CONSTRUCTION OF ALABAMA’S FIRST SINGLE POINT URBAN INTERCHANGE (SPUI)

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Project Overview

- Owner: ALDOT
- General Contractor: Brasfield & Gorrie
- Engineer: AECOM
- Contract Amount: $83,409,790.11
- Contract Completion: December 18, 2020

- I-20/59 ADT: 60,004 (2017) & 98,323 (2037)
- ≈ 4.2 miles of interstate widening
- 2 Bridge Replacements
- Decorative Lighting
Additional Lanes

Project Overview
**Bridge Replacement: Skyland Blvd**

- **Foundation**
  - 284 – 12” deep foundation H-Piles
  - estimated 7,245 LF of piling

- **4 Spans For A Total Length Over 350’**
  - 3 intermediate bents
  - 27 – 36” round columns

- **Girders**
  - 68 – BT-54 girders
  - 55’ to 105’ in length
Bridge Replacement: McFarland Blvd

- Foundation
  - 30 – 54” diameter drilled Shaft foundations
- Mass Concrete Abutments/Thrust Blocks
- Single Span of 256’-10 ¼”

- Girders
  - 7 steel tub girders
  - 6’ tall
- 2 Independent Steel Arches
  - 13 – 2 5/8” steel cables per side
Why...

• a Single Point Urban Interchange (SPUI)?
• an arch suspension bridge?
Existing Interchange

- Conventional Diamond Interchange
  - 2 sets of signals, 1 on each side
  - Congestion causing miscues up and downstream

- Poor Level of Service
  - LOS F, 113 second delay
  - Urban Area, Limited ROW
Analysis, Design, & Selection

- Modeled New Intersection Designs
- Evaluated Simulations

- Single Point Urban Interchange (SPUI)
  - Requires fewer traffic signals.
  - Improves safety.
  - Increases efficiency.
  - Improves travel time.
  - Accommodates large vehicles.
  - Level of service improvements.
SPUI & McFarland Blvd Bridge Construction

- Ramp Geometry Changes
- Simplified Construction Phases – Stages
- Foundation Installation
- Temporary Bent Construction
- Girder Installation
- Bridge Demolition
- Arch Erection

- Ribs & Welding
- Cable Installation
- Cable Tensioning & Temporary Bent Removal
- Decorative Paint Color
- Decorative Lighting
- Comparisons
Ramp Geometry Changes

• Existing

• Changes
Foundation Installation

• 30 – 54” Diameter Drilled Shafts
• 545,300 lbs Steel Reinforcement
• 1,177 cy Bridge Substructure Concrete

• 3,420 lbs Structural Steel
• 2,384,860 lbs Structural Steel Superstructure (including arch ribs approx.)
Temporary Bent Construction

- Designed By the Contractor
- HP14x117 Driven Pile Foundation
- Double W35x232 For Bent Cap

- Welded structure
- Utilized Shim Plates
- Removed After Final Arch Installation
Girder Installation

- Detailed Erection Plan and Pickup Points
- 54-hour Shutdown Window
  - complete shutdown of McFarland
  - interstate to remain open

- 20-min Rolling Roadblocks On Interstate
- Work Around University of Alabama Home Football Games
Bridge Demolition

- 54-hour Shut Down Window
- Removal of superstructure, substructure, and debris
- Developed Engineered Demolition Plan
  - avoid impacts to newly constructed bridge
  - controlled collapse of bridge focusing on “attach zones”
- 2-ft Layer of Sand To Protect Roadway
Arch Erection

• Temporary Erection Towers
  • 3 towers per side
  • 2 months to construct 6 footings,
    • Located in shoulder & 2 in median

• Erection Scheme
  • Weekday, daytime lane closures
  • Weekend, 54-hour shutdown window
Ribs & Welding

• Arch Segments Secured Via Ribs
• Weld Sections Together

• Welding Time Frame: \(\approx 5.5\) weeks
• Ribs Removed After Welding
Cable Installation

- Transfers Load To Arch
- 26 – 2 5/8” ASTM A586 Steel Cables
  - 13 each side

- Hanger Length: 12.5ft – 55.5 ft
- Avg. Max Ultimate Design Load: 367 kips
Cable Tensioning & Temporary Bent Removal

• Utilized Jacks To Remove Shims
• Estimated Max Deflection: ≈ 3”
Decorative Paint Color

- Consulted with the University of Alabama’s to color match their Crimson.
- Painted over 2 weekends.

Federal Standard 595
25488 “Crimson”
Decorative Lighting

- Consultant
  - HLB Lighting Design

- 6 Preprogramed Lighting Schemes
  1) TRAFFIC
  2) HIGH FIVE
  3) ROLL TIDE
  4) SOLEMN HOLIDAY
  5) DECEMBER HOLIDAYS
  6) FIRE WORKS
Comparisons

SPUI & McFarland Blvd. Bridge Construction

Design Renderings vs Finished Construction
Comparisons

Design Renderings
Comparisons

Finished Construction