Innovative Bridge Designs for Rapid Replacement Using ABC/PBES

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SHRP2 ABC/PBES
Subject Matter Expert
Accelerated Bridge Construction (ABC)

ABC – refers to technologies, contract mechanisms, design templates, and rapid-time savings in bridge construction

- Reduces construction time and minimizes traffic impacts
- Decreases safety risks by minimizing contractor exposure to traffic
- Increases local contractor involvement through standardized approaches
- Reduces environmental impacts
- Saves money and time
EDC-2, Prefabricated Bridge Elements and Systems

PBES (December 2014)

PBES

Federal Lands Highway
Puerto Rico
US Virgin Islands
Washington DC

Institutionalized
Post-Demonstration
Pre-Demonstration
Opt Out of EDC

Number of States in Various Implementation Stages

Dec 2014

4 5 10 35

Jan 2013

5 12 8 29
EDC-2, Slide-in Bridge Construction

SIBC (December 2014)

Federal Lands Highway
Puerto Rico
US Virgin Islands
Washington DC

Institutionalized
Post-Demonstration
Demonstration
Pre-Demonstration
Opt Out of EDC

Dec 2014
0 10 20 30 40 50 60

Jan 2013

Post-Demonstration
Pre-Demonstration
Demonstration
Opt Out of EDC
EDC-3, Ultra High Performance Connections

Current (December 2016)

Number of States in Various Implementation Stages

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<td>5</td>
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ABC Construction Methods

- Elements Assembled Onsite
- Slide In Bridge Construction (SIBC)
- Entire Super Structure moved in from a remote location (SPMT)
- Other methods?
Other Factors: ABC Significantly Decreases Construction Impacts

- During peak construction season:
  - 20% of highways are under construction
  - More than 3,000 work zones.
  - Active work zone in 1 out of every 100 miles

- More than 40,000 people are injured each year in crashes in work zones.
- One work zone fatality every 8 hours – 3 per day
- One work zone injury every 9 minutes – 160 per day
Emergency Replacement

At right, I-10 spans on Lake Pontchartrain after Hurricane Katrina

When to Use ABC
How UHPC Fits into ABC

- **Benefits**
  - Strong joint, short lap lengths of rebar
  - Watertight
  - Chloride resistant

- **Drawbacks**
  - Expensive material
  - Specialty sub contractor?
  - Non-familiarity of contractor/owner
UHPC Strength Gain

Compressive Strength Gain

- Cure at 105°F
- Cure at 73°F
- Cure at 50°F
UHPC Mixing and Placement – NYSDOT Example
Example: Utah Bridge Farm

Utah I–80 Bridges,
State to 1300 East
Precast Piers
Gila River - Arizona
Gila River - Arizona
Gila River - Arizona
Seney National Wildlife Refuge, Michigan

- Federal Lands Highway applied R04 Toolkit to Seney National Wildlife Refuge PBES project
- Single lane, three-span continuous concrete box beam bridge
- Piers/abutments built with precast pile caps
- Placed a concrete overlay on top of boxes
- Concrete rails cast on to boxes before beam erection
- Prefabrication will limit impacts in an environmentally sensitive area
Seney National Wildlife Refuge, Michigan
Seney National Wildlife Refuge, Michigan
Oregon DOT ABC Project

- Applying precast prestressed deck panels with UHPC joints
- US 30 Burnt River (UPRR) 2012
Oregon DOT ABC Project

US 30 Burnt River (UPRR)
Nevada PBES/ABC Projects

B-1942 Tuscarora

Bridge Replacements
- Performance Specs
- Prefabricated Bridge Rail/Headwalls/Wingwalls
- Structure Placed in 1 Day
Nevada PBES/ABC Projects

Safety Crossings
- Performance Specs
- Temporary Road Closures
Georgia ABC Project

Georgia DOT Precast Substructure
For More Information

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