Accelerated Bridge Construction (ABC) and the Utah Experience

by

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What is “Accelerated Bridge Construction (ABC)”?

• Building the bridge more quickly than your conventional practice, while maintaining quality
• What ABC means to you depends on where you are now
• ABC spans the entire process, from planning through construction
Examples of ABC - Planning

- Early owner meetings with contractors & suppliers to innovate
- Right-of-way acquisition & utility relocations before advertising project
- Early environmental clearance & permitting
- Innovative contracting strategies in contract documents (e.g., A+B bidding, lane rental, incentive/disincentive clauses)
Examples of ABC – Planning, cont’d.

- Electronic shop drawing submittal & approval process
- Procurement of materials before advertising project (e.g., prestressed concrete girders, structural steel girders)
Examples of ABC - Design

• Prefabrication of bridge components or entire bridge
• Geotechnical engineering enhancements (e.g., mechanically-stabilized earth walls instead of conventional cantilever retaining walls; reinforced or lightweight backfills)
Examples of ABC - Construction

• Allowing contractor options to innovate
• Use of innovative equipment (e.g., self-propelled modular transporters – SPMTs – to move entire bridge; launching, pivoting, or skidding equipment)
• Concurrent onsite engineering operations (e.g., building abutments & interior supports simultaneously)
“Accelerated Bridge Construction”

• Replacement or new construction
• Uses innovative design & construction methods & high performance materials
• Reduces typical construction time
• Maintains or enhances quality
• Reduces traffic disruption
• Increases work-zone safety
• Produces cost-effective, long-lasting bridges with early openings
“Prefabricated Bridges”

• One ABC method
• Bridge elements or systems, or entire bridges, built at offsite locations
• Controlled offsite environment assures quality construction
• Transported to site & quickly installed, e.g.,
  – Girders & partial-depth deck panels
  – Full-depth precast deck panels
  – Superstructure systems
  – Substructure systems
  – Entire bridges of prefabricated elements
Benefits of ABC

- Minimized traffic disruption – from months to days
- Improved work-zone safety – improved worker safety & motorist safety
- Improved product quality – controlled environment, cure times, easier access, etc.
The Utah Experience

Making ABC Standard Practice
What does “ABC as Standard Practice” mean?
ABC as standard practice means considering ABC at the initial planning stage of each project

- Use FHWA Framework for Prefabricated Bridge Elements and Systems (PBES) Decision-Making
  - http://www.fhwa.dot.gov/bridge/prefab

Or

- Develop your own decision-making tool
  - Example: Utah DOT Decision Chart

And having a business model in place to use ABC as appropriate
FHWA Decision-Making Framework

3 formats:
- Flowchart
- Matrix Questions (yes-no-maybe)
- Q&A Discussion
RAPID ONSITE CONSTRUCTION FACTORS
Traffic Volume / Emergency / Commerce / User Delay

Start here

High ADT and/or ADTT?

No

Yes

Emergency Replacement?

No

Yes

Evacuation Route, or over Railroad or Navigation Channel?

No

Yes

Required Lane Closures or Detours?

No

Yes

Impacts Critical Path of the Total Project?

No

Yes

Does Need for Rapid Onsite Construction Justify Prefabrication?

No

Yes
OTHER FACTORS

Worker Safety / Wetlands-Air Quality-Noise / Endangered Species / Multiple Similar Sections

??
PBES CONSTRUCTION COSTS LESS

Compare Construction Costs between Conventional Bridge and Prefabricated Bridge

Prefabrication Costs less than Conventional Construction?

Yes → Use Prefabrication

No → Use Conventional Construction
## FHWA Decision-Making Framework

### Decision-Making Matrix

#### Example Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>High traffic volume?</td>
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<td>Emergency replacement?</td>
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<td>Worker safety concerns?</td>
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<tr>
<td>High daily traffic control costs?</td>
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FHWA Decision-Making Framework
Utah’s Transition to ABC as Standard Practice

- Developed decision-making chart
- Completed project-specific prefabricated ABC, e.g.,
  - Full-depth deck panels
  - Precast bent caps
  - Prefabricated superstructure installed with SPMTs
- Conducted domestic scanning tours
- Identified a program of ABC projects
- Requested demonstration project funding
Utah’s Transition to ABC as Standard Practice, cont’d.

- Involved nationally
- Developed first 2 sets of draft prefabricated ABC standards, specifications, design aids
  - Full-depth precast deck panels
  - Use of SPMTs to move superstructure spans
- Hosted workshop with national experts & local industry to receive recommendations
  - First 2 draft products
  - Transitioning to ABC as standard practice by 2010
Utah’s Transition to ABC as Standard Practice, cont’d.

- Revised first 2 sets of ABC standards
- Hosted local industry feedback meeting to further refine standards to meet local needs
- Updated standards & incorporated into upcoming projects
- Maintaining communication with industry
- Updating standards as needed
Utah’s Transition to ABC as Standard Practice, cont’d.

- Initiated development on 2nd round of prefabricated ABC standards, including precast
  - Pretensioned girders
  - Parapets
  - Bent caps
  - Columns
  - Footings
  - Approach slabs
Utah’s Transition to ABC as Standard Practice, cont’d.

• Assessing & implementing strategies to enhance performance of ABC by accelerating other areas, e.g.,
  – Project delivery (shortening time from funded concept to final constructed project)
  – Decision making during design & construction
  – Construction of critical path non-bridge parts of projects

• Continuing to consider workshop recommendations on transitioning to ABC
UDOT’s Family of Innovative ABC Elements and Methods

- Innovative Accelerated Bridge Construction
  - Precast Concrete Elements
  - Modular Construction
  - Structure Placement Methods
  - Accelerated Geotech Work
  - Fast Track Contracting
**UDOT ABC History**

UDOT has 17 projects completed or under construction that utilized ABC

- Self-Propelled Modular Transports: 4 (14)
- Partial-Depth Precast Deck Panels: 2
- Full-Depth Precast Deck Panels: 8
  - In conjunction with precast abutments: 1
  - In conjunction with precast bent caps: 1
- Precast Voided Slabs: 1
- Segmental Bridges: 1
- Heavy Lift Cranes: 1
I-15 Design-Build

17-mile Corridor Completed in 4.5 years for 2002 Winter Olympics – included partial-depth deck panels
I-215 East over 3760 South

Precast Deck on Steel Girders
Superstructure Replacement
Parrish Lane Bridge over I-15

Widened with Precast Bent Caps & Full-Depth Precast Deck Panels
4500 South Bridge over I-215E

Prefabrcicated Superstructure driven into position with SPMTs

- I-215 closed over a weekend
- 4500 South closed only 10 days
I-80 State Street to 1300 East Multiple Structures, Salt Lake City

June-July 2008 SPMT Bridge Moves in Program of Projects:

- I-80W over Highland Drive
- I-80W over 900 East Street
- I-80W over 700 East Street
- I-80W over 600 East Street
- I-80W over 500 East Street
- I-80W over 300 East Street
- I-80W 600 East Ramp Bridge
I-80 State Street to 1300 East
Bridge Farm
I-80 State Street to 1300 East

I-80W over Highland Drive
Upcoming SPMT Bridge Moves

I-80 Lambs Canyon/Mt. Dell:

- I-80W at Lambs Canyon and at Mt. Dell
  - August 9-10 (approximate)

- I-80E at Lambs Canyon and at Mt. Dell
  - August 16-17 (approximate)

I-215 East 3300 South:

- 3300 South Bridge over I-215E
  - August 22-25 (approximate)
Upcoming SPMT Bridge Moves

For details, see UDOT’s Innovate 80 link:
http://www.udot.utah.gov/innovate80

For exact move dates, contact:
Susan K. Parker
UDOT Project Development Office
Phone: (801) 965-4826
Email: skparker@utah.gov
Utah’s Transition to ABC as Standard Practice, cont’d.

• Evaluating costs
Utah Precast Deck Panel Projects

Bid Cost per Square Foot

- $90.00
- $80.00
- $70.00
- $60.00
- $50.00
- $40.00
- $30.00
- $20.00
- $10.00

Dates:
- 18-Jan-07
- 09-Mar-07
- 28-Apr-07
- 17-Jun-07
- 06-Aug-07
- 25-Sep-07
- 14-Nov-07
- 03-Jan-08
- 22-Feb-08
- 12-Apr-08
- 01-Jun-08

Projects:
- I-15 at Parrish Lane
- I-80 Silver Creek Canyon
- I-84 Weber Canyon
- I-80 Kimbal Jct
- MP200
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<thead>
<tr>
<th><strong>4500 South over I-215 SPMT Bridge Move</strong></th>
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<tbody>
<tr>
<td><strong>Construction Year:</strong></td>
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<tr>
<td><strong>Total Construction Cost:</strong></td>
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<tr>
<td><strong>ABC Construction Cost:</strong></td>
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<tr>
<td><strong>Facility User Cost Per Day:</strong></td>
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<td><strong>Estimated Days Saved:</strong></td>
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<td><strong>User Savings:</strong></td>
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<td><strong>Cost Benefit Ratio:</strong></td>
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* Project cost does not take into account traffic control cost savings from traditional to ABC
Utah’s Transition to ABC as Standard Practice, cont’d.

- Communicating with the public

### Stakeholders’ OVERALL Satisfaction With Project Results
(1=not satisfied, 7=very satisfied)

- 7, 76.10%
- 6, 18.30%
- 5, 2.80%
- 4, 1.40%
- 3, 1.40%
- 2, 0.00%
- 1, 0.00%

4500 South Bridge over I-215E Installed in One Weekend
Lessons Learned & Best Practices

• Get commitment from internal leadership
• Become educated nationally & internationally; consider domestic scans
• Develop business model, including decision-making tool & program of work
• Seek funding for demonstration projects
• Implement standardization
• Use innovative contracting strategies
• Educate and communicate internally, with industry, & with the public
Accelerated Bridge Construction helps transportation agencies achieve their Mission

To efficiently & effectively move people, goods & services
Accelerated Bridge Construction

and the Utah Experience

Thank You