



## Replacement of the US 90 Bridge across St. Louis Bay

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### Summary

The 3.38 km US 90 Bridge over St. Louis Bay was awarded by the Mississippi DOT five months after Hurricane Katrina destroyed the original bridge. This Design/Build Project has recently finished construction and successfully met the deadlines of opening the first two lanes by May 17<sup>th</sup> (15 months after award) and the entire bridge on February 15<sup>th</sup>. The bridge is built as two separate structures except for the navigation unit, where the deck and substructure are continuous between the eastbound and westbound structures.

**Keywords:** design build; precast; capbeams; prestressed; piles; post-tensioning; spliced girders

### 1. Introduction

When Hurricane Katrina made landfall on August 28, 2005, a vital link between the communities of Pass Christian, MS and Bay St. Louis, MS, was severed. This bridge is located approximately 1 1/2 hours east of New Orleans, LA. The storm surge of Hurricane Katrina devastated both the superstructure and substructure of the previous bridge, making replacement the only reasonable solution to reconnect the communities along historic US Highway 90. A major contributing factor in the destruction of the bridge was the superstructure clearance to the water, which ranged from approximately 4.0 m near the bridge ends to a maximum of 7.0 m at the bascule.

### 2. Preliminary Design Phase

The need for a rapid reconstruction led the Mississippi Department of Transportation (MDOT) to issue their first major design/build contract in Mississippi. With the support of the Federal Highway Administration (FHWA), a Request for Proposals (RFP) for the replacement structure was released on November 3, 2005, just slightly more than two months after Hurricane Katrina made landfall. The governing design requirements for the replacement structure, as expressed in the RFP included:

- AASHTO Standard Bridge Design Specifications [1]
- Navigational span clearances of 26.0 m (vertical) and 45.7 m (horizontal)
- Low chord of Elev. 37.00
- Four 3.66 m lanes with respective shoulders and breakdown lanes
- 3.66 m shared use path



### 3. Final Design Phase

The project bids were opened on January 25<sup>th</sup>, 2006 and the design team commenced work immediately. Construction at the site began on approximately April 30<sup>th</sup>, 2006, well ahead of completing a final set of plans. To realize such an enormous design effort in this compressed time frame, the design of the bridge was conducted in the Kansas City office of HNTB, with several designers from other offices temporarily relocating. Additionally, the design of the superstructure and substructure for Spans 63-76 were subcontracted to the Jacksonville office of Reynolds, Smith and Hills, Inc., which played a significant role in meeting the design deadlines. To achieve the first contract milestone, the design was focused to match the order of construction with select groups of pile bents, waterline footings, and beams being designed first. This provided adequate lead time for the precast suppliers.

To meet the compressed schedule, four different precast components were used within the substructure including precast/prestressed (P/S) piles, precast pile bent caps, precast soffit slabs for the waterline footings, and precast struts to join the waterline footings.

### 4. Conclusion

This project was successfully completed because of the close coordination between the design team (HNTB), the contractor (GAW), and the owner (MDOT). Additionally the advantage of using both cast-in-place and precast concrete became evident to the design/build team when reviewing alternative sections and materials in the proposal stage. Fortunately, local precast suppliers were readily able to produce these common prestressed pile and prestressed beam elements, including the haunch girder segments. Completing the substructure as quickly as possible was crucial to the success of the project as the critical path followed the pile bents. As noted, the use of precast cap beam elements played an important role in reducing the amount of time spent in the field completing these units.

By utilizing a design/build environment to its fullest potential, GAW took a project that would normally span three to four years and compressed the time frame to only 18 months. To achieve this remarkable effort of opening two lanes of a 2.1 mile bridge in just 15 months, several extraordinary achievements occurred: the bridge, geotechnical, and roadway design were completed in 4 months, the contractor drove over 1000 precast piles in just 10 months, and the contractor was able to place over 60,000 square feet of deck in one month. This project clearly demonstrated the full extent of design/build capabilities and illustrated that a team's achievement is much more than the sum of the individual parts. The result of this effort was the replacement of this bridge on the Mississippi Gulf Coast, providing a critical link for the rebuilding communities.