“Whitson Bridge Replacement over North River – Tuscaloosa County - AASHTO Meets Precast”

Tuscaloosa Branch of ASCE
Thursday, October 29, 2020

Craig P. Williams, P.E., M. ASCE – Burk-Kleinpeter, Inc.
Mike Henderson – Tuscaloosa County Public Works
Whitson Bridge Replacement – AASHTO Meets Precast

- **History**
  - Location
  - Dispute
  - Truss Bridge Collapse – 1989
  - Supreme Court Ruling
  - Glued-Laminated Timber Bridge
  - Destruction by Fire

- **Design**
  - Geotechnical
  - AASHTO
  - Precast
    - Tuscaloosa County Precast Yard
Whitson Bridge Replacement – AASHTO Meets Precast

- Bid Letting
  - Award of Contract
- Construction
  - Foundations
  - Drilled Shafts
    - Bent 3 & 4 Excavation
    - Bent 3 & 4 Construction
  - Substructure
    - Bent 3 & 4 Step Caps
  - Girder Erection
  - Superstructure
    - Deck Pans
    - Superstructure Steel
    - Superstructure Concrete
- Precast
  - HP 12 x 53
  - Precast Caps
  - Precast Deck Sections
  - Precast Barrier Rails
- Completion
History

Location
- Approximately 24 miles north of Tuscaloosa on Old Jasper Road.
- 3 miles east of US-43 / SR-13
- Whitson Bridge is located over North River
- Lake Tuscaloosa was created by damming North River. It was constructed by Thornton Jones to provide water for Tuscaloosa residents and for industrial use as well. It was completed in 1970.
History

- Dispute
  - Between Taylor Henry and J.H. Willingham over Gertrude Lunceford
Dispute

- Between Taylor Henry and J.H. Willingham over Gertrude Lunceford
- Taylor Henry was killed on December 18, 1920, at the site of the steel truss of Whitson Bridge.
Gertrude (Lunceford) Henry
- (1900-2000)
- She was born in the Samantha area of Tuscaloosa County
Taylor Edwin Henry

(1899-1980)

Mr. Henry was a Navy veteran in World War I.

After Henry was killed, Gertrude and Taylor moved back to Cleveland, Tennessee, where he was from.

He was never charged with the death of Henry. It was said to have been justifiable.

Taylor and Gertrude are both buried in Cleveland, Tennessee.
Truss Bridge Collapse

- Friday, May 12, 1989
- The truss buckled due to the weight of a loaded tractor-trailer rig after the rig attempted to cross the structure, which had a 10-ton posted weight limit.
Supreme Court Ruling

- Tuscaloosa County sued the trailer’s owner, Jim Thomas Forestry Consultants, Inc. of Selma and won $100,000 in October 1991. The county appealed for more money and sought an opinion from the Alabama Supreme Court.

- From a legal standpoint, county attorneys said the landmark case cleared the way for counties to see actual replacement cost rather than the much lesser market value. Thomas Forestry attorneys estimated the value of the Whitson Bridge at $15,000.

- The county got $115,000, including interest, from the suit as well as a $60,000 grant from the U.S. Forestry Service to build a wooden bridge there.
County engineers paired up with the University of Alabama to design the structure, as well as the county’s first new wooden bridge on Old Fayette Road in October 1992. The Old Fayette Bridge was the first of its kind in the United States and possibly the world at the time, according to designer Dr. Mike Triche. Whitson Bridge was the county’s second wooden bridge and Alabama’s 10th or 11th one at the time.
Glued-Laminated Bridge

- Dr. Michael Triche was an associate professor of civil and environmental engineering at The University of Alabama. He grew up in Baton Rouge, La., and received his bachelor’s degree in agricultural engineering from LSU and went on to Purdue University for a master’s degree in agricultural engineering and a Ph.D. in civil engineering.
Glued-Laminated Bridge

- Picture shows the Glued-Laminated superstructure with rich creosote treatment.
Glued-Laminated Bridge

- Picture shows the Elevation view of the Wooden Bridge over North River
Glued-Laminated Bridge

- Picture shows the Old Rock Pier that was kept to support the glued-laminated bridge
Glued-Laminated Bridge

- Picture shows the glued-laminated bridge along centerline.
Destroyed by fire

- Wooden bridge burned in January 2017 when a group of people partying in the area threw a dry Christmas tree onto a bonfire.

Whitson Bridge in the Northern part of Tuscaloosa County, was the longest “simple span” timber structure in the United states. Simple span, simply means that it crossed the river without any supports.

Whitson Bridge was destroyed by fire around 12 midnight Saturday night and it’s believed that a group of people started a small brush fire that engulfed the bridge accidentally. The Tuscaloosa County Sheriff’s Office is still investigating according to the Tuscaloosa News. The Whitson bridge spans North River connecting Old Jasper Road and Willingham Road. Whitson Bridge was 102 feet at its longest span and was constructed in 1992.
Authorities are investigating the cause of a fire that destroyed a bridge in north Tuscaloosa County early Sunday.

Firefighters were called to Whitson Bridge around midnight, said Tuscaloosa County Sheriff Ron Abernathy. The bridge crossed North River at Old Jasper Road and Willingham Road.

The bridge was fully engulfed in flames when deputies arrived, Abernathy said.

The Samantha Volunteer Fire Department, Tuscaloosa County Road and Bridge and Tuscaloosa County Emergency Management Agency responded. Sheriff's deputies are investigating the cause of the fire, which started under the bridge.

Reach Stephanie Taylor at stephanie.taylor@tuscaloosanews.com or 205-722-0210.
Whitson Bridge – Destroyed by fire
Destroyed by fire

- Picture along the centerline of the bridge starting to burn.
Destroyed by fire

- Picture looking at the side of the bridge starting to burn.
- Wingwall shown in bottom left corner
Destroyed by fire

- Picture along the centerline
Whitson Bridge – Destroyed by fire
Destroyed by fire

- Picture taken on the day after

Whitson Bridge – Destroyed by fire
Destroyed by fire

- Aerial View after the fire
BKI was selected by Tuscaloosa County for design of the Whitson Bridge and approaches over North River on Old Jasper Road.

The total proposed bridge length was 290’ and consists of 5 – 34’ precast spans and 1 – 120’ AASHTO girder span. The contract was let for the construction of the AASTHO girder span and adjacent bents. County forces would construct the precast spans.
- TTL, Inc. performed the geotechnical work.
- Boring logs from Bent 3 and Bent 4 locations
Main Channel - Span 3 – 120’ – BT-63 Girders – 5’ Diameter Drilled Shafts
- 28’-0” Gutter to Gutter
- 10’ Lane Widths
  - 4’ shoulders

Design - AASHTO
- BT-63 Girders
- 63” Depth or 5’-3” Depth
- 5’-0” Diameter Drilled Shafts
- Bent 3 Proposed Shaft Length = 32 linear feet
- Bent 4 Proposed Shaft Length = 22 linear feet

Design - AASHTO
- Step Cap
- 9’-6 ¾” – Precast side
- 5’-0” – AASHTO Side
- 5’-6” Wide
Estimated Quantities

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<thead>
<tr>
<th>QUANTITY</th>
<th>UNIT</th>
<th>ITEM</th>
<th>DESCRIPTION</th>
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<td>MOBILIZATION</td>
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<td>STEEL REINFORCEMENT (GRADE 60)</td>
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<td>LUMP SUM</td>
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<td>STEEL REINFORCEMENT FOR BRIDGE SUPERSTRUCTURE, STA 4+83.00 APP 28400 LBS</td>
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<tr>
<td>58</td>
<td>LINEAR FOOT</td>
<td>506A-003</td>
<td>DRILLED SHAFT EXCAVATION, 5'-0&quot; DIAMETER</td>
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<tr>
<td>50</td>
<td>LINEAR FOOT</td>
<td>506B-005</td>
<td>SPECIAL DRILLED SHAFT EXCAVATION, 5'-0&quot; DIAMETER</td>
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<td>108</td>
<td>LINEAR FOOT</td>
<td>506C-044</td>
<td>DRILLED SHAFT CONSTRUCTION, 5'-0&quot; DIAMETER, CLASS DS1 CONCRETE</td>
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<td>1170</td>
<td>POUND</td>
<td>508A-000</td>
<td>STRUCTURAL STEEL</td>
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<td>$ 94</td>
<td>CUBIC YARD</td>
<td>510A-007</td>
<td>BRIDGE SUBSTRUCTURE CONCRETE</td>
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<tr>
<td>1</td>
<td>LUMP SUM</td>
<td>510C-051</td>
<td>BRIDGE CONCRETE SUPERSTRUCTURE, STA 4+83.00 APP 120 CY</td>
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<tr>
<td>320</td>
<td>SQUARE YARD</td>
<td>510E-000</td>
<td>GROOVING CONCRETE BRIDGE DECKS</td>
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<td>8</td>
<td>EACH</td>
<td>511A-053</td>
<td>ELASTOMERIC BEARING TYPE 2 (MARK B4)</td>
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<td>477</td>
<td>LINEAR FOOT</td>
<td>513B-019</td>
<td>PRETENSIONED-PRESTRESSED CONCRETE GIRDER, TYPE BT-63 (SPECIALTY ITEM)</td>
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<tr>
<td>200</td>
<td>TON</td>
<td>610C-001</td>
<td>LOOSE RIPRAP, CLASS 2</td>
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<td>300</td>
<td>SQUARE YARD</td>
<td>610D-003</td>
<td>FILTER BLANKET, GEOTEXTILE</td>
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<td>980A-001</td>
<td>GEOMETRIC CONTROLS</td>
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<td>698A-000</td>
<td>CONSTRUCTION FUEL (MAXIMUM BID LIMITED TO $ 24000)</td>
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</table>

$ BRIDGE SUBSTRUCTURE CONCRETE SHALL HAVE A 28-DAY MINIMUM COMPRESSIVE STRENGTH $f_c = 4000$ psi
Design - Precast

- Precast Spans – Spans 1,2,4,5,& 6 - 34’ Precast Bridge Sections
- HP 12x53 Pile Foundation
- Precast Channel Modifications to 34' Spans

NOTES:

1. THIS SHEET IS BASED ON STD. DRAWING PC-34-2. ALL DETAILS EXCEPT THOSE SHOWN SHALL REMAIN THE SAME.

2. END VIEWS SHOW MODIFICATIONS TO PRECAST 34'-0" CHANNEL UNITS @ PRECAST UNITS FOR SPANN. NO. 2 @ BENT NO. 3 AND SPANN. NO. 4 @ BENT NO. 4.

3. DETAILS FOR ALL OTHER UNITS TO REMAIN.
In 1989, there were 320 bridges in Tuscaloosa County, of which 248 structures were in need of replacement.

In the same year, Tuscaloosa County purchased the forms to begin pouring precast bridge components.
The first precast bridge constructed by county forces using components cast by the county was completed in 1990 - a two-span bridge on Slayton Road.

Now, in 2020 there are 217 bridges in Tuscaloosa County, of which 8 structures are in need of replacement.
Tuscaloosa County has constructed 132 precast bridges, most on the county road system, a few for the Cities of Tuscaloosa and Northport, and one for Pickens County.
Pre-Bid Conference

- Bridge replacement project on Old Jasper Road over North River in Tuscaloosa County. The total proposed bridge length is 290’ and consists of 5 – 34’ precast spans and 1 – 120’ AASHTO girder span. This contract will ONLY be for the construction of the AASTHO girder span and adjacent bents. County forces will construct the precast spans.
- The project time for construction is 80 working days. The work is to commence within 15 days after the Date of Contract. The contractor must submit a project schedule at the pre-construction conference.
- A NPDES Permit is required for this project and will be obtained by Tuscaloosa County. Tuscaloosa County forces will be responsible for erosion control on this project. The contractor shall use care during placement of the Class II riprap and filter blanket as shown on sheet 10 of 10.
### Best Management Practices
- Hindsight for Mandatory Pre-Bid Conference
- Only two contractors and a subcontractor were present
- Only one bid was submitted
- $937,980.00

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<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>APPROX QTY.</th>
<th>UNIT</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
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<td>1</td>
<td>Lump Sum</td>
<td>Mobilization and Demobilization (ALDOT 600-A)</td>
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<td>$66,000.00</td>
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<td>2</td>
<td>34700</td>
<td>Pound</td>
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<td>1</td>
<td>Lump Sum</td>
<td>Steel Reinforcement for Bridge Superstructure, STA 4+83.00 APP 28400 lbs (ALDOT 502-B)</td>
<td>$60,445.00</td>
<td>$60,445.00</td>
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<td>4</td>
<td>58</td>
<td>Linear Foot</td>
<td>Drilled Shaft Excavation, 5'-0&quot; Diameter (ALDOT 506-A)</td>
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<td>$900.00</td>
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<tr>
<td>5</td>
<td>50</td>
<td>Linear Foot</td>
<td>Special Drilled Shaft Excavation, 5'-0&quot; Diameter (ALDOT 506-B)</td>
<td>$85,000.00</td>
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<td>6</td>
<td>108</td>
<td>Linear Foot</td>
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<td>7</td>
<td>1170</td>
<td>Pound</td>
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<td>8</td>
<td>94</td>
<td>Cubic Yard</td>
<td>Bridge Substructure Concrete (ALDOT 510-A)</td>
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<td>$850.00</td>
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<td>9</td>
<td>1</td>
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<td>10</td>
<td>320</td>
<td>Square Yard</td>
<td>Grooving Concrete Bridge Decks (ALDOT 510-E)</td>
<td>$14,000.00</td>
<td>$12,400.00</td>
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<tr>
<td>11</td>
<td>8</td>
<td>Each</td>
<td>Elastomeric Bearing Type 2 (Mark B4) (ALDOT 511-A)</td>
<td>$6,000.00</td>
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<td>12</td>
<td>477</td>
<td>Linear Foot</td>
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<td>13</td>
<td>200</td>
<td>Ton</td>
<td>Loose Riprap, Class 2 (ALDOT 610-C)</td>
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<td>14</td>
<td>300</td>
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<td>Filter Blanket, Geotextile (ALDOT 610-D)</td>
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<td>$5.00</td>
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<td>15</td>
<td>1</td>
<td>Lump Sum</td>
<td>Geometric Controls (ALDOT 680-A)</td>
<td>$10,000.00</td>
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**TOTAL BASE BID**

$920,000.00

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<th>ITEM DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
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<td>Permanent Drilled Shaft Casing, 5'-0&quot; Diameter (ALDOT 506-F)</td>
<td>$17,980.00</td>
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**TOTAL ALTERNATE NO. 1**

$17,980.00

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**TOTAL BASE BID + ALTERNATE NO. 1**

$937,980.00

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<th>ALTERNATE NO. 1</th>
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<td>Mobile Controls</td>
<td>$920,000.00</td>
<td>$17,980.00</td>
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<td>Revisions</td>
<td>$937,980.00</td>
<td>$937,980.00</td>
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Fayette

Jenkins Cemetery

Based on 2/23/18

TOTAL BASE BID + ALTERNATE NO. 1

$937,980.00

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The following items shall be constructed in accordance with the 2018 Alabama Department of Transportation Standard Specifications for Highway Construction, except as modified in this contract.
- Best Management Practices
  - Tried to negotiate with the only bidder
  - County Engineer and the Commission made the decision to re-bid the project.
  - Electronic Drawings and Specifications were sent out to prior bridge contractors that we had worked with over the years
  - Pre-bid was not mandatory
  - $734,532.18 was the lowest bidder price
## Bid Letting

### Bid Tabulation

**Tuscaloosa County**  
Bridge Replacement on Old Jasper Road Over North River

**Bids Received March 6, 2019 @ 9:00 a.m.**

### Bid Schedule

**Base Bid Items**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>ITEM DESCRIPTION</th>
<th>APPROX. QTY</th>
<th>UNIT</th>
<th>PRICE</th>
<th>AMOUNT</th>
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<td>Mobilization</td>
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<td>Pound</td>
<td>$0.95</td>
<td>$32,965.00</td>
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<td>502B-000</td>
<td>Steel Reinforcement for Bridge Superstructure, STA 4+63.00 APP 28400 lbs</td>
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<td>Lump Sum</td>
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<td>$26,890.00</td>
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<td>506A-003</td>
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<td>Linear Foot</td>
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<td>$30,401.20</td>
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<td>506B-005</td>
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<td>Linear Foot</td>
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<td>$54,000.00</td>
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<td>506C-044</td>
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<td>Structural Steel</td>
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<td>Pound</td>
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<td>510A-007</td>
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<td>Cubic Yard</td>
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<td>510C-051</td>
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<td>Lump Sum</td>
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<td>$63,000.00</td>
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<td>510E-000</td>
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<td>800A-001</td>
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**Total Base Bid:** $710,093.88  
**Total Alternate Bid:** $734,532.18

**Alternate Bid Items**

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<tr>
<th>ITEM</th>
<th>ITEM DESCRIPTION</th>
<th>APPROX. QTY</th>
<th>UNIT</th>
<th>PRICE</th>
<th>AMOUNT</th>
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**Total Alternate Bid:** $24,438.30

**Total Base Bid + Alternate Bid:** $734,532.18  
**Total Base Bid + Alternate Bid:** $759,971.58

### Contractors

- **Contractor #2:** Riley Bridge Company, Inc.  
  P.O. Box 716  
  Russellville, AL 35653  
  AL LIC #14281  
  Hartford Fire Insurance Company of America  
  8501 New Watermelon Road  
  Tuscaloosa, AL 35406
  P.O. Box 240397  
  Montgomery, AL 36124

- **Contractor #3:** Travelers Casualty and Surety Company of America  
  IKAROS, LLC  
  Fidelity and Deposit Company of Maryland  
  521 Glasgow Loop  
  AL LIC #48850  
  Guin, AL 35563  
  P.O. Box 716  
  Russellville, AL 35653

- **Contractor #4:** Western Surety Company  
  Contractors  
  #2  
  Contractors  
  #3  
  Contractors  
  #4  
  TOTAL BASE BID: $710,093.88  
  TOTAL ALTERNATE BID: $24,438.30  
  TOTAL BASE BID + ALTERNATE BID: $734,532.18

**TOTAL BASE BID:** $726,616.60  
**TOTAL ALTERNATE BID:** $751,484.50  
**TOTAL BASE BID + ALTERNATE BID:** $808,000.00
The bids were opened on March 6, 2019, and the contract was awarded to Riley Bridge Company, Inc. of Russellville, AL.

They submitted a base bid of $710,093.88 and an alternate no. 1 bid of $24,438.30 for a total project bid of $734,532.18.

The project time for construction is 80 working days. The contract was awarded on March 6, 2019.
- Drilled Shaft Excavation – Bent 3
- 5’-0” Diameter Shafts
- Drilled Shaft Excavation – Bent 3
- 5’-0” Diameter Shafts
- Drilled Shaft Excavation – Bent 3
- 5’-0” Diameter Shafts
- Drilled Shaft Excavation – Bent 3
- 5’-0” Diameter Shafts
Construction - Foundations

- Drilled Shaft Excavation – Bent 3
- 5’-0” Diameter Shafts
- Drilled Shaft Excavation – Bent 4
- 5’-0” Diameter Shafts
- Drilled Shaft Excavation-
- Bent 4
- Drilled Shaft Construction – Bent 4
- 5’-0” Diameter Shafts
- Bent 3 Slope
- Step Cap – Bent 3
- Bent 3 Forms
- Step Cap – Bent 3
- Bent 3 Forms
- Step Cap – Bent 3
- Bent 3 Forms
- Step Cap – Bent 3
- Bent 4 Forms
- Step Cap – Bent 4
- Bent 4 Forms
- Step Cap & Slope – Bent 4
• Bent 4 - Step Cap
Crane Preparation for Girder Erection
- BT-63 Girder Delivery
Construction – Superstructure

- BT-63 Girder Erection
BT-63 Girder Erection
- BT-63 Girder Erection

Construction – Superstructure
Construction – Superstructure

- BT-63 Girder Erection
Stay-in place metal decking
- BT-63 Girders and Deck Pans
• Stay-in place metal decking
• Overhang Jacks
Deck prep for Steel Reinforcement

Superstructure Steel

Construction – Superstructure
- Placement of Concrete Superstructure
- Screed
Construction – Superstructure

Placement of Concrete Superstructure
- Precast Spans – Spans 1,2,4,5,& 6 - 34’ Precast Bridge Sections
  – HP 12x53 Pile Foundation
• HP 12x53
Piles and Precast Bent Cap
- Tuscaloosa County Bridge Crew working on Pile Encasements
• Tuscaloosa County Bridge Crew setting Exterior Precast Deck Sections
Tuscaloosa County Bridge Crew setting Precast Barrier Rail Sections
Construction – Precast

- Tuscaloosa County Bridge Crew setting Precast Barrier Rail Sections
Construction – Precast

- AASHTO Transition to Precast
Construction – Precast

- AASHTO Transition to Precast
Quote from District One Commissioner Stan Acker

"As the District One County Commissioner, I had to balance the need to replace the burned wooden bridge with a safe and modern concrete and steel bridge for the residents of this rural area, while staying within a budget the County could justify. This required significant cooperation with our County Engineer's office and our consulting firm to develop a rather unique solution for the bridge design. Then we had to find the right contractor for the portion done externally and tie it all together. It was just about the best example of good teamwork I have seen and the end result is a fantastic bridge that will be there long after everyone involved is gone. And, it was done on time and within budget and the residents of the area no longer have a long detour."
Quote from Commission Chairman – Judge Rob Robertson

"The Tuscaloosa County Commission is very happy with the outcome of this project. The close collaboration between public and private engineering talent resulted in an innovative, durable, and cost-effective bridge solution that will serve our community well for years to come."
Questions ???

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