Panel Discussion: Putting Durability into Superpave Mixes

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2007 Survey of State Asphalt Pavement Associations

- Has your State altered the Superpave design process
- 20 respondents
  - 83% YES
  - 17% NO
Adjusting Superpave

Changes to Superpave

<table>
<thead>
<tr>
<th>Property/Criteria</th>
<th>% of Respondents</th>
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<tbody>
<tr>
<td>Gyr</td>
<td>56%</td>
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<tr>
<td>AV</td>
<td>22%</td>
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<tr>
<td>VMA</td>
<td>33%</td>
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<tr>
<td>ESAL</td>
<td>22%</td>
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<tr>
<td>FAA</td>
<td>17%</td>
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<tr>
<td>VFA</td>
<td>11%</td>
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<tr>
<td>DB</td>
<td>17%</td>
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<tr>
<td>AC</td>
<td>11%</td>
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New Jersey
New Jersey

- We don’t claim to have the answer to the question about the durability of Superpave mixes...
- But we have learned some things since our first project in 1996.
New Jersey

- Started with four traffic levels:
  - V – very high
  - H – high
  - M – medium
  - L – low
- Eliminated the “V” mixes as we felt that the mixes were too dry.
New Jersey

- Started with 19 mm surface course for Interstates.
- Found too difficult to make longitudinal joints so quickly went to 12.5 mm surface course (minimum lift of 2”).
- Now also looking at 9.5 mm surface course and for a thin overlay 4.75 mm surface course with modified binder to prevent rutting.
New Jersey

- Traditionally used AC–20 asphalt binder with an occasional project with modified binder.
- With advent of Superpave, started using more PG 76–22 SB/SBS Modified.
- Last year 75% of the 2.5 M tons of HMA contracted out required PG 76–22.
Performance Testing
  ◦ APA Rut Test
  ◦ Fatigue Test
  ◦ TTI Overlay Tester
  ◦ Simple Performance Test

Nothing definitive yet and not used across the board. Looking at these tests during research and with some of our special mixes.
New York
New York History

- 1996– One of five Superpave lead states
- Immediately experienced how the gyratory compactor impacted PGB contents.
  - Difficulty w/field compaction
  - Difficulty w/Segregation
- Altered gyrations in step with early change and guidance of ETG during implementation, including elimination of back calculation from Nmax.
  - $> 30 = 125$ at Ndes
  - $< 30 = 100$
  - $<3.0 = 75$
  - $< 0.3 = 50$
Premature failure of pavements widely acknowledged in New York

Task group including NYSDOT and NYCMA members monitored national research and trends in other states, and implemented the following changes:

- Air Void Target reduced from 4.0% to 3.5%
- Increased requirement of % passing 2.36 mm by 3%
- Reduced gyrations
  - > 30 = 100 gyrations
  - < 30 = 75
  - < 3.0 = 65
  - < 0.3 = 50
In addition:

- Increased PGB minimum requirements.
- Implementation on existing contracts included payment of $1.00/HMA ton for additional PGB
  - 37.5 mm = 3.7%
  - 25.0 mm = 4.2%
  - 19.0 mm = 4.5%
  - 12.5 mm = 5.2%
  - 9.5 mm = 5.8%
Impact of changes

- Evidence is largely anecdotal
  - Crews report easier compaction
  - DOT reports less segregation and “issues” in general
  - Improved durability is anticipated, less “graying” of pavements in short term
NYSDOT
Compaction Data
2002–2007

50 Series
2002 - 2007 Comparison

Density - %MMTD

% of Lots
Mix Design Change 2006

Compaction Failures in NY

Year

% Failure

0 10 20 30 40

2002 2003 2004 2005 2006 2007

% Over comp % Under comp
Pennsylvania
Pennsylvania

Many initiatives through our Joint PennDOT/PAPA/FHWA Asphalt Paving Quality Improvement Task Force (APQITF)

- In 2001, after review of Superpave projects:
  - Reinforced policy for wearing course thickness to be minimum 3X the NMAS of mixture.
  - Recommended use of 9.5 mm Wearing Courses instead of 12.5 mm Wearing Courses especially in the Northern & colder regions & on lower design ESAL roadways.
In 2003:
- Increased density requirements for both Standard Paving and Restricted Performance Paving (RPS)
  - Standard
    - From single min. 88% and lot average min. 90%
    - To single min. 90% and lot average min. 92%
  - RPS
    - From single min. 90% and lot average min. 92%
    - To single min. 92%
Pennsylvania

- In 2004:
  - Increased required frequency (to daily) for HMA producers to perform AASHTO T 209.
  - Required min. oven aging to account for potential asphalt absorption by absorptive aggregates before performing AASHTO T 209 (more accurate effective AC and Density).
  - Revised AASHTO T 283 procedure for vacuum, freeze cycle time, soak time and tensile strength variation of dry and conditioned specimen sets.
In 2005:

- Required minimum production VMA to equal minimum design VMA (AASHTO).
- Required use of PG 64–22 to tack vertical surfaces of longitudinal and transverse joints.
- Increased min. thickness of 19 mm Binder Courses from 2” to 2½”.
Pennsylvania

- In 2006:
  - Began longitudinal joint study
  - Benchmarked with Maryland SHA
  - Constructed 2 projects comparing contractor’s normal joint construction/compaction technique vs. MDSHA technique

- In 2007
  - Constructed 4 more joint comparison projects
  - Evaluated comparison study results
  - Began collecting baseline joint density using cores
Pennsylvania

- In 2008:
  - Implemented Longitudinal Joint BMPs.
  - 2007 Forensic investigation of 8 projects in Northwestern PA
    - Clarified equipment & aging procedures for AASHTO T 209.
    - Revised AASHTO T 283 procedures for vacuum, freeze cycle time, soak time and min. tensile strengths of dry and wet specimen subsets.
    - Revised Gyrations from 125 to 100 for design ESALS > 30 Million
    - Increased min. design VMA by 0.5 to 1.0%.
Rhode Island
All HMA pavements fail eventually

How do they fail?
Permanent Deformation

Cracking
Rhode Island aggregates are such that rutting has not been a problem.

Virtually all mixes in RI use 100% manufactured aggregate.
In general, Rhode Island roads fail because they crack.

- It has taken us quite some time to adopt Superpave.
- Most Superpave projects we have completed show increased cracking over our standard Marshall mixes.
How do we adopt Superpave such that our optimum asphalt contents remain acceptable?
Increase VMA by one percent over AASHTO requirements.

All mixes designed at 50 gyrations.
Modified binder is specified at intersections and on heavily travelled roads
Consider range of voids other than 3.0 to 5.0 percent?
New Hampshire