Concrete Overlays in Maryland

North Carolina Concrete Conference
November 17-18, 2016
Durham, NC

Robert R. Long, Jr.
American Concrete Pavement Association
Mid-Atlantic Chapter
Family of Concrete Overlays

- **Thinner**
  - Bonded Resurfacing Family
    - Bonded Concrete Resurfacing of Concrete Pavements
    - Bonded Concrete Resurfacing of Asphalt Pavements
    - Bonded Concrete Resurfacing of Composite Pavements
  - Unbonded Resurfacing Family
    - Unbonded Concrete Resurfacing of Concrete Pavements
    - Unbonded Concrete Resurfacing of Asphalt Pavements
    - Unbonded Concrete Resurfacing of Composite Pavements

- **Thicker**

Bond is integral to design
Old pavement is base
Bonded Resurfacing Family

- Thin Overlays (3” – 6”)
- Over concrete, asphalt, and composites
- Bond is critical
Let’s Shuffle the Names…………

- Whitetopping
- Concrete Overlay
- Bonded Concrete Overlay
- Inlay

For our purposes today, a “concrete overlay” is a bonded concrete inlay.
History of Concrete Overlays in MD

- Overlays in MD were Asphalt on either Concrete or Asphalt Pavements
- Not a Long History of Concrete Overlays, but Use is Growing
- Pilot Project – Anne Arundel County – MD 3 at Cronson Boulevard – 2006
Why did Maryland Look at Concrete Overlays?

- Wanted to address frequent maintenance due to pavement deformation
- Improved structural capacity
- Maintains high level of serviceability
- Improve safety
First Project: MD 3 – Summer 2006

- Existing Mainline Pavement Depth: 17”+
- Asphalt Roadway
- Extensive history of rutting approaching a traffic signal
- SHA reported having to resurface in less than 2 years
- 3 through lanes with left and right turning lanes
Location Information

- Average Daily Traffic one-way
  - 2003: 67,125
  - 2025: 105,375
- Trucks ADT: 10%
- Posted speed: 50 MPH
Basic Design Details

- Mill 6” of existing Asphalt pavement
- Place 6” fiber reinforced portland cement concrete pavement
  - 3# 1 ½” polypropylene fiber per cubic yard
  - Modified Mix 6
  - 800# cement
- Weekend closures
- Saw cut in 6’ x 6’ panels
  - 1/8” saw cut
  - No reservoir
  - No seal
Milling
Milling Oops!
Lessons Learned

- Concrete Overlays can be built quickly and efficiently under traffic
- More thorough coring/pavement evaluation needed
- Stop overlay at the stop bar
- Reduce fiber and cement content
- Incorporate grinding for final surface
Completed Projects in MD

- MD 3 at Cronson Boulevard – 2006 (Mill 6” HMA and 6” Concrete Overlay)

- Benfield Boulevard Park and Ride Lot – 2010 (Mill 3” HMA and 3” Concrete Overlay)

- US 40 near MD Portable Mix Concrete Plant – 2011 (Mill 6” HMA and 6” Concrete Overlay)

- MD 355 at MD 27 – 2012 (Mill 6” HMA and 6” Concrete Overlay)

- US 50 at US 301 – 2013 (Mill 6” HMA and 6” Concrete Overlay)
Completed Projects in MD

- I-68 Truck Climbing Lanes – 2014 (Mill 6” HMA and 6” Concrete Overlay)
- MD 2 at MD 214 – 2014 (Mill 6” HMA and 6” Concrete Overlay)
- MD 182 – Bus Stop Pads – 2015 (Mill 6” HMA and 6” Concrete Overlay)
- MD 210 NB from MD 373 to Farmington Road – 2015 (Mill 4” HMA and 6” Concrete Overlay)
Single 350’ Turn Lane
Stage 1

Stage 2

Stage 3

Close to Traffic: Friday 8:00 PM
Open: Monday 5:30 AM
Completed Intersection
Three Quarters of a Full Clover Leaf
Concrete Placement
Concrete Overlay Joints
Finished Concrete Overlay
Truck Climbing Lane I-68
Selection of MD 210

- Recurring Rutting/Shoving Issues
- Heavy Cracking
- Urban instead of Rural Area
- Availability of nearby Roads for Detour or MOT
- Longer Sections instead of only Intersections
Project Description and Location

- MD 210 Northbound from MD 373 (Livingston Road) to Farmington Road
- Length – 1.43 miles
- County – Prince George’s
- District – 3
Project Description and Location
Design for MD 210

- Traffic Data including Truck Percentage (ADT – 30,000 and 4% Trucks)

- Coring
  - Cores in Mainline and Shoulder
  - The Most Important Step before Design

- MD 210 NB – Existing Pavement Structure
  - Mainline – 8” Asphalt over 6” Stone Base
  - Shoulder – 6” to 7” Asphalt over 4” Stone Base
Design for MD 210

Software
- Illinois DOT
- From ACPA Website
- AASHTO 1993 (Not Reliable)
- MEPDG (Do Not have Module for 6” Concrete Overlay)
- University of Pittsburgh – BCOA-ME
Design for MD 210

- **Design Output**
  - 6” Concrete Overlay

- **Final Recommendations**
  - 4” Milling and 6” Concrete Overlay
  - Typical 6’ X 6’ Joint Spacing Slabs without Dowel Bars
Maintenance of Traffic

MOT Options

1. Total Closure of MD 210 NB during Weekends
   - Detour was not practical

2. Double Lane Closure and Maintain only One Lane on MD 210 during weekends
   - Longer Construction Duration
   - Excessive Queues
   - Mercy of Weekend Weather

3. Double Lane Closure counting Outside Shoulder as lane for 7 days/week (Selected)
   - Shorter Construction Duration
   - Shorter Queue than Option 2
MOT (cont.)

MOT Option 3 was selected

- Shorter Queue
- Shorter Construction Duration
- Phase 1 – Slow Lane and Outside Shoulder to be Closed. Maintain Traffic on the Existing Middle and Fast Lane
- Phase 2 – Fast Lane and Middle Lane to be Closed. Maintain Traffic on the already Constructed Slow Lane and Outside Shoulder
MOT (cont.)

- Concrete Construction Barrier Placement
- Heavy PR campaign from SHA
MOT Challenges

Typical for MOT Phase 1 and 2
Construction Challenges

- Tight Schedule – 6 weeks for Concrete Operation
- 26,000 square yards of Concrete Overlay (4400 LF)
- Limited Road Width and Congestion
- Saw Cut Joints Close to Final Lane Markings
- Unknown Subgrade Conditions
Project Schedule

- Notice of Award – 06/24/15
- Notice to Proceed – 07/06/15 (accelerated)
- 24-hour Lane Closures – 07/08/15 to 08/21/15
- Concrete Overlay – 07/21/15 to 08/19/15
- Substantial Completion – 10/9/15
- Final Construction Cost - $2.84 million ($3.03 million bid price)
Project Highlights/Achievements

- First “Long” Concrete Overlay Project
- Completed ahead of Schedule
- Won an AASHTO America's Transportation Award

Paving Performance
- Average IRI – 43
- Number of Defect Sections – 0
- Ride Profile Incentive – $19,257

Concrete Performance
- No of Failing Cores – 0
- No of Failing Strength Cylinders – 1 of 250+
Existing Roadway before Milling
Milled Roadway – Section on Localized Shoulder
Milled Roadway
Pre-wetting the Surface for Good Bond
Concrete Pouring and Finishing
Diamond Grinding
Diamond Grinding
Close-up of Diamond Grinding
Completed Concrete Overlay
Lessons Learned

- Large Number of Cores – Mainline and Shoulder
- Include Joint Layout in the Contract Document
- Detour or MOT Plans during the Planning/Design Stage
- The Queue Length were not as long as predicted
- PR Campaign helps (may be the reason for less Queue Length)
Advantages of Concrete Overlay

- Greater Design Life (15 – 25 Years)
- For the Same Thickness, Concrete Overlay adds More Structural Strength as Compared to the Asphalt Overlay
- Rutting/Shoving is Eliminated
- Very Good Ride Quality
- Less Rehab or MOT Occurrences over the Design Life
- Reduces MOT Cost and Inconvenience to the Commuters over the Design Life
Future of Concrete Overlay Projects in MD

“Future is Bright”

- Second Section of MD 210 – Prince George’s County
- I-68 – Truck Climbing Lanes (2 more planned)
- Bus Stop Pads for Asphalt Pavement – Statewide
SPECIAL THANKS TO:

Shekhar Murkute, P.E.
Division Chief - Concrete Technology Division
Office of Materials Technology
Maryland State Highway Administration
THANK YOU!

Questions?

www.midatlantic.pavement.com
www.pavement.com