Roller-Compacted Concrete Pavements for Highways

TN Concrete Pavement & Cement-Based Pavement Solution Conference
Nashville, TN
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Outline

- RCC Utilization
- Use for High Speed Roads/Highways
- South Carolina DOT Experience
Acknowledgement

Significant portions of the information presented herein have been provided by:

- Andy Johnson, SC State Materials Engineer, and
- Corey Zollinger, Director of Paving Solutions, Cemex

Their contributions are greatly appreciated
RCC use has increased in parts of the country as the owners & engineers specify projects, and contractors take the necessary steps to be trained and gain experience with the product.
Grew faster in 2000’s, may be faster this decade

Cumulative RCC SY

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<th>Year Period</th>
<th>1975 - 1999</th>
<th>2000-2010</th>
<th>2011-2013</th>
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<tr>
<td># of Projects</td>
<td>71</td>
<td>99</td>
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<td>SY</td>
<td>2,999,771</td>
<td>8,933,250</td>
<td>5,293,898</td>
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Square Yards Per Year

- Grew faster in 2000’s, may be faster this decade
RCC Since 2011, # of Projects Per State

1 - # of Projects

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1 - # of Projects
RCC DOT Projects

- RCC DOT projects completed
- RCC specified as an alternate

1 # of DOT Projects
Recent Development

- ACPA’s RCC Task Force
  - RCC Explorer
  - RCC Guide Specifications

- RCC Pavement Promotion & Research Council (proposed name)
  - Inaugural meeting on Jan 22, 2014 at the World of Concrete
    - Focus on research and awareness
Use on Highways
RCC Highway Applications

- Interstate shoulders
- Lower lift in 2-lift interstate construction
- Diamond-ground surface layer*
- Base layer covered with a thin surface layer of HMA*

*diamond ground or covered with HMA to meet ride smoothness requirements
SCDOT Experience
History of RCC DOT Projects in SC

- 2000: Industry approached SCDOT
- 2002: SCDOT provided a site for demonstration near Aiken, SC, constructed March 2002.
Demonstration considered successful

February 2003
August 2013
Why is SCDOT interested?

- Industrial development/heavy loads
  - Paper plants
  - Landfills
  - Industrial plants
  - Quarries
  - Ports
  - Large truck stops
  - Military installations

- They use RCC as the riding surface
Why is SCDOT interested?

- **Urban/fast-track construction**
  - Lift thickness limitations
  - Drop-off limitations
  - Maintenance of cross-traffic
  - Rapid construction

- **Would use RCC as base under asphalt**
  - Success with Cement Stabilized Aggregate Bases
SCDOT Case Studies
US Route 78 widened from 2 lanes to 5 in 1984

Pavement design was 3.8 inches HMA plus 8 inches aggregate base

Considerable difficulty was encountered during construction due to unstable subgrade

By 2005, pavement was in very poor condition
US 78, Ladson, SC
US 78, Ladson, SC

- In 2008, existing pavement was removed to a depth of 12 inches and replaced with 10 inches RCC and 2 inches HMA
- Project length was approximately 0.9 miles, four lanes wide
- Problems were encountered with the subgrade as in the 1980s
- Overall, project went smoothly
US 78, Ladson, SC

- Construction joint issues were encountered in 2009 after a week of +100° F temperatures.
What I expected…

What we found…
Projects in Aiken and Columbia

- In 2009, four RCC projects let in two packages.

- Three projects were in the Columbia area:
  - New State Rd. (2” HMA/10” RCC)
  - Greystone Blvd. (2” HMA/10” RCC)
  - S. Beltline Blvd. (10” RCC/Diamond Grind)

- One project in Aiken, SC
  - Richland Ave. (10” RCC/Diamond Grind)
New State Road
Greystone Blvd.
Greystone Blvd.
Greystone Blvd.
Greystone Blvd.
Greystone Blvd.
S. Beltline Blvd.
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What have we learned?

- If the paver is not set up correctly, rock pockets can form in the surface.
Lessons Learned/Observations

- RCC can be placed in an urban environment without excessive traffic disruption
- Diamond grinding can be successfully done on RCC
- You only get one shot at doing it right
- Patching with thin leveling lifts will cause problems
Lessons Learned/Observations

- Adequate subgarde is critical to achieve smooth RCC surface and adequate density
- Smoother surface can be achieved when using 8” instead of 10” RCC lift
- Proper construction of joints is crucial
- Research is needed to determine best curing methods, especially at joints
Lessons Learned/Observations

- Incorporate expansion joints where needed
- Subsurface drainage may ultimately be an issue
- RCC can be diamond ground to achieve a smooth ride.
- Improve gradation of combined aggregates to reduce segregation and to improve surface texture
Questions?

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