Bridge 1-717: I-95 over SR7
Precast Panel Deck Replacement

Presented to: FHWA/DeIDOT Accelerated Bridge Construction Workshop on September 17, 2015
Presented by: John Milius, PE AECOM
Agenda

• Project Overview
• Why use ABC?
• ABC Superstructure Replacement Alternatives Considered
• Precast Panel Options Considered
• Staging Alternatives Considered
• Selected Deck Replacement Option
• ABC Design Details
• Questions
Project Overview

- **I-95 NB over SR7/SR1**
  - 4 travel lanes + entrance ramp lane
  - Length ~ 208.5’
  - 4 steel simple spans
  - Full depth deck replacement needed
Project Goals

- Replace bridge deck
- Update bridge barrier to meet AASHTO TL-4 requirements (currently TL-4 adjacent to structure)
- Minimize impacts to traffic
Limited staging area adjacent to structure
Why Accelerated Bridge Construction?

• I-95 is a key artery in Delaware (ADT = 85,000 in 2011)
• Traffic impacts must be minimized
ABC Superstructure Replacement Alternatives

• Only Steel Alternatives Considered
  – Existing Substructures to Remain
  – Vertical Clearance

• New Steel Girders w/ Pre-Fabricated Deck Sections

• Simple Spans vs. Continuous Span Options Explored
ABC Superstructure Replacement Alternatives

• Longitudinal Launching

• Slide-In Construction

• Conventional Crane Construction
  – Modular Superstructure Segments (Inverset)
Decision for Deck Replacement

- Existing Steel Beams in Good Condition – Recently Cleaned and Painted

- Replacement of superstructure would cause:
  - Likely need to strengthen or modify substructures
  - Subsequent increases in construction costs
  - Delay in construction schedule
Precast Panel Options Considered

Panel Orientation

• Panels oriented in transverse direction (typical)
  – Not feasible due to skew angle and large width to span ratio of structure
  – For skews > 30 degrees, panel joints must be perpendicular to beams

• Panels oriented in longitudinal direction

Transverse Panel Layout

Full Depth Precast Concrete Deck Slabs. PCINER-02-FDPCDS. p. 6.

BR 1-717 Transverse Layout
Precast Panel Options Considered Cont’d

Panel Orientation

• Panels oriented in transverse direction (typical)
  – Not feasible due to skew angle and large width to span ratio of structure

• Panels oriented in longitudinal direction
Deck Joint Considerations

– Currently 4 Simple Spans with Joints over each Support
– Deck Replacement Options:
  • Install New Deck Joints (5 Deck Joints to Remain)
  • Provide Link Slab to Eliminate Deck Joints
  • Simple-Made-Continuous Steel Beams to Eliminate Deck Joints (Uplift at End Supports)
MOT Considerations

• Provide cross-over to SB structure?
  – Not feasible given proximity of RT1 interchange.

• Half-width Construction
  – Additional Bridge Width Due to Ramp
**Dual Stage Alternative**

**MOT = Half-width Re-decking**
- Construction Staging = 2 Stages
- 10 days per stage
- Divide stages at girder line 20
- Maintain 3 lanes of traffic within each phase
• Construction Stage Schedule Continued
Selected Deck Replacement Option

- Panels run longitudinally and span across two bays
- UHPC joints utilized to reduce lap lengths
- Deck joints to be placed in field using blockouts
- Use of UHPC eliminates need for post-tensioning
ABC Design Details - Panel Design

- Panels designed as typical CIP deck
- Use of UHPC joints provides rebar continuity
- Barrier precast onto exterior panels to expedite construction

ABC Design Details - Panel Joints

- 7” nominal joint width
- UHPC permits use of non-contact lap splices within joint

ABC Design Details - Panel to Girder Connection Details

- Panels connected through cast-in-place UHPC trough/joint
- Shear studs remain below rebar mat to avoid interference
- Panel elevation set by angles to avoid need for leveling screws
ABC Design Details - Strip Seal Blockout Details

- Strip seals field cast into closure pours
  - Eliminates issues with alignment of extrusion
  - Closure pour required at diaphragms anyway
  - High early strength concrete used rather than UHPC to minimize cost
ABC Design Details - Deck Finish

- **PPC (Polyester Polymer Concrete) Overlay Proposed**
  - Deck panels include additional ¼” of cover on top for grinding profile if necessary
  - 1” PPC overlay provided on bridge deck to:
    - Provide smooth riding surface
    - Protect concrete joints from water / chlorides infiltration
    - Adjust for final profile
Questions & Answers