>
<td>0.0465</td>
<td>0.0620</td>
<td>0.0582</td>
<td>0.0647</td>
</tr>
</tbody>
</table>
Threshold Values - Rideability

- Same 11 projects
- Measured with FDOT’s High Speed Profiler
- Used Ride Number (RN)
- 1241 lots, three years old:
  - Avg. Ride = 4.46
  - Std. Dev = 0.191
- Threshold Level: < 3.70
  - < 1% fails criteria
Threshold Values - Cracking

- Same 11 projects
- Determined manually per PCS Handbook
- Threshold Value > 1/8”
  - Accumulated cracking length >30 feet
- Historically, cracking does not appear in first three years
<table>
<thead>
<tr>
<th>Type of Distress</th>
<th>Threshold Values</th>
<th>Remedial Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rutting (1)</td>
<td>Depth &gt; 0.25 inch</td>
<td>Remove and replace the distressed LOT(s) to the full depth of all layers and to the full lane width (2)</td>
</tr>
<tr>
<td>Ride (3)</td>
<td>RN &lt; 3.5</td>
<td>Remove and replace the friction course layer for the full length and the full lane width of the distressed LOT(s) (4)</td>
</tr>
<tr>
<td>Settlement/Depression (5)</td>
<td>Depth ≥ 1/2 inch</td>
<td>Propose the method of correction to the Engineer for approval prior to beginning remedial work</td>
</tr>
<tr>
<td>Cracking (6)</td>
<td>Cumulative length of cracking &gt; 30 feet for Cracks &gt; 1/8 inch</td>
<td>Remove and replace the distressed LOT(s) to the full depth of all layers, and to the full lane width (7)</td>
</tr>
<tr>
<td>Raveling and/or Delamination affecting the Friction Course (8)</td>
<td>Any length</td>
<td>Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end</td>
</tr>
<tr>
<td>Pot holes and Slippage Area(s) (8)</td>
<td>Observation by Engineer</td>
<td>Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end</td>
</tr>
<tr>
<td>Bleeding (9)</td>
<td>Loss of surface texture due to excess asphalt, individual area ≥ 10 sf.</td>
<td>Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end</td>
</tr>
</tbody>
</table>

(1) Rutting: Rut depth to be determined by Laser Profiler in accordance with the Flexible Pavement Condition Survey Handbook. For any LOT that cannot be surveyed by Laser Profiler, the rut depth will be determined manually in accordance with the Flexible Pavement Condition Survey Handbook, with the exception that the number of readings per LOT will be one every 50 feet.

(2) Full depth of all layers is determined by the depth of the bottom of the distress.

(3) RN: roller force number.

(4) Full lane width is determined by the lane width of the distressed LOT(s).

(5) Full depth of all layers is determined by the depth of the bottom of the distress.

(6) Cracking: Cumulative length of cracking and cracks greater than 1/8 inch.

(7) Full lane width is determined by the lane width of the distressed LOT(s).

(8) Full distressed area plus 50’ on each end.

(9) Loss of surface texture due to excess asphalt, individual area ≥ 10 sf.
Key Takeaways from the FDOT Specification

▪ Applies to all asphalt projects
▪ All requirements of the FDOT construction specifications still apply
  - FDOT inspection is still applicable
▪ Warranty Period – Lasts for three years after Final Acceptance
▪ Project subdivided into 0.1 mile lots per lane
▪ Remedial work clearly defined (basically remove and replace 0.1 mile lot to full distressed depth and width)
▪ Disputes handled through Statewide Disputes Review Board
▪ Failure to perform: Contractor’s certificate of qualification revoked for a minimum of six months or until the remedial work is completed (whichever is longer)
Florida Experiences to Date

- Specification was adopted on all projects beginning in January 2004.
- To date, primarily “smaller” remedial actions have been required (Slippage, Bleeding, Raveling, and Localized rutting)
  - No large, project-wide repairs
- Typically 1 - 3 remedial actions/district/year
  - ~500 projects constructed each year
- Initially took FDOT several years to develop a “system” to address any problems
FDOT Position

Positives
- Helps to prevent obviously bad material from being placed (The Good Angel Effect)
  - Holds Contractors accountable for their work
- Further reduces risks of premature failures – specifically rutting
- System has been well-received by Industry
  - Not many issues have gone to the DRB
- Helping to improve pavement performance in Florida
  - One piece of the puzzle

Negatives
- A lot of projects to monitor and keep up with
- Would like to see longer warranty periods & ultimately reduce FDOT involvement on projects
- Does not adequately address cracking – which is the biggest distress in Florida
Industry Position (in Florida)

**Positives**
- Short-term and not long-term
- No warranty bond required
- Relatively simple to meet the performance criteria
- Helps to reduce the “Bad Actors”
- Good way to Partner with FDOT

**Negatives**
- Inconsistent enforcement by Districts
- Overly critical enforcement in some instances
- Bigger contractors have an advantage over smaller ones
Summary of Industry Concerns

- Unrealistic performance requirements
  - Needs to be based on real performance data
  - Don’t expect 20 year performance if you currently get 10 years. If you do, expect to pay for it!

- Responsibility for issues outside the Contractor’s control
  - Bad pavement design, underlying layers, traffic volumes and loading, accidents, etc.

- Poorly worded specifications where the interpretation changes over the warranty period – i.e., “…the guy who wrote the spec retires”.

- Liability – A car accident and we’re in litigation!

- General reluctance of Agencies to allow innovation

- Bonding - Extended warranty periods are a problem for Sureties
  - Contingent Liabilities
Thank You – Questions?

James A. Musselman, P.E.
Asphalt Performance Manager
Performance - Asphalt

CRH Americas Materials, Inc.
14 Monument Square, Suite 302
Leominster, MA 01453-1184

T +1 (774) 364 5894
E jim.musselman@na.crh.com

www.crhamericasmaterials.com