John James Audubon Bridge

Introduction
The Project
Why build the bridge?

• The bridge--proposed to be the longest cable-stayed bridge in America--will replace an existing ferry between the communities of New Roads and St. Francisville, Louisiana.

• The bridge will also serve as the only bridge structure on the Mississippi River between Natchez, Mississippi and Baton Rouge, Louisiana (approximately 90 river miles).

• The project is part of the Zachary Taylor Parkway, a scenic highway across Louisiana from Mississippi to Texas.

• Economic development for the area.

Data provided by Louisiana ’s TIMED Program
Artist Rendering
Artist Rendering
Design/Build

Owner
Program Manager (Optional)

Design/Builder
(Often a General Contractor)

Construction Team
Quality Control
Designer
Louisiana Department of Transportation & Development

- LA DOTD is the owner of this bridge and are managing the construction with the Louisiana TIMED Program.
The Joint Venture

The $348 million dollar project is being constructed by Audubon Bridge Constructors (ABC), a joint venture consisting of:

• Flatiron Constructors (Longmont, CO)
• Granite Construction Company (Watsonville, CA)
• Parsons Transportation Group, Inc. (Washington, DC)
The Design Team

Parsons Transportation Group is the lead designer for ABC however the design tasks were distributed among various Consultants.

- Evans-Graves (Baton Rouge, LA) was responsible for Bridges 1 & 2 as well as roadways in Pointe Coupee Parish.
- GOTECH (Baton Rouge, LA) was responsible for roadways in Pointe Coupee Parish and utility coordination.
- Parsons Transportation Group (Pasadena, CA) was responsible for the approach bridges to the CSU and the foundations for the CSU.
- Buckland & Taylor (Vancouver, BC) was responsible for the cable-stayed bridge unit.
- Burk Kleinpeter (New Orleans, LA) was responsible for Bridges 4-8 as well as roadways in West Feliciana Parish and environmental work.
- PSI & Fugro were the Geotechnical Engineer for the approach Bridges.
## Overall Project Facts

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Scheduled Time to Complete</td>
<td>47 Months (February 2010)</td>
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<tr>
<td>Estimated Number of Man-Hours</td>
<td>793,000 MH</td>
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<tr>
<td>Number of Bridges</td>
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<tr>
<td>Concrete</td>
<td>99,000 CY</td>
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<tr>
<td>Reinforcing Steel</td>
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<tr>
<td>Structural Steel</td>
<td>14,500,000 LBS</td>
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<tr>
<td>Stay Cables</td>
<td>1,834,000 LBS</td>
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<tr>
<td>Asphalt</td>
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John James Audubon Bridge

Roadways
Roadways

TYPICAL PAVEMENT SECTION

1. 8" SUPERPAVE ASPHALTIC CONCRETE (LEVEL 2)
   (2" WEARING COURSE)
   (3" BINDER COURSE)
   (3" BASE COURSE)

2. 4" SUPERPAVE ASPHALTIC CONCRETE (LEVEL A)
   (2" WEARING COURSE)
   (2" BINDER COURSE)

3. CLASS II BASE COURSE (4" THICK)

4. CLASS II BASE COURSE (8" THICK)

5. OMIT

6. 4" THICK NON-PLASTIC EMBANKMENT

7. 8" CLASS II BASE COURSE (SOIL CEMENT)

8. GEOTEXTILE FABRIC
Clearing & Grubbing
Earth work and mobilizing
The Bridges

Approach Bridges

Bridge 1
Bridge 2
Bridge 3
Bridge 4
Bridge 5
Bridge 6
Bridge 7
Bridge 8
Approach Roadway Bridges

• 2 Lane and 4 Lane Configurations – Future Widening of Approach Roadway and Bridges
• LRFD Design Method
• Conventional Bridge Layouts and Construction Details- Use of Standard LA DOTD Details Such as Expansion Joints, Railing, Approach Slabs, etc.
Sample Bridge General Plan
Typical Sections
Approach Bridges
Steel Plate Girders Span the Levee
Approach Structures

- West Approaches
  - 2044’-6” long with 15 spans
  - Low Level Approach
    * Supported by PPC driven piles (six bents)
    * AASHTO Type III girders
  - High Level Approach
    * Supported by drilled shafts & PPC Piles
    * Spans 3W to 6W utilize steel plate girders
    * Spans 7W to 10W utilize Bulb Tee girders
Approach Structures

- East Approaches
  - 6780’ long with 80 spans
  - Low Level Approach
    - Supported by PPC driven piles
    - 68 Spans with AASHTO Type III girders
  - High Level Approach
    - Supported by drilled shafts & PCC piles
    - Bulb Tee girders for all spans
Drive Piles with Diesel Impact Hammer
Two-Level Template
Cutoff Piles
Steel Pipe Piles under Powerlines
Construct Bent Cap
Finished Bent Caps
Setting Type III Girders
Setting SIP Deck Pans
Bridge 2 Deck Steel over RR
Setting the Deck Screed
Pump Truck used for Deck Pours
Placing Deck Unit (3-4 spans)
Finishing the Deck Pour
## Construction Progress

<table>
<thead>
<tr>
<th>Bridge</th>
<th>EVANS-GRAVES</th>
<th>PARSONS</th>
<th>BURK-KLEINPETER</th>
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- **BUILD FOUNDATIONS**
  - EVANS-GRAVES: 100%
  - PARSONS: 100%
  - BURK-KLEINPETER: 100%

- **BUILD SUBSTRUCTURE**
  - EVANS-GRAVES: 100%
  - PARSONS: 100%
  - BURK-KLEINPETER: 100%

- **SET GIRDERS**
  - EVANS-GRAVES: 100%
  - PARSONS: 100%
  - BURK-KLEINPETER: 100%

- **FORM DECK**
  - EVANS-GRAVES: 100%
  - PARSONS: 50%
  - BURK-KLEINPETER: 100%

- **POUR DECK**
  - EVANS-GRAVES: 100%
  - PARSONS: 0%
  - BURK-KLEINPETER: 100%

- **POUR BARRIERS**
  - EVANS-GRAVES: 100%
  - PARSONS: 50%
  - BURK-KLEINPETER: 0%
Cable-Stayed Bridge

Designers
B&T, PTG, OEA, RWDI & DBA
General Arrangement

- 1583 ft main span
- 1463 ft navigational clearance provided
Key Design Features

- Light superstructure supported by 136 stay cables
- Minimum loads on foundations
- Designed for ship vessel impact
- Durability – 100 yr design life
  - Beneficial deck compression from stay cables and deck post-tensioning
  - 2 “ LTM overlay
  - 8000psi precast deck panels
  - 50ksi weathering steel protected by deck
Dead Load Analysis

- Dead load analysis is non-linear
  - Non-linear cable elements
  - Non-linear beam elements
  - Non-linear soil springs
- Structure is “tuned” for dead loads
  - Towers built tall to compensate for shortening
  - Deck built long to compensate for shortening
  - Cables installed short to compensate for stretch
Untuned Structure
Tuned Structure
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
Towers:

- 500’ high
- 136 cable stays
- Two crossbeams
- Tower top is Elev. 520
- Deck is Elev. 130
Tower Foundations 1W & 1E

- 160’ x 64’ x 15’ Cap
- 7 by 3 pile group – 1 test pile
- 8’-0” diameter shafts
Tower Shafts

- 96” dia permanent casing
- 90” dia drilled shaft
- Pile tip Elev. -175 to -180
- Tip grouting
Wind Loads

• AASHTO static wind load pressures not appropriate for long-span structures

• Three components to wind loads
  – Mean static
  – Background
  – Dynamic (Buffeting)
  – Dynamic component obtained from buffeting analysis provided by wind specialists
• Economy, simplicity and constructability
• Durability
• Accessibility
• Low maintenance
Sectional Model in Wind Tunnel
Sectional Model Tests
Aeroelastic Model Details
Aeroelastic Model in Wind Tunnel
Tower Cable Anchorages

- Steel anchorage trays for upper stays
- Concrete corbels for lower steep cables
- Crossbeams connected clear of anchorage zone
Stay System

- 7-Wire parallel strand
- Monostrand Jacking
- State-of-the-Art Corrosion Protection
  - Galvanizing
  - Grease
  - Strand PE
  - Coextruded HDPE Pipe
- Vibration suppression
Deck Anchorage
Construction Stage Modeling
Construction Stage Modeling
CSU Construction Photos
Land Based Drilled Shaft
O-cell set up
Tip Grouting Apparatus
Construction Photos – P1E Cofferdam
Question & Answer
Be sure to see the bridge model