Accelerated Bridge Construction (ABC) in New York

Wahid Albert, PE
Director, Structures Design

September 17, 2015
New York City: Lateral Slide
Jamaica & Hillside Ave. over Van Wyck Expwy
Cross Bay Boulevard over North Channel

- Precast Tub Caps
- Cylinder Piles
Roslyn Viaduct Replacement

Match-Cast Piers W/ Vertical Post-tensioning
I–287 Cross Westchester Expressway Viaducts
Precast Deck on Steel Tubs
Grouted joints, PT, exposed stud pockets, overlay
Grouted joints with PT and overlay
Cracks in Exposed Pockets

Figure 35. Photo. Cracking apparent on top of deck at grout pocket near east end of test specimen prior to start of structural loading.

Figure 36. Photo. Cracking apparent on top of deck at grout pocket near west end of test specimen prior to start of structural loading.
Ultra High Performance Concrete

• Ultra High Compressive Strength – Up to 30 ksi
• High Ductility
• Outstanding Durability
NYSDOT Development Length Tests

#4 BARS (BLACK & EPOXY) – 3” EMBEDMENT
#5 BARS (BLACK & EPOXY) – 4” EMBEDMENT
#6 BARS (BLACK & EPOXY) – 5” EMBEDMENT
Joint Testing by FHWA for Strength, Durability and Performance

- 8” THICK PANEL - #4 EPOXY COATED HAIRPIN BARS
- 8” THICK PANEL - #5 GALV. STRAIGHT BARS (6” LAP)
- 8” THICK PANEL - #5 BLACK STRAIGHT BARS (6” LAP)
- 8” THICK PANEL - #5 BLACK HEADED BARS (3 ½” LAP)
- 6” THICK PANEL - #5 BLACK STRAIGHT BARS (6” LAP)
- 6” THICK PANEL - #5 BLACK HEADED BARS (3 ½” LAP)
1st US Bridge w/ Precast Deck & UHPC Joints.

UHPC joints, Exposed Stud Pockets, Overlay
First use of UHPC Joints in Deck Bulb Tees.

85’-0” SPAN
42’-9” WIDE
15 DEGREE SKEW
3’-5” DEEP DBT
5’-4” DBT SPACING
Other Type of Bridges with UHPC

- Deck Bulb Tees, UHPC joints, membrane and asphalt overlay
- Deck Bulb tees, UHPC joints, concrete overlay
- NEXT beam, UHPC joints, concrete overlay
- NEXT beam, UHPC joints, thin overlay
- NEXT beam, UHPC joints, Asphalt overlay
NY Works Program

• Accelerated Bridge Program:
  – $ 212 M Budget/115 Bridges
  – 108 Decks, 2 PBES and 5 Bridge Replacements
  – 16 Bridges utilized ABC Method
  – 9 Decks Syracuse, NY
  – 4 Decks Binghamton, NY
  – 2 PBES Albany, NY
  – 1 Westchester County, NY
NY Works Program

• Accelerated Bridge Program:
  – Bare Concrete Decks (No Overlay)
  – UHPC in the Joints Exposed to Traffic
  – Hidden Pockets filled w/Grout
  – Integral Concrete Barriers
  – Diamond Grind Surface
  – Armorless Joints at End of Approach Slabs
Another First in the USA

Hidden Haunch Pocket

Long Studs to Engage Transverse Bars
Haunch Down Approach Slab
Precast Deck System with UHPC joints

Accelerated curing with external heating

UHPC Placement operation
UHPC Link Slab

Rt. 962G Over Rt. 17

Two 137’ simple spans, curved steel multi-girder
Fixed-fixed bearings (W/1/8” Gap around PIN) at the pier
Deck replacement utilizing precast panels w/ UHPC joints
Expansion joints at End of Approach Slabs
Deck joint at pier replaced w/ UHPC Link Slab
UHPC Link Slab

Design Concept

Simple span behavior retained

Girder end rotation to be relatively unrestrained.

Rotation of girder ends accommodated by small translation of fixed bearings (1/8 “ Gap around the PIN)

Uniform tensile stress in the UHPC combined with bending stresses.

UHPC’s large tensile strain capability combined with the ability of fixed bearings to translate by a small amount made link slab feasible.
ROTATION DUE TO LIVE LOAD
Precast Deck Replacement

Case Study

• Syracuse, NY
• I-690 WB over Peat St.
• 79’ Single Span
• 8,000 SF Deck Area
• Built in a Weekend
Other Decks
RTE 31 over Putnam Brook
Prefabriicated Bridge Element and System

Modular Deck Beam

Integral Concrete Barrier

Rapid Set Concrete Joints (2,500 psi / 3 Hours)

Waterproofing Membrane and Asphalt Overlay
I-87 NB & SB over the Mohawk River
1st Best Value Contract in NY
Other Projects

• I-81 SB & NB over Preble Rd
  – Modular Deck Beam With UHPC Joints
  – Precast Semi Integral Abutments
  – October 22, 2013 Construction

• I-190 SB & NB over Buffalo Ave/Weekend project
  – Modular Deck Beam with Rapid Set Concrete Joints, Semi Integral Abutments – Cast at Site
  – May 2014 Construction
Semi-Integral Abutment – As Fabricated
Semi-Integral Abutment – As Fabricated
CONSTRUCTION
Crane/pick info below in notes
Add pictures
Setting of Precast Deck Panels
Hidden Pocket Girder Haunch
I-84 over Delaware River

- $40 Million.
- 9 spans, each 140’ long
- bridge length of about 1260’
- The decks are 37’-4” out-to-out.
- Precast Deck area per bridge is about 47,000 SF for a total of 94,000 SF
- The low 3 bidders was $465/SY.
- These panels had stainless steel reinforcement.
Questions

Wahid Albert, PE
NYSDOT/Office of Structures

Wahid.albert@dot.ny.gov