Polyester Polymer Concrete Overlays in North Carolina

Tim Sherrill, P.E. - NCDOT
Merritt Hanson – Kwik Bond Polymers
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Project Overview

• NCDOT C203818
  – I-95 in Cumberland & Harnett Co.
  – Bid March 15, 2016
  – PPC work performed Fall 2016
    • LMC-VES expected 2017
  – Low bidder S.T. Wooten
    • PPC Subcontractor American Civil Constructors
Project Overview

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Project Overview

• NCDOT C203818
  – Specified both LMC-VES and PPC
    • Side by side comparison on nearby bridges
    • LMC-VES overlay called for Milling and Hydro-Demo removal
    • PPC overlay called for milling
Polyester Polymer Concrete

• PPC overview
  – Mix of Sand, Stone, & Polyester Resin
    • Includes HMWM primer
    • No cement or water
    • Typical thickness 1”
  – Developed by CalTrans
    • Finalized in 1983
    • First PPC overlays still in service
    • Commonly specified nation wide
Polyester Polymer Concrete

- PPC properties
  - Impermeable to moisture/chlorides
  - Integrated chemical bond to substrate
  - High wear resistance and friction longevity
  - Rapid cure time
Why PPC?

- Strong track record in other States
- Rapid construction
  - High production mechanized placement
  - 2 hour traffic ready cure
- Opportunity to compare to other successful strategy
  - Side by side next to Hydro-Demo and LMC-VES
Why PPC?

• Existing deck condition worth preserving
  – Existing deck NBI rating of 5
• Unsound can be rehabilitated using same PPC material as overlay
• Successful trial adds a tool to the toolbox
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Why *not* PPC?

- When a deck is too deteriorated
  - Can’t make good out of a bad deck that should be replaced
  - If the majority of top is bad and underside is good, consider hydro-demo and LMC
- Can not place PPC in wet conditions
PPC Project Details

- Two bridges received PPC
- Total area = 13,140 square feet
- Built in 1955
- Deck NBI Rating 5
- 1.5” – 2” asphalt overlay removed
- 1.25” PPC overlay placed
PPC Project Details

TYPICAL SECTION
Construction

• Mill off existing asphalt overlay
Construction

- Mill off existing asphalt overlay
Construction

• Substrate rehabilitation
  – Identify Unsound areas
    • Chain drag
    • Hammer sound
  – Only remove/replace the bad, all sound concrete stays in place
Construction

- Replace unsound substrate with PPC
Construction

• Shot blast substrate surface
Construction

- HMWM Primer
Construction

• Place PPC overlay
Construction

• Place PPC overlay
  – Open to traffic in the morning
  – No daytime traffic disruption
Finished Product

• Open to traffic
Finished Product

- Grooved surface
Bid analysis

• Compare LMC-VES cost to PPC cost
  – Include all related items
Bid analysis

• LMC-VES items
  – Scarify Bridge Deck
    • 3,520 yd$^2$ @ $38.07 = $134,006.40
  – Hydro Demolition of Bridge Deck
    • 3,520 yd$^2$ @ $118.57 = $417,366.40
  – LMC – VES
    • 176.8 yd$^3$ @ $1631.65 = $288,475.72
  – Place & Finish LMC Overlay – VES
    • 3,520 yd$^2$ @$92.46 = $325,459.20
  – Groove Bridge Floor
    • 27,180 ft$^2$ @ 1.09 = $29,626.20
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    • 27,180 ft² @ 1.09 = $29,626.20

Total Item Cost = $1,194,933.92
Unit Cost = $37.72 per Ft²
Bid analysis

• PPC items
  – Incidental Milling
    • 1,460 yd$^2$ @ $6.81 = $9,942.60
  – Concrete Bridge Deck Repair - PPC
    • 2 yd$^2$ @ $5,438.83 = $10,877.66
  – PPC
    • 60.8 yd$^3$ @ $3,045.75 = $185,181.60
  – Place & Finish PPC Overlay
    • 1,460 yd$^2$ @$87.02 = $127,049.20
  – Groove Bridge Floor
    • 13,140 ft$^2$ @ 1.09 = $14,322.60
Bid analysis

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    • 1,460 yd² @$87.02 = $127,049.20
  – Groove Bridge Floor
    • 13,140 ft² @ 1.09 = $14,322.60

Total Item Cost = $347,373.66

Unit Cost = $26.44 per Ft²
Project Recap

• PPC overlay installation was a success
• PPC unit cost 30% cheaper than LMC-VES
• Price was higher than other states
  – Typical of first job in state
  – Expected to come down on future projects
Future Plans

• Monitor performance of installed PPC
  – IR’s
  – Division Engineer drives the bridges regularly

• Three more PPC overlays have been specified and bid
  – Lower prices on all

• Look to use PPC where it fits in to NCDOT needs

• Allow local contractors to perform smaller, non-mechanized overlays

• Learn through experience where PPC is best suited
Thank You

Questions Please