UHPC FOR PBES CONNECTIONS

Ben Graybeal, Ph.D., P.E.
Structural Concrete Research Program Mgr.
Federal Highway Administration
202-493-3122
benjamin.graybeal@dot.gov
Prefabricated Bridge Elements and Systems

- **Benefits:**
  - Reduced construction on critical path
  - Increased safety
  - Increased quality

- **Challenges:**
  - Transportation and Assembly
  - Connections

*Significant Hurdle*
Field-Cast UHPC Connections

- Simplify Fabrication of Precast Components
- Simplify Field Construction Operations
- Create Robust Connections
Deck-Level UHPC Connections

Field-Cast, Non-Contact Lap Splice Connection
Deck-to-Girder UHPC Connections

Traditional Studs

Shortened Studs

Reduced Stud/Stirrup Height & No Interference
What is Ultra-High Performance Concrete?

- Advanced cementitious composite material
- High strength, high stiffness
- Exceptional durability
- Internal steel fiber reinforcement for added ductility
- Self-consolidating

UHPC, UHPFRC, RPC
Ductal, CoreTUFF, BSI, Densit, Cemtec, …
Field-Cast UHPC Properties:
Some Ballpark Values

- Compressive Strength – 18 to 25 ksi
- Modulus of Elasticity – 6200 to 7200 ksi
- Creep Coefficient – 0.5 to 0.8
- Sustained Tensile Capacity – 0.9 to 1.3 ksi
- Rapid Chloride Permeability – 200 to 360 Coulombs
- Freeze/Thaw Resistance – RDM > 95%

Source: FHWA Report FHWA-HRT-06-103
Material Property Characterization of Ultra-High Performance Concrete
Introduction to UHPC

- NHI Webinars – November 18, 2010 and April 21, 2011
  http://fhwa.adobeconnect.com/n134083201011
  http://fhwa.adobeconnect.com/n134083201104

- TechNote: UHPC
  - FHWA HRT-11-038
  - Aimed at DOTs and practitioners
  - General information on casting, curing, testing, applications, inspection, etc.
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Web Search:
NHI Innovations

Web Search:
UHPC TechNote
Field-Cast UHPC Connections between Precast Deck Panels

SR 23 over Otego Creek
Oneonta, New York
Field-Cast UHPC Connections b/t Deck-Bulb-Tee Girders

SR 31 over Canandaigua Outlet
Lyons, New York
Field-Cast UHPC Connections b/t Adjacent Box Beams

Highway 17 Bridge over Eagle River
In Western Ontario, Canada
Field-Cast UHPC Connections b/t Decked Steel Stringer Modules

U.S. 6 over Keg Creek
Pottawattamie County, Iowa

SHRP2 R04 Demonstration Project
Construction Scheduled for October 2011
Field-Cast UHPC Connections

Simple, Robust Connection Solutions

WEBINAR: OCTOBER 11