TODAY’S PRESENTERS

Jack Kimbrough, PE
Manager-Alabama Transportation

Kevin McAlister, PE
Bridge Practice Leader
AGENDA

- Project Overview
- Project Goals
- Technical Alternative Review
- Next steps
PROJECT OVERVIEW

PROJECT OVERVIEW
PROJECT OVERVIEW

- Vertical Clearance +/- 16'
- Capacity (Below and Above)
PROJECT OVERVIEW

- Tuscaloosa Revitalization of Access Network Systems (TRANS)
- 2019 INFRA Grant (Small Category) for CN
- TCRIC Funds (June 2020) for PE

TEAM INTRO

- Barge Design Solutions
- TTL, Inc.
- Bell and Associates
**Main Goals:**

1. Replace Bridge with Minimal Total Closure Time
2. Mitigate Risk while utilizing “Innovative Construction Methods”
3. Review Use of “Innovative Materials”

**Accelerated Bridge Construction**

**Other Design Criteria Include:**

1. Provide 17’ Clearance over McFarland
2. Capacity Improvements (Add Future Lane and 10’ MUP)
3. Reduce Closure work on University Blvd. (Tie-in’s)

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**What is ABC?**

**Accelerated Bridge Construction (ABC)**

uses innovative planning, design, materials and construction methods in a safe and cost-effective manner to reduce the onsite construction time that occurs when building new bridges or replacing and rehabilitating existing bridges.

*(FHWA Accelerated Bridge Construction Manual)*
Design Considerations

When utilizing ABC:

1. Evaluate ABC Strategies
2. Risk Analysis
3. Pros and Cons for Construction and Successful Project Execution

What are the tools in our toolbox? and how can we best deploy them for this project?

ABC Design Considerations

<table>
<thead>
<tr>
<th>Innovative ABC Strategies</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefabricated Bridge Elements and Systems (PBES)</td>
<td>• Built off the critical path</td>
<td>• Higher risk than traditional bridge construction</td>
</tr>
<tr>
<td></td>
<td>• Built under controlled environmental conditions to avoid weather related impacts</td>
<td>• More expensive</td>
</tr>
<tr>
<td></td>
<td>• Improvements in safety, quality, and long-term durability</td>
<td>• Higher emphasis on precision and workmanship of rigid elements for proper fit up</td>
</tr>
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<td></td>
<td>• Reduced onsite construction time</td>
<td>• Potential for damage during transportation/additional handling</td>
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<tr>
<td></td>
<td>• Reduced road user impacts</td>
<td>• Large impact on traffic during closure weekend, but for a shorter duration</td>
</tr>
<tr>
<td></td>
<td>• Allows room for innovation</td>
<td>• Need for storage/staging area nearby</td>
</tr>
<tr>
<td>Micropiles</td>
<td>• Built off the critical path</td>
<td>• Can be a noisy and messy installation activity</td>
</tr>
<tr>
<td></td>
<td>• Built under the existing bridge</td>
<td>• Can be expensive when hitting voids in kurt geology</td>
</tr>
<tr>
<td>Pocket/Socket connections for precast substructure elements (columns and caps)</td>
<td>• Easily formed voids in precast elements using corrugated steel pipe</td>
<td>• Precision alignment over the piles or voids is more difficult</td>
</tr>
<tr>
<td></td>
<td>• Excellent structural performance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Proven to emulate the behavior of a CIP connection</td>
<td></td>
</tr>
</tbody>
</table>
ABC Design Considerations

Project Goals

Technical Review

Next Steps

Example of Precast Bridge Elements and Systems (PBES) per FHWA ABC Design Manual, Publication HIF-12-013, 2011
ABC Design Considerations

_PROJECT GOALS_

Technical Review

_NEXT STEPS_

Example Micropile detail per SIBC per Slide-In Bridge Construction Implementation Guide, December 2013

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ABC Design Considerations

_PROJECT GOALS_

Technical Review

_NEXT STEPS_

Micro Pile construction at I-24 over S. Germantown Rd. in Chattanooga, TN 2020
ABC Design Considerations

Project Goals

Technical Review

Next Steps

Example of a socket connection per LRFD Guide Specifications for Accelerated Bridge Construction, 1st Edition, 2018

ABC Design Considerations

Project Goals

Technical Review

Next Steps

SPMT bridge move at WB Poplar Ave. over I-240 in Memphis, TN 2018
## Risk Matrix Summary

### Goals and Changes

- Four Design Concepts
- Various construction methods
- Pros and Cons

### Technical Alternate Review

**Goals and Changes**

- Four Design Concepts
- Various construction methods
- Pros and Cons

**Technical Review**

**Next Steps**
### Technical Alternate Overview

#### Goals and Changes

#### Technical Review

#### Next Steps

**Concept A** – 2 span Steel; Modular Construction

- Two Span
- Steel Beams
- Near site Modular Construction

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**Concept C** – 2 span Steel; Lateral Slide

**Concept D** – 1 span Steel; Lateral Slide

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**Concepts B & E** – 2 span Concrete; Stick Build

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**Existing**

192’

44’ 52’ 52’ 44’
## Concept A

### Goals and Changes

### Technical Review

### Next Steps

### Pros
- Simple span steel modular units (SPMT)
- Use existing bent 2
- Eliminate interior bents 1 and 3
- Shallow superstructure
- Contractor can build near site lower to the ground
- Erection process is repetitive and can move quickly
- Substructure work is under the existing bridge and doesn’t affect traffic

### Cons
- Subsurface work required
- Abutment stem wall construction
- Larger crane size to lift and maneuver the modular units
- Modular unit/SPMT cost
- Closure pour rideability

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## Concepts A, B, C and E

### Goals and Changes

### Technical Review

### Next Steps

### Pros
- Bent footings and columns can be constructed under the existing bridge
- Precast bent caps can then be connected utilizing a socket connection or grouted duct connections
Concepts A, B, C and E

Goals and Changes

Technical Review

Next Steps

Example of a socket connection per LRFD Guide Specifications for Accelerated Bridge Construction, 1st Edition, 2018

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Concepts A, B, C and E

Goals and Changes

Technical Review

Next Steps

Example of a socket connection per LRFD Guide Specifications for Accelerated Bridge Construction, 1st Edition, 2018

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Example of a socket connection and grouted duct connections per LRFD Guide Specifications for Accelerated Bridge Construction, 1st Edition, 2018

Example of a precast bent elements and columns per PCI Northeast Bridge Technical Guide, 2nd Edition
Concept B

Goals and Changes

- Two Span
- Concrete Beams
- “Stick Build”

Technical Review

Next Steps
Goals and Changes

Technical Review

Next Steps

Pros

• PCC concrete beams
• Less closure time
• Shallow superstructure
• Three cranes needed
• Substructure work is under the existing bridge and doesn’t affect traffic

Cons

• Near site storage is required
• Box beams are not a typical ALDOT beam type
• Additional cantilever work needed after closure period
• Closure pour rideability
• Subsurface work required
• Abutment stem wall construction
Concept C

Goals and Changes

- Two Span
- Steel Beams
- Lateral Slide

Technical Review

Next Steps
Goals and Changes

- Eliminate interior bents 1 and 3
- Contractor can build adjacent to the existing bridge
- Smaller crane size once the beams are erected
- Substructure work is under the existing bridge and doesn’t affect traffic

Technical Review

Next Steps

Pros

Cons

- More expensive (temporary works construction and risk)
- Part of critical path in construction
- Traffic impact (rolling roadblocks) to erect beams over McFarland
- Construction of temporary bents
- Subsurface work required
- Abutment stem wall construction
Goals and Changes

Technical Review

Next Steps

- Single Span
- Steel Beams
- Lateral Slide
Concept D

Pros
- Eliminate all interior bents 1-3
- No center bent rehab/construction
- Fewer micropiles
- Contractor can build adjacent to the existing bridge
- Smaller crane size once the beams are erected
- Substructure work is under the existing bridge and doesn't affect traffic

Goals and Changes
- Need to raise profile of University much more than other options
- More expensive (temporary works construction and risk)
- Deeper/costlier steel superstructure
- Part of critical path in construction
- Traffic impact (rolling roadblocks) to erect beams over McFarland
- Construction of temporary bents
- Subsurface work required
- Abutment stem wall construction
Concepts C & D - example

Goals and Changes

Technical Review

Next Steps

Example figure showing SIBC per Slide-In Bridge Construction Implementation Guide, December 2013

Concept E

Goals and Changes

Technical Review

Next Steps

- Two Span
- Concrete NEXT Beams
- “Stick Build”
Concept E

Goals and Changes

Technical Review

Next Steps

- Two Span
- Concrete NEXT Beams
- “Stick Build”

Example of a precast bent elements and columns per PCI Northeast Bridge Technical Guide, 2nd Edition
Summary

Goals and Changes

Getting the most out of ABC

- Allows opportunities for innovation
  - High performance materials
  - Construction means & methods
- Collaboration is key
- Devil is in the details

Technical Review

Next Steps

NEXT STEPS

- Complete Geotech and Foundation Concepts
- Revise Alternates and Finalize Selection
- Complete Design
Questions?

Thank you.