Accelerated Bridge Construction

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- Accelerated deployment of innovation that meets customers needs and increase efficiency of project delivery

- Accelerated Bridge Construction Workgroup:
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  - Dorie Mellon - Caltrans - Structure Policy & Innovation
  - Ryan Moore - City of Sacramento
  - Linda Newton - Caltrans - Local Assistance
  - Matt Randall - Placer County

www.fhwa.dot.gov/innovation/stic/
Accelerated Bridge Construction (ABC)

ABC uses the most efficient combination of innovative planning, design, materials and construction to **significantly reduce construction related impacts** by reducing the number of onsite construction days and/or minimizing traffic disruption.

**Minimize Construction Impacts**

Project Goals & Constraints

FHWA Every Day Counts (EDC)

FHWA set of initiatives to deploy innovation aimed at:

- Shorten the project delivery process
- Enhanced roadway safety
- Reduced congestion
- Improve environmental sustainability
Elements of a Bridge
from Foundation to Superstructure

A bridge is a structure that spans an opening greater than 20 feet.

Conventional Construction Methods

ACCELERATED BRIDGE CONSTRUCTION
ABC Methods

Prefabricated

Slide-In

Large Bridge Move

Launch

ABC
Prefabricated Bridge Elements & Systems

Bridge elements are manufactured at an off site facility and assembled at the project location.
Ultra-high Performance Concrete (UHPC) connections for prefabricated bridge elements

PROPERTIES
• Strong
• Flexible
• Durable
• Excellent Bonding
• Self Consolidating

ADVANTAGES
• Robust connections
• Simplified construction
• Better long term performance

Slide-In Bridge Construction
The new bridge is constructed next to the old bridge and then slid into place overnight or during off peak hours

SR 55 over Weber River, Utah

Nevada I-15 Bridge
Large Bridge Move
Self Propelled Modular Transporters

Bridges or large portions of bridges are built off site and moved in to place with self propelled modular transporters (SPMT’s).

ABC
Incremental Launching

Bridge superstructure is assembled at one end of the bridge and launched across to the other end of the bridge.
Pfeiffer Canyon Bridge Launch

Keys to ABC success

• Embrace Innovation
• Define project goals
• Early consideration
• Total Project Cost
• Identify user cost benefits
• Communicate with stakeholders
• Include in initial HBP application when appropriate
Advantages of ABC
Improving Delivery Through Innovation

Time

Safety

Constructability

Mobility

Full Road Closure for Work Zone Operations

- Accelerate construction
- Cost savings (MOT, more efficient work area)
- Improve quality (full access to roadway results in higher standards in efficiency and quality)
- Enhance safety (separate construction activities from through traffic)
- Increase favorable public sentiment
ABC Advantage - Environment
Reduced Environmental Impact

- Reduced construction time allows scheduling around crucial times for plant growth and animal life.
- Eliminating falsework keeps construction activities out of the stream.
- Conduct construction activities offsite
- Reduce wetland mitigation

Embrace Innovation

Define Project Goals
Programmatic Approach

ABC Evaluated for Every Bridge Project


- Construction Time
- Environmental
- User Costs and Delays
- Site Conditions
- Risk Management
- Economy of Scale

The evaluation of ABC is triggered during preliminary project development when adjustments to funding, right of way requirements and the environmental document can be accomplished with relative ease.

Cost Considerations

ABC can be the most cost effective means of construction when considering total project cost.

- Maintenance of traffic
- Project Administration
- Environmental Compliance
- Lowered vertical profile
- Wetlands
- Environmental Mitigation

Total Project Cost
**User Cost Consideration**

**CONVENTIONAL METHODS**

- Lengthy detours and traffic delays
- Limited access to essential services
- Long term impacts to local business
- Environmental impacts over multiple seasons of construction
- Negative public perception of lengthy construction duration

**ABC METHODS**

- Reduced detours and delays
- Access to essential services
- Reduced impact to local business
- Reduced environmental impacts due to single season construction
- Positive perception of “speedy” and low impact construction

**Public Outreach for ABC**

**BENEFITS**

- Traffic avoidance
- Increased awareness
- Decreasing impatient behavior
- Building trust
- Project buy-in
- Support for the next ABC project

**METHODS**

- Signage
- Project specific websites
- Local newspaper & radio
- Social media*
- Mobile apps*
- Town hall meetings*
Case Study: MassDot Fast14

- Replaced 14 bridges in 10 weekend closures along Interstate 93 through the city of Medford
- Project was completed on budget and ahead of schedule

“The I-93 Fast 14 project proves that America is ready, willing, and able to dream big and build big.”
US Secretary of Transportation Ray LaHood

Case Study: San Mateo Bridge Replacement Project 2016
Caltrain track parallel to Route 82

- 4 bridges in 4 weekends
- 16 hour track closure

Poplar Ave
Original Structure 1903

Poplar Ave
Replacement Structure 2016
Construction Sequencing

Stage I Activities
1. Track is raised to final elevation prior to change over (by PCJPB).
2. All utilities relocated.
3. Complete pile installation.

Stage II Activities
1. Install temporary restraining system where excavation is taking place.
2. Complete footing construction.

Stage III Activities
1. Remove temporary restraining system.
2. Construct abutment walls.

Stage IV Activities
1. Build roll-out and roll-in supporting system (prior to change over).
2. Remove existing track.
3. Excavate behind the walls.
4. Disengage existing bridge.

Stage V Activities
1. Lift and roll out central span.
2. Crane lift existing end spans.
3. Place precast abutment seat units and secure in place.
4. Backfill behind the abutments with soil-cement mix.

Stage VI Activities
1. Roll in new bridge.
2. Finish backfilling behind the abutments with soil-cement mix.
3. Complete trackwork.
4. Test run.
5. Open to traffic.

Complete Structure
1. Install crash beams (not shown)
2. Remove existing bents and supporting system.
3. Complete roadworks including sidewalks.
4. Open to road traffic for optimum use.
Case Study: Fort Goff Creek Bridge
Siskiyou County Route 96
Streambed Restoration Project

GOALS:
- Restore Fish Passage
- Single Season Construction
- Reduce Environmental Impacts
- Quality Concrete in Remote Location

Solution: Prefabricated Bridge

Bridge No. 02-0200
What Supported the Solution?

- Temporary culvert
- One way signalized traffic control
- Fish relocation
- Permits
- Coordination with environmental partners
- Collaborative funding
- Route for the precast element delivery

Case Study: Hardscrabble Creek

**GOAL:**
- Reduce Construction to a Single Season
- Reduce Traffic Disruption from months to hours

**SOLUTION:**
- Lateral Slide

**WHAT SUPPORTED THE SOLUTION?:**
- Room Adjacent to Route for Construction
- Additional $ for Bridge Construction
- Temporary Creek Diversion
Caltrans Multi-Span Precast Pilot Projects

- 2 projects
  - D4 Laurel Street OC (complete)
  - D6 Route 46/99 Sep
- Focus on connections & constructability
- Gather lessons learned
- Improve efficiency & reduce risk
- Educate project development staff, construction staff and contractors

Laurel Street Overcrossing Pilot Project
Vallejo CA, Route 780

Precast columns and cap were set in 3 hours under full night closure of 780
Laurel Street Overcrossing Pilot Project
Vallejo CA, Route 780

Rapid strength concrete deck
Concrete cures in 4 hours

Precast Wide Flange Girders
set in 2 nights

UHPC connection mock up
Improving delivery through Innovation

Don’t be this guy

“Your proposal is innovative. Unfortunately, we won’t be able to use it because we’ve never tried something like this before.”

ABC Resources

• STIC ABC:
  http://www.dot.ca.gov/hq/LocalPrograms/hbrr99/hbrr99a.htm
• FHWA Center for Accelerating Innovation:
  https://www.fhwa.dot.gov/innovation/
  – Every Day Counts
  – STIC Network
  – AID Demonstration
  – Resources
• FHWA ABC:
  https://www.fhwa.dot.gov/innovation/everydaycounts/edc-2/abc.cfm
• ABC University Transportation Center: https://abc-utc.fiu.edu/
• SHRP2 ABC Toolkit:
  http://www.trb.org/Main/Blurbs/168046.aspx
• Coming Soon: AASHTO Guide Specification for ABC
STIC ABC:
http://www.dot.ca.gov/hq/LocalPrograms/hbrr99/hbrr99a.htm

Thank You