

In Katrina's Wake

Two bridges destroyed by Katrina are replaced, reconnecting the Mississippi Gulf Coast.

By Kent B. Dussom

Hurricane Katrina dealt a crushing blow to the Mississippi Gulf Coast on August 29th, 2005. In addition to virtually all businesses and houses within a mile of the coastline being wiped away, two critical links along the US 90 business corridor were also destroyed—the US 90 Bridge across the St. Louis Bay and the US 90 Bridge across Biloxi Bay.

Compounding the impact of the general devastation throughout the area, the urgency of restoration was heightened by the significant roles the bridges play in the economic health of the communities along the Gulf Coast. The critical need to reconnect the coastline prompted the Mississippi Department of Transportation (MDOT) to make reconstruction of the two bridges its top priority.

After surveying the situation following the storm, an executive group composed of representatives of the Federal Highway Administration (FHWA), MDOT, and the Mississippi Transportation Commission met on the coast to discuss possible solutions. The bridges had connected the coastal communities and provided access to casino operations, which were a backbone of the area's economy. Detour routes added about 20 miles and an additional 45 minutes to a trip up to Interstate 10, the only other crossing point. Road user costs were computed to average an increase of more than \$100,000 a day in gasoline costs, wasted time in traffic, and personnel time for each bridge site. The need for economic recovery in an area that had been badly crippled made early completion a crucial factor in the restoration program.

MDOT and FHWA agreed that a design-build procurement would be the

best way to approach the reconstruction project. MDOT selected URS Corporation (www.urscorp.com) to assist with the first major design-build project in the state—reconnecting both US 90 bridges across the Gulf Coast. URS personnel were provided office space at the MDOT headquarters building in Jackson, where they worked together with MDOT and FHWA staff to develop the procurement documents. Within six months following the storm, MDOT was able to procure Granite-Archer Western (contractor), a joint venture of Granite Construction Company (www.graniteconstruction.com) and Archer Western Contractors (Atlanta, GA), and HNTB Corporation (designer, www.hntb.com) as the design-build team for the St. Louis Bay project. Shortly thereafter, MDOT was able to procure Gulf Coast Constructors, a joint venture of Massman Construction Company

(Kansas City, MO), Traylor Brothers Inc. (Evansville, IN), and Kiewit Southern Company (Peachtree, GA), and Parsons Transportation Group (Chicago, IL), as the design-build team for the Biloxi Bay Project.

Following the successful procurement, URS was responsible to MDOT for construction management and quality assurance on both projects. Responsibilities for both projects included assuring the adequacy of the contractor's quality control system by random testing of materials used in the construction, observing construction methods, and inspecting the finished product to verify conformance with the standards and specifications that had been prepared by the contractors' engineers and reviewed by URS and MDOT engineers. In addition to material inspections in the field and at independent testing laboratories, URS also confirmed that construction methods, fab-



The westbound main navigation span on the US 90 Bridge over Biloxi Bay was set on April 24, 2007.



The main navigation span provides 250-ft horizontal clearance and 95-ft vertical clearance.

rication, and installation conformed to the specifications. This was accomplished by observing and documenting reinforcement and concrete placement, erosion control, earthwork compaction, pre-cast member fabrication, transport, post tensioning and placement, pile fabrication and installation, embankment and structure drainage system, asphalt placement, and maintenance of traffic operations.

St. Louis Bay Bridge

The 54-year old St. Louis Bay Bridge connected the communities of Bay St. Louis and Pass Christian along the Mississippi coastline. The destruction of the bridge resulted in the disconnect of the towns at the mouth of St. Louis Bay. As part of its rebuilding plan, MDOT determined that a replacement bridge project would need to be more modern in design and capacity to meet the current and future needs of the communities. During construction of the new bridge, ferry service was provided to relieve some of the traffic congestion that sent commuters around the bay along local roads and Interstate 10.

The new 2.1-mile bridge features two 12-ft lanes with an eight-ft inside shoulder and a ten-ft outside shoulder in each direction. There is also a 12-ft shared used lane for bicycles and pedestrians on the south side of the eastbound bridge. At the main navigation channel, the new structure has 85 ft of vertical clearance to accommodate marine traffic, an

improvement over the previous draw bridge it replaced. In addition, the new bridge was designed with higher approach elevations that account for up to 30 ft of potential storm surge. The extra height is designed to protect the structure against future hurricanes, allowing

storm surge to flow beneath it. Longer spans between piers, permitted by using prestressed beams (120 ft compared to the original's 52-ft spans) reduced costs by limiting the number of pile bents. Also, shear keys used on the ends of the deck girders to transfer lateral loads to multiple pile bents and girder bearings that resist uplift further protect the bridge from vertical and lateral water impact loads.

A number of aggressive scheduling techniques were employed to speed completion of the project. Demolition of the existing bridge took place simultaneously with pile driving operations

for the new bridge. Debris removed from the original structure was transferred by barge for man-made fishing enhancements and shoreline protection. More than a dozen cranes were used on the bridge to transport material and equipment and to install precast piles. To achieve the production rates necessary to meet the schedule, two ten-hour shifts were used six days a week for most of the construction. Sunday was reserved for equipment repair and maintenance.

An unusual problem that threatened to slow progress was the storm-induced migration of the Mississippi work force that made it difficult to find sufficient labor to meet the demanding schedule. Most of the area's population had fled for shelter from Hurricane Katrina and had not returned by the time reconstruction was starting. In an attempt to attract an adequate labor force, the contractor established work camps, offered double the minimum wage and up to 20 percent higher than that for some crafts, and relocated personnel to the area. A wage increase also was offered to those who stayed for the duration of the project, to be deposited in a lump sum at the conclusion of the project. Personnel were not the only commodity that was difficult to come by. Supplies, housing, and other necessities were hard to procure during the early days of the project.



The Biloxi Bay Bridge connects Biloxi on the west with Ocean Springs on the east. Photo by John Thomas Photography.



One of the brass plaques created by sculptor Greg Moran to be placed on the pedestrian walkway of the US 90 bridges. Artwork was selected by an artist competition that drew hundreds of submissions for about 20 spots on each bridge. The brass was recovered from the old bridge that was destroyed by Hurricane Katrina.

Biloxi Bay Project

About 30 miles further east on US 90, along the same coastline, the 1.6-mile Biloxi Bay Bridge, linking Biloxi and Ocean Springs, suffered the same fate as the St. Louis Bay Bridge. The once thriving resort and casino town of Biloxi and the quaint, main-street shopping community of Ocean Springs, with its local artisan shops and communities, were also devastated. As part of its rebuilding plan, MDOT decided that a replacement bridge would need to be designed in much the same manner as the St. Louis Bay Bridge.

Prior to the bridge being replaced, travel between the two cities took at least 45 minutes, depending on the time of day, and the traffic diverted to I-10 overloaded local connecting roads that were not designed to handle the increased detour traffic. Some 35,000 cars crossed the four-lane US 90 bridge daily before Katrina, which when combined with the already 50,000 travelers along I-10, added daily traffic to an already weary recovering community.

The original drawbridge was replaced with a higher and sturdier bridge designed to survive future storms. The new bridge provides 95 ft of vertical clearance at the navigation channel to accommodate marine traffic. Similar to the St. Louis Bay Bridge, the new Biloxi Bridge provides longer, heavier spans and shear keys on the approaches to the

high-rise navigation channel, locking the spans in place to better withstand surges. The new bridge offers three 12-ft traffic lanes, an eight-ft inside shoulder, and a ten-ft outside shoulder in each direction. The new east-bound bridge also provides a 12-ft shared biking and pedestrian path with see-through railings on the south side overlooking the Gulf of Mexico. Also included in the project was a bridge over the CSX railroad on the Ocean


Springs side. Conventional construction methods of metal and wood forms and Bidwell (Bid-Well, a TEREX Company, www.bid-well.com) finishing machines were used for bridge decks. The repetition in the design maximized efficiency with repetitive work, such as the reuse of forms.

Aesthetic Treatments

Both new bridges feature a pedestrian walkway with decorative plaques installed on bollards every one-tenth of a mile along the bridges. MDOT sponsored a call to artists for designs that symbolized the spirit of the Gulf Coast.

Over 300 hundred submissions were made for each bridge, and following a judging by the Mississippi Arts Commission, the final artwork was selected for each bridge. A local sculptor was chosen to create three-dimension plaques using the selected artwork and using bronze recovered from the old Biloxi Bay bridge that was destroyed. In addition to the physical link restored by the bridge, the artwork reflects a symbolic link connecting the past to the present.

Additionally, both bridges have ribbon lighting along the outside beams and down cast lighting on each of the piers. The subtle lighting makes the bridges a breathtaking view at night.

Both bridges are now open with all lanes in operation. The initial opening of one lane in each direction provided much needed relief to local communities. The St. Louis Bay Bridge was opened May 17, 2007, less than 21 months following Katrina. The Biloxi Bay Bridge opened November 1, 2007, less than 26 months following Katrina. The use of a design-build program expedited the reconstruction process, allowing both bridges to be fully opened (all lanes) in just over two and a half years after being destroyed by Katrina. 

Mr. Dussom, P.E., is a Transportation Group Manager, URS Corporation, Metairie, LA.



The Biloxi Bay Bridge lighting illuminates both the edge beam and the piers. Photo by John Thomas Photography.