Sliding Bridge

2019 Winter Meeting

Alabama Section ASCE

March 7, 2019

Wiregrass Rehabilitation Center Rotary Hall

Dothan, AL

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Thompson Engineering

Mobile, AL

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ABC
Outline

1. Accelerated Bridge Construction (ABC)
    a. Goals & Initiatives
    b. Considerations
    c. Techniques
    d. ABC Resources
    e. Design-Build Comes to Alabama DOT
2. ALDOT Ross Clark Circle Bridge Slide Project (Dothan, AL)
    a. Project Overview & Bridge Information
    b. Contract Delivery Method
    c. Bridge Slide Design & Construction Aspects
    d. Partial Time-Lapse Video During Construction
3. Q/A

Accelerated Bridge Construction (ABC)

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ABC
Goals & Initiatives

- Minimize traffic disruptions and/or road closures during bridge construction
  - Reduce user delay-related costs
- Improve work-zone safety
- Improve bridge construction quality and/or durability
- Minimize disruption to environmentally sensitive areas
- Promote standardization
- Take advantage of site accessibility and/or existing right-of-ways
- Reduce construction time
  - Accelerate the overall project
  - Utilize accelerated bridge construction techniques
- Provide another solution for bridge construction compared to traditional methods

ABC *Considerations*

- High traffic volumes
- Right-of-way
- Environmental
- Time
- Cost
- Construction quality
- Safety
- Mobility Impacts
- Availability of Prefabrication Bridge Elements
- ABC Technologies
- Planning, Design, & Construction
- Site Selection
- Contracting/Procurement/ Delivery Methods
- Construction equipment and/or means-and-methods
- Standardization
- Construction Specifications and Materials

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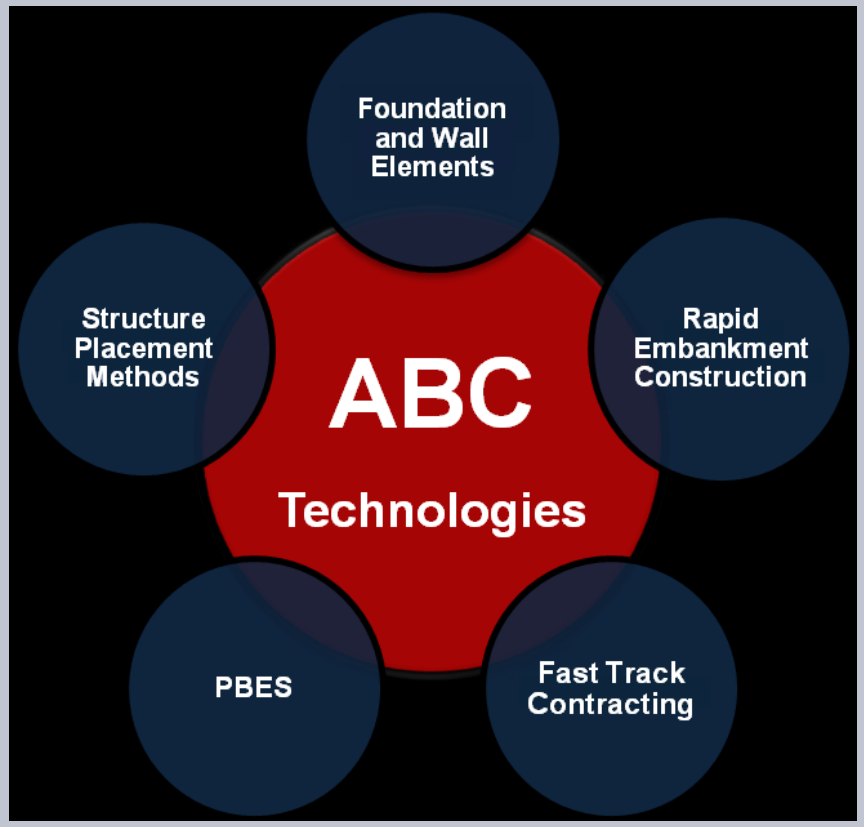
ALABAMA DEPARTMENT OF TRANSPORTATION
Enriching lives in Alabama through excellence in transportation

Accelerated Bridge Construction Technologies



- *source: FHWA Every Day Counts Initiative from USDOT/FHA Accelerated Bridge Construction Manual (Publication No. HIF-12-013)*
- ALDOT Ross Clark Circle/Dothan Bridge Slide Project utilized 3 ABC technologies:
  - Prefabricated bridge elements (i.e., prestressed girders and stay-in-place metal deck forms)
  - Fast Track Contracting (i.e., design-build and incentive/disincentive clause)
  - Structure Placement Methods (i.e., horizontal slide)

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ABC Resources/Websites

Highways for LIFE (LIFE is an acronym for Long-lasting, Innovative, Fast construction, Efficient, and safe, all characteristics of the ideal highway or bridge construction project)

www.fhwa.dot.gov/publications/publicroads/10janfeb/01.cfm

www.slideinbridgeconstruction.com/

FHWA Center for Accelerating Innovation

http://www.fhwa.dot.gov/innovation/

Every Day Counts (EDC)

www.fhwa.dot.gov/innovation/everydaycounts/

Second Strategic Highway Research Program (SHRP2)

www.fhwa.dot.gov/goshrp2/

FHWA's ABC

www.fhwa.dot.gov/bridge/abc/index.cfm

Slide In Bridge Construction

www.fhwa.dot.gov/construction/sibc/

Florida International University-Accelerated Bridge Construction University Transportation Center

https://abc-utc.fiu.edu/

ALDOT Dothan Bridge Project

www.dothanbridge.com/

Design-Build Comes to Alabama DOT

From the Design Build Institute of America (April 28, 2016)

- *"Alabama joins 35 other states where design-build is authorized for use by their State Departments of Transportation. The Governor has signed the legislation into law and is effective immediately."*
- *"The bill – sponsored by State Senator Arthur Orr – authorizes the Alabama Department of Transportation (DOT) to enter into design-build contracts for the first time. Design-build is an integrated approach to project delivery that offers design and construction services under one contract with a single point of responsibility."*
- *Various studies show design-build transportation projects are completed up to 36 percent faster, with up to 11 percent costs savings when compared to the traditional delivery method."*

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ALDOT Ross Clark Circle Bridge Slide Project (Dothan, AL)

SR-210 Ross Clark Circle Bridge over Bridge Culvert from Fortner Street to Bauman Drive

STATION 668+92

Houston County, Alabama

ALDOT Project No.: NHF-BRF-0210(506)

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ALDOT Ross Clark Circle
Project Overview

- US 231
- Built in 1950s
- Divided Four Lane
- ADT 40,000 (73,000 in 2040)
- 250 ft. Right-of-Way
- 3-barrel culvert
  - 155 ft long
  - 20’ fill
  - Structurally Deficient

- Project Rendering taken from ALDOT’s project website www.dothanbridge.com

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ALDOT Ross Clark Circle
Bridge Information

- Separate NB & SB bridges
- Single span length = 120 ft
- Gutter-to-gutter = 58 ft (NB)
- Gutter-to-gutter = 48 ft (SB)
- Cast-in-place concrete abutments on driven steel H-piles
- Precast I-girders (BT-63)
- Cast-in-place concrete deck and barriers
- Stay-in-place deck forms
- Cast-in-place concrete end slabs
- Modified cast-in-place concrete end diaphragms to accommodate the jacking equipment and loads

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ALDOT Ross Clark Circle
Contract Delivery Method

- ALDOT is the owner and project designer
- The design of the temporary construction/ABC was given to the Design-Build Team
  - The project was awarded to McInnis Construction in 2015 who partnered with Thompson Engineering for the design of the temporary construction aspects associated with the bridge slide
- ALDOT Special Provisions
  - 235 day contracting window
  - ABC-Horizontal Slide
  - Incentive Payments, Disincentive Deductions, and Liquidated Damages ($35,000/day)
    - Limit the complete road closure to less than 7-days per bridge during each slide
  - High-early concrete strength for the bridge approach/end slabs

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Contacts:
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Contacts:
Roger Earley & David Tomley

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ALDOT Ross Clark Circle
ABC Design & Construction Aspects

1. Temporary Shoring

   Used to construct the new Abutments (while maintaining traffic)

2. Temporary Falsework

   Used to support new Superstructure in preparation for bridge slide

3. Bridge Slide

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Temporary Shoring Boxes

- Cost effective
- Used material that was readily available to McInnis Construction
- Could be installed quickly at the project site
- Could be de-constructed
- Could be re-used on future projects
- Standup to the extensive traffic (40,000 ADT) with large truck volumes over several months
- Included individual component designs for the:
  - Removable upper-lid (comprised of longitudinal & transverse beams)
  - Cap beam
  - Struts
  - Columns
  - Lagging
  - Sill plate (3/4”)
  - Mats & Bearing Capacity (2000 psf)

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Temporary Shoring Pre-Fabrication Site

In order to ensure proper geometry controls and check constructability, McInnis Construction set up a pre-fabrication site at their home office to verify the temporary shoring box geometry and fit-up, pick weights and crane reach requirements, fabrication steps, transportation requirements, and de-construction sequence

Thompson Engineering coordinated the AASHTO LRFD design of the temporary shoring box with McInnis Construction in order to optimize construction means & methods.

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Temporary Shoring Lay-Down Area

Construction activities continued concurrently as the shoring boxes were built in the Lay-Down area.

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Traffic Control (inside)

A two phase traffic control was used to maintain traffic during excavation and installation of the shoring boxes. The first phase shifted traffic to the inside with excavation on the outside.

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Traffic Control (inside)

A plan note required existing traffic to be maintained during peak hours, therefore McInnis Construction installed the shoring boxes during the weekend including nighttime work to minimize impacts to traffic.

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Traffic Control (inside)

To stay within the crane capacity the upper lid and side sill plates were erected separately.

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Traffic Control (inside)

Backfilling and approach roadway asphalt being completed.

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Traffic Control (outside)

Phase two traffic control shifted traffic to the outside while construction activities were repeated on the inside.

Corner piles and timber wingwalls were installed to support the approach roadway embankment.

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Traffic Control (outside)

Excavation continued on the inside while traffic was maintained on the outside.

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Traffic Control (outside)

Shoring boxes being erected and set in the trench.

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Traffic Control (outside)

The last of the four shoring boxes being set adjacent to traffic.

Inside excavation.

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Pile Driving Preparation

After the shoring boxes were installed, pile layout and geometry control checks were made prior to pile driving.

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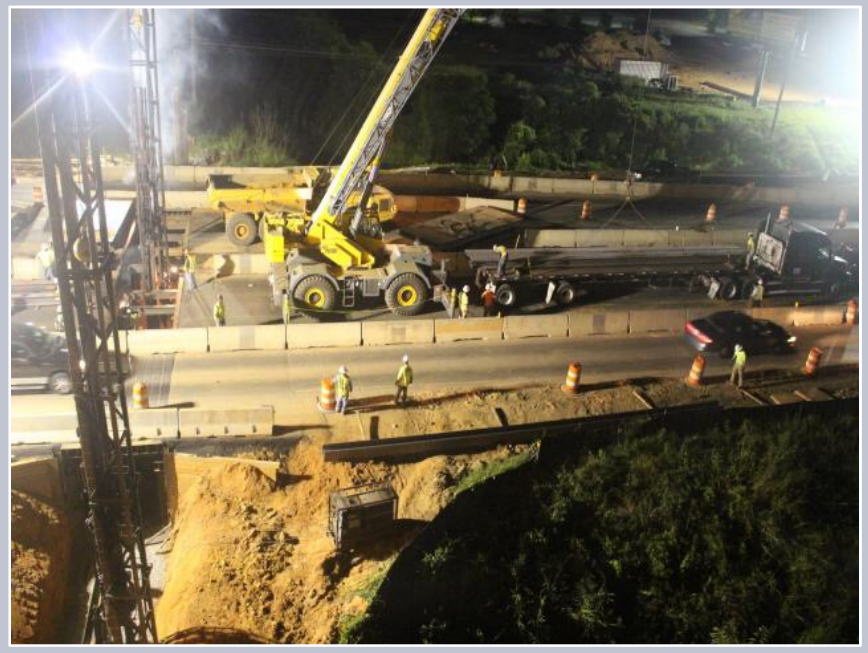
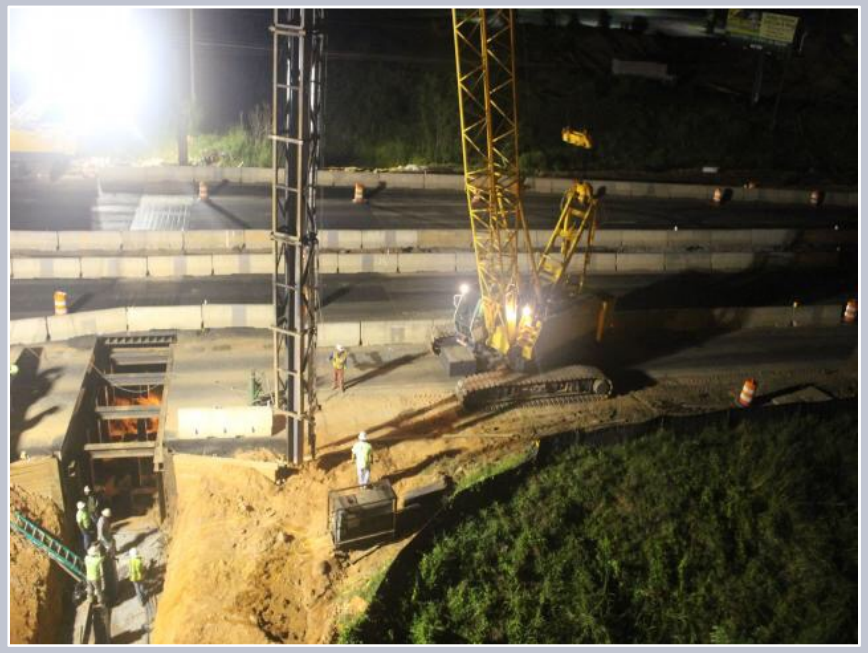
Pile Driving





A similar inside/outside traffic control was used to drive the piles after the upper lids of the shoring boxes were removed. Additional falsework piles were driven on the outside.

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ALDOT Ross Clark Circle
Site Photo

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ALDOT Ross Clark Circle
Shoring Boxes/Abutment Cap Seat

After the piles were installed the abutment cap seat was constructed.

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Temporary Falsework

Temporary falsework was installed adjacent to the new bridge location to support the new superstructure in preparation for the bridge slide.

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Precast Girder Erection

The BT-63 inch precast prestressed concrete bulb-tee girders were erected adjacent to the new bridge location on the falsework.

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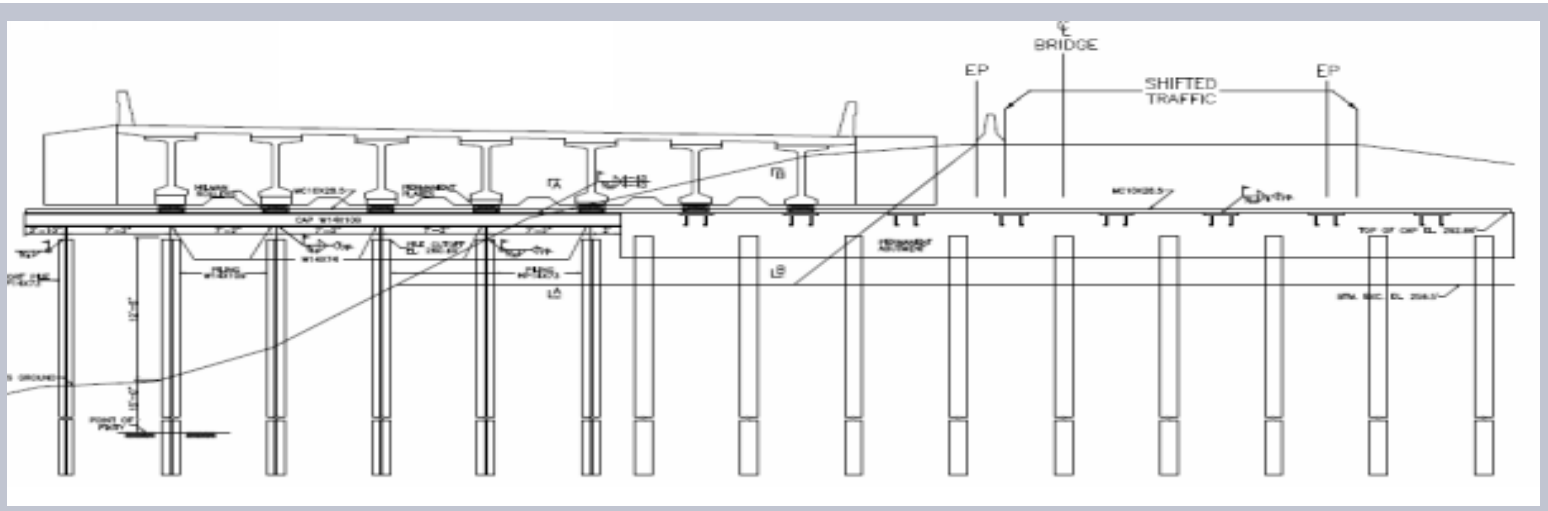
ALDOT Ross Clark Circle
Jacking Sequence



Jacking Sequence:

Step 1: use 3-50 ton jacks at each diaphragm location in between the girders to initially lift bridge to insert the MC slide track, 2-50 ton jacks, and Hilman rollers under each girder

Step 2: using 100 ton jack, slide bridge horizontally into final position

Step 3: re-install 2-50 ton jacks under each girder and remove rollers and then lower bridge into final position using 3-50 ton jacks at each diaphragm location in between the girders

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Horizontal Bridge Slide

New superstructure ready for bridge slide

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Horizontal Bridge Slide

Hillman rollers and steel channel used as a guide for the slide

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ALDOT Ross Clark Circle
Horizontal Bridge Slide

- 100-ton jack used during the slide
- Total bridge weight was 1.6M lbs for the SB bridge and 1.9M for the NB
- 3-50 ton jacks were used in between each beam to support and lower the final structure onto the abutment cap
- The bridge slide took only a few days for McInnis Construction to complete

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Time-Lapse Video

- Provided by McInnis Construction, LLC

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Q/A

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