The Longest Bridge in the West: Design and Construction of the John James Audubon Bridge

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• 13,050 LA. BRIDGES (607,751 in U.S.)
  – 8,087 ON SYSTEM (STATE)
  – 4,963 OFF SYSTEM (NON-STATE)
  – 2nd in US - 151 ARE MOVABLE (Lift, Swing, Bascule, Pontoon) BRIDGES
  – 12 Miss. River Crossings (10 Truss, 2 Cable Stay)
  – 21st in US, NUMBER OF BRIDGES
  – 4th in US, BRIDGE AREA (Length x Width)
ALTERNATE ALIGNMENTS DURING ENVIRONMENTAL PHASE

SELECTED ALIGNMENT
Project Scope

- Total Cost: $406 Million
- Project Length: 15.3 miles
- Bridge Length: 4.0 miles (main bridge & main bridge approach 4 lanes, other bridges 2 lanes)
- Roadway: 11.3 miles (2 lane, buy R/W for future 4 lane)
- First Design-Build Procurement for LA DOTD
- Opened to traffic on May 5, 2011, Other misc. work and punch list items not completed till February 2012
The Bridges

Approach Bridges for Main Span

Bridge 1
Bridge 2
Bridge 3 Main Bridge
Bridge 4
Bridge 5
Bridge 6
Bridge 7
Bridge 8
BRIDGE PROJECT FEATURES

• **Cable Stayed Superstructure Main Span:**
  - 1583 ft. longest stay cable span in Western Hemisphere
  - Galvanized and sheathed 7 wire prestressed strands and outer HDPE pipe (multi levels of protection)
  - Steel edge girders, steel floor beams
  - Precast concrete panels with latex concrete overlay
  - Concrete cast-in-place towers
  - Wind Analysis with Computer Simulation, Wind Tunnel, Wind faring plate used on main span

• **Main Span River Piers:**
  - Unique cofferdam for low water footing, first on Miss. R. with Shafts. Designed for vessel /barge impact loads.
  - Tip grouted 8’ dia. Drilled Shafts in river, Construction Techniques- Oscillated and Fully Cased
  - O(Osterburg) - Cell load testing to verify shaft load capacities
Cable-Stayed Main River Span

1583 ft main span, 1463 ft navigational clearance
Main span substructure
Tower Foundations 1W & 1E

- 160’ x 64’ x 18’ Cap
- 7 by 3 drilled shaft group
- 8’-0” diameter shafts - 21 per each pier
Tower Shafts

• 96” dia permanent casing
• 90” dia drilled shaft
• Pile tip Elev. -175 to -180
• Tip grouting
Footing Cofferdam Structure Sequence

Piles and trestle have been installed
Shaft Template
Drive Permanent Casing

• Vibratory hammer driving the casing into the ground
Drive Temporary Casing

- Temporary casing is driven inside the permanent casing with an Oscillator.
Excavate Temporary Casing – Hammer Grab or Air Lifts

90" Temporary Casing

Hammer Grabs

West - 175  East - 180

Bottom of Permanent Casing
Excavation by Air Lifts
Base grouting verification

- Pressure
- Volume
- Movement of Shaft
Install Soffit Panels
Install Bracing Frame

• Install first tier of brace frame
Erect Pre-Cast Wall

- Install pre-cast walls
- Connect to soffit panels and first tier brace frame
Install Jacking System

- Install jacking system with permanent hangers
- Lower structure to facilitate 2\textsuperscript{nd} & 3\textsuperscript{rd} tier bracing installation
Install Additional Brace Frames

- Install 2\textsuperscript{nd} and 3\textsuperscript{rd} tier brace frame.
Cofferdam Structure with Bracing
Install Follower Sheeting

• Install sheet pile
Lower Structure

- Lower structure to final elevation
- Lock off hangers
Pour Concrete Seal

- Install 8 foot concrete seal
Remove Hangers and Cut Casing

• Remove hangers
• Cut casing
Place Reinforced Pile Cap

- Place reinforced pile cap concrete
Place Pedestal Concrete

- Remove center section of level 2 strut
- Place pedestal reinforcing and concrete lift 1
- Restrut as required
- Remove center section of level 1 strut
Remove Cofferdam

- Remove sheeting
- Remove Bracing
- Patch blockouts
Main Span Towers

- 500’ high
- 136 cable stays
- 2 Crossbeams
- Top of tower is elevation 520’
- Deck Elevation is 130’
- Corbels for deck support
- Maintenance traveler under the deck
Tower Cross Section

- Anchor box sections for simple jump forming
- Cable anchorage inside tower wall
- Elevator in each leg
Tower and Cross-Beam Forms
Main span
Superstructure
Stage-by-Stage Analysis

- Structure built one segment at a time
- Precisely captures locked-in effects
- Models time-dependent effects during construction
- Required for tracking bridge geometry during construction
- Performed prior to bridge construction
Construct pier table
Pier Table Erection
Simultaneous tower and superstructure erection
Bridge Construction
Completion of Backspan and Transition Span
• Economy, simplicity and constructability
• Durability
• Accessibility
• Low maintenance
Stay System

- 7-Wire parallel strand
- Monostrand Jacking
- State-of-the-Art Corrosion Protection
  - Galvanizing
  - Grease
  - Strand PE
  - Coextruded HDPE Pipe
- Vibration suppression
- Anti-Vandilism end pipe
Joint Venture of:

- Granite Construction
- Flatiron Construction
- Parsons Transportation Group, Buckland-Taylor

LTM – LOUISIANA TIMED MANAGERS – PB, GEC, LPA Group
LA DOTD Project Manager - DOTD Bridge Design