High Performance Hot Mix Asphalt Intersections
Develop A Strategy

- Recognize that intersections may need to be treated differently than posted-speed pavements.
Intersection Strategy

- Assess the problem (if rehabilitating)
- Ensure structural adequacy
- Materials selection, mix design and quality control
  - SUPERPAVE Mix Design System
- Practice proper construction techniques
MD Intersection Competition

- MD SHA formed a “Rutting Team” in 1993
- No solutions found
- In 1994 two intersections on RT 40 given to HMA & PCC industries
  - Use any available technology - can ignore MD DOT specs
  - Work within a budget
  - Best performance wins
Maryland Asphalt Association Strategy

- Form Task Force
  - MD Asphalt Association
  - NAPA
  - Asphalt Institute
- Perform forensic analysis on existing roadway before deciding on a solution
- Consider new technology
Before - 1.5” Rutting per Year
Before - Westbound RT 40
Forensics - Roadway Trench
Forensics - 10” Roadway Cores
Forensics - Hamburg Wheel Tracking Device Testing

![Graph showing rut depth vs. number of wheel passes for different mixes.]

- **Rut Depth, mm**
  - 19mm Plant Mix
  - 19mm Core
  - Existing HMA

**Number of Wheel Passes**

0 4000 8000 12000 16000 20000
Rutting was evident almost to the bottom of existing 8” HMA in trench. Remove and replace all 8” of existing HMA. Use SUPERPAVE mixes rather than MD SHA mixes. Coarser aggregate structure. Specify asphalt binder to meet both climatic and traffic conditions.
Pavement Design Selection

- **Section 1 - 8”**
  - Mill 8” & Pave 8”
  - Test Section to be compared to PCC intersection

- **Section 2 - 5”**
  - Mill 5” & Pave 5”
  - Compare performance to 8” section

- **Section 3 - 2”**
  - Mill 2” & Pave 2”
  - Cosmetic improvement
Asphalt Binder Selection

- Standard Climatic Grade - PG 64-22
- Traffic Data
  - 20 year ESAL’s = 12.8 million
  - 12% Trucks
- “Bump” asphalt binder two grades for stopped traffic
- Selected asphalt grade was PG 76-22
- Used a stabilized SBS polymer modified asphalt
Paving Schedule

- All work done at night - 7:00PM to 6:00AM
- Avoided rush hours
- Little or no traffic disruption
- Work accomplished in 8 nights - 15,000sy of milling & paving
- PCC intersection - 12 days and nights (24 hour lane closure) - for 1700sy of paving
Vehicles Affected by Work Zone

US RT 40 - ADT 29,000
- 12% Trucks
Maintenance of Traffic

- Placed temporary HMA ramps at all entrances after milling operation.
Compaction

- Used 2 double drum vibratory rollers
- High frequency, low amplitude
- NO TENDER ZONE
- Achieved density
QC Test Results - 25mm Mix

<table>
<thead>
<tr>
<th>Test</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2'' #8</td>
<td>60</td>
<td>59.2</td>
</tr>
<tr>
<td>#8</td>
<td>20</td>
<td>20.1</td>
</tr>
<tr>
<td>#200</td>
<td>2.5</td>
<td>3.3</td>
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<tr>
<td>Asphalt</td>
<td>4.4</td>
<td>4.46</td>
</tr>
<tr>
<td>Content</td>
<td>5.5</td>
<td>6.1</td>
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<tr>
<td>In-Place Air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voids</td>
<td></td>
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</tr>
</tbody>
</table>

- **Target**
- **Actual**
Completed 25mm Base Paving
After - RT 40 Eastbound
After - RT 40 Eastbound
Performance Testing - Ride

- Used California Type Profilograph
- Measured both HMA intersection and PCC intersection one year after paving
Ride Testing - Results

Inches/ Mile

- HMA
- PCC

13
41
Performance Testing - Rutting

- Transverse Profilograph
- Pen holding device follows roadway surface
- Pen draws profile on chart paper
- After 5 years - 1/16” rutting
Performance Testing - Rutting
PCC Performance - After 4 Years (6.25” Whitetopping)
Conclusions

- Intersections require special treatment
- Develop a strategy
  - Forensic investigation
  - Structural strength
  - Aggregate structure
  - Correct Asphalt Binder grade
  - Good construction practices
How do they compare?
PCC Performance - July 2000

- PCC installed in Spring 1995
- PCC removed July 2000 & replaced with SUPERPAVE
Conclusions

SUPERPAVE provides excellent solutions for intersections at substantial cost savings compared to PCC.
PCC Performance - July 2000

- PCC required **288 hours** to install
- PCC removed and replaced with HMA in **22 hours**
Initial Cost Comparison

![Bar chart showing initial cost comparison between HMA and PCC. The cost for HMA is 36 dollars per SY, and the cost for PCC is 103 dollars per SY.](image-url)
Somerset Intersection Update

Kentucky Intersection Study
## Somerset Statistics

<table>
<thead>
<tr>
<th>Asphalt</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>8818 Square Yards</td>
<td>7865 Square Yards</td>
</tr>
<tr>
<td>Worked 7 evenings</td>
<td>38 Calendar days</td>
</tr>
<tr>
<td>5 inches milled and replaced</td>
<td>4 inch white-topping inlay</td>
</tr>
<tr>
<td>Utilized PG 76-22</td>
<td>Cost of $50 per square yard</td>
</tr>
<tr>
<td>Cost of $25.25 per square yard (48% less than concrete)</td>
<td>Currently 108 cracked slabs</td>
</tr>
<tr>
<td>Currently meets and exceeds performance expectations</td>
<td>Many slabs may require replacement in 2001</td>
</tr>
</tbody>
</table>
PCC Sections

May 17, 2001
PCC Sections

May 17, 2001
PCC Sections

May 17, 2001
I-10 Suwannee County Weight Stations

- **Westbound Lane**
  - SBS Modified HMA
    - PG 76-22
    - 12.5 mm TL 5 Mix Virgin
    - Two - 2 inch thick lifts

- **Eastbound Lane**
  - Ultra Thin Whitetopping
Asphalt intersections work when designed and built properly.
PCC does not always work, is expensive, and can cause congestion.
PCC whitetopping performance tied to the quality of the underlying HMA
HMA is the better choice.