Accelerated Bridge Construction
Research, Design and Practice
Florida International University
April 20, 2011

Presented by:
Carmen Swanwick, SE
UDOT Chief Structural Engineer
Presentation Outline

- Research
  - Accelerated Bridge Construction (ABC) initial efforts
- Design
  - Program implementation
- Practice
  - Projects
Research Outline

- Perform scanning tours
- Conduct pilot project
- Identify a program of projects
- Get involved nationally
Research
Scanning Tours

- Market internally and externally
- Conduct workshops
- Engage industry
Research
Pilot Project

- Obtain senior leadership involvement
- Evaluate project risks
- Define scope, schedule and budget
- Identify procurement method
Research
Program of Projects

- Prescriptive projects – gain experience
  - Design-Bid-Build
  - Construction Manager General Contractor (CMGC)

- Performance projects – innovations led by contractor
  - Design-Build
Research
Get Involved Nationally

- Coordinate with FHWA
- Participate in AASHTO Subcommittees
- Host showcase projects
- Share lessons learned and best practices
- Educate and communicate with industry
- Evaluate projects
- Implement standardization
- Improve based on lessons learned
ABC goals

- Relentlessly pursue reducing traffic congestion during construction
- Add value by furthering Department themes and meeting project goals
- Improve worker safety and safety to the traveling public
- Improve quality
Design

Evaluate Projects

- Scope
- Schedule
- Budget
- Quality
- Risk
- Communications
- Procurement
Total Project Cost

Total Project Cost = Construction + User Costs

Lowest Project Cost

Lowest Construction Cost
Advantages of ABC

- Reduced on-site construction time
- Minimized traffic disruption – *months to days*
- Reduced environmental impact
- Improved work zone & worker safety
- Provides positive cost-benefit ratios when user costs are considered
- Improved product quality – *controlled environment, cure times, easier access, etc.*
Design

Implement Standardization

- Develop guidelines for ABC project inclusion
- Develop typical details and manuals
- Include user costs in analysis
- Encourage innovation
- Provide training and obtain feedback
### Design

**Implement Standardization**

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<thead>
<tr>
<th>Average Daily Traffic</th>
<th>Rating</th>
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<td></td>
<td>3</td>
<td>10,000 to 15,000</td>
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<tr>
<td></td>
<td>4</td>
<td>15,000 to 20,000</td>
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<td>5</td>
<td>More than 20,000</td>
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<table>
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<td>5-10 minutes</td>
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<td>15-20 minutes</td>
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<table>
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<tr>
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<td>Normal Bridge</td>
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<td></td>
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<td>Essential Bridge</td>
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<td>Critical Bridge</td>
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<td>$10,000 to $25,000</td>
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<td>3</td>
<td>$25,000 to $50,000</td>
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<tr>
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<td>4 to 5 spans</td>
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<table>
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<th>Use of Typical Details</th>
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<td>Complex geometry or unfavorable site conditions</td>
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<td>Some complexity, but favorable site conditions</td>
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<td>Simple geometry and favorable site conditions</td>
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<td>5</td>
<td>1 Short duration impact with simple MOT scheme</td>
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<tr>
<td></td>
<td></td>
<td>2 Short duration impact with multiple traffic shifts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Normal duration impact with multiple traffic shifts</td>
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<tr>
<td></td>
<td></td>
<td>4 Extended duration impact with multiple traffic shifts</td>
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<tr>
<td></td>
<td></td>
<td>5 Extended duration impact with complex MOT scheme</td>
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<thead>
<tr>
<th>Railroad Impacts</th>
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<tr>
<td></td>
<td>0</td>
<td>0 No railroad or minor railroad spur</td>
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<td></td>
<td>3</td>
<td>1 One mainline railroad track</td>
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<tr>
<td></td>
<td>5</td>
<td>5 Multiple mainline railroad tracks</td>
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</table>
ABCD Manual and Standard Drawings
Promote marketing and media plan
Develop messaging
Prepare visual animation
Design

Implementation

SAM WHITE BRIDGE
1-15 CORE | A UDOT PROJECT

354 Feet Long | Two Spans | One Big Night
Design

Lessons Learned

- Perform program review
- Find program deficiencies
- Repair deficiencies
- Review design decisions
- Measure design assumptions vs. reality
Practice
Outline

- Innovative elements and methods
- Timeline and history
- Project highlights
- Upcoming projects
- Program evaluation
Practice

Innovative Elements and Methods

Innovative Accelerated Bridge Construction

- Precast Concrete Elements
- Modular Construction
- Structure Placement Methods
- Accelerated Geotech Work
Practice

Innovative Elements and Methods

Precast Concrete Elements; I-80; Wanship Bridge
Practice

Innovative Elements and Methods

Modular Construction; I-215 over 3670 South
Practice

Innovative Elements and Methods

Structure Placement Methods
Practice

Innovative Elements and Methods

Accelerated Geotechnical; Geofoam Embankment
Practice
Timeline and History

<table>
<thead>
<tr>
<th>Year</th>
<th>1998-2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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<td>2</td>
<td>8</td>
<td>6</td>
<td>3</td>
<td>7</td>
<td>75</td>
<td>46</td>
<td>18</td>
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### Practice

**Timeline and History**

<table>
<thead>
<tr>
<th>ABC Method / Element</th>
<th>Number of Bridges</th>
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<tbody>
<tr>
<td>Bridge Launch</td>
<td>2</td>
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<tr>
<td>Self Propelled Modular Transporters (SPMT)</td>
<td>23</td>
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<tr>
<td>Slide-in</td>
<td>5</td>
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<tr>
<td>Heavy Lift Cranes</td>
<td>2</td>
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<tr>
<td>Half Depth Precast Deck Panels</td>
<td>63</td>
</tr>
<tr>
<td>Full Depth Precast Deck Panels</td>
<td>31</td>
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<tr>
<td>Precast Voided Slabs</td>
<td>3</td>
</tr>
<tr>
<td>Approach Slab Panels</td>
<td>15</td>
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<tr>
<td>Precast Sleeper Slabs</td>
<td>14</td>
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<tr>
<td>Precast Abutments</td>
<td>6</td>
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<td>Precast Bent Caps</td>
<td>3</td>
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<td>Precast Columns</td>
<td>1</td>
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<tr>
<td>Prefabricated Pedestrian Bridge</td>
<td>5</td>
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<tr>
<td>Precast Box Culvert</td>
<td>44</td>
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</table>
Practice
Project Highlights

800 North over I-15; Precast Deck Panels; CMGC
Practice
Project Highlights

Riverdale Road over I-84; Lego Bridge; CMGC
Project Highlights

4500 South over I-215; SPMT; CMGC
Practice
Project Highlights

I-80; Lambs Canyon Bridge; SPMT; Design-Build
Practice

Project Highlights

I-80; State Street to 1300 East; SPMT; CMGC
Practice

Project Highlights

I-70; Eagle Canyon Bridge; Precast Deck Panels; CMGC
Practice
Project Highlights

SR-66 Over Weber River; Slide-in; Design-Bid-Build
Practice
Project Highlights

I-80; Two Bridges Near Echo Junction; Slide-in; Design-Build
Practice

Project Highlights

I-80 over 2300 East; Slide-in; Design-Build
Practice
Project Highlights

South Layton Interchange; Launch; Design-Build
Practice

Project Highlights

U.S. 89 over I-15; SPMT; Design-Build
Practice
Project Highlights

I-15 CORE Proctor Lane over I-15: SPMT; Design-Build
Practice

Project Highlights

I-15 CORE 200 South over I-15; SPMT; Design-Build
Practice

Project Highlights

I-15 CORE Sam White Lane over I-15; SPMT; Design-Build
Practice
Upcoming Projects

- **Slide-in**
  - I-80 over Weber River; Spring 2011
  - I-80 at Atkinson; Summer 2011
  - I-80 at Summit Park; Summer 2011

- **Prefabricated bridge elements**
  - SR-193 over UPRR and UTA; Spring 2012
Program Evaluation
Utah ABC Costs; SPMT

Valued Added (includes user cost savings)

- I-215; 4500 South
- I-80; State St. to 1300 East
- I-80; Mt. Delle to Lambs Canyon
- 3300 South over I-215
- I-15; Widening, 500 North to I-215
- Pioneer Crossing

Costs:
- $0
- $5,000,000
- $10,000,000
- $15,000,000
- $20,000,000
- $25,000,000
- $30,000,000
Program Evaluation
Utah ABC Costs; Slide-In

Valued Added (includes user cost savings)

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Value</th>
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<tr>
<td>SR-66 Over Weber River</td>
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<td>I-80; 2 Bridges near Echo Junction</td>
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<td>I-80; 2300 East Bridge</td>
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Program Evaluation

ABC Because...

- Value added to the public
- Societal costs minimized
- Public support for innovation
- Political capital

Source: 2010 Dan Jones & Associates
UDOT Structures Division

Carmen Swanwick, S.E.

UDOT Structures

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