



US 90 Bridge Over Biloxi Bay-A Design-Build Solution to Katrina Recovery

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Summary

This US\$339M design-build project includes replacement of a 2.6 kilometer long bridge over Biloxi Bay connecting the gulf coast communities of Biloxi and Ocean Springs, Mississippi that was destroyed by hurricane Katrina. The majority of the design was completed in just 6 months to allow the roadway to be opened to 1 lane of traffic in each direction by November 2007, only 18 months from notice to proceed. The entire project was completed by April 2008. This paper will focus on the strategies implemented to reconstruct the bridge in response to the disaster and reopen the bridge as quickly as possible.

Keywords: Katrina Reconstruction, Prestressed Girder, Spliced Girder, Precast Pile, Waterline Footings, Vessel Collision, Design-Build

1. Introduction

Hurricane Katrina made landfall on August 29, 2006, devastating the Gulf Coast. The US 90 Bridge over Biloxi Bay connecting Biloxi, MS to Ocean Springs, MS was one of many major highway and railroad bridges knocked out of service due to extensive storm damage. The Mississippi Department of Transportation and Federal Highway Administration elected to replace the damaged bridge with a new high level bridge utilizing the design-build project delivery method.

This fast-track US\$339 million design-build contract was awarded to GC Constructors (GCC) with Parsons as the lead design firm. GCC is a joint venture of Massman Construction Co., Traylor Brothers Inc., and Kiewit Southern Co. with Massman as the managing partner. In just 18 months from notice to proceed the bridge was required to have one lane open to traffic in each direction in November 2007 with the entire project complete in only 22 months in April 2008. The entire project is 3.9 kilometers long and includes 2.6 kilometer dual bridges over Biloxi Bay and a 244 meter long bridge over the CSX Railroad.

The original bridge consisted of low level approach spans with a bascule navigation span. The approach spans were comprised of simple span prestressed, precast girders cast integrally with the deck and spanning 16 meters. The 10 meter wide superstructure units weighed 1500 kN and were supported on pile bents.

The eye of the storm passed 97 kilometers west of Biloxi, MS. Peak wind gusts of up to 160 km/hr, a peak storm surge height of 7 meters and waves of up to 2.4 meters occurred in the bay. In general, spans that had a low-chord elevation of 7 meters or less were badly damaged while higher spans remained relatively intact. A lot of the low level superstructure units were thrown off of the pile caps and into the water with some of them even flipping upside down.

The new bridge consists of dual structures each carrying three lanes of traffic. The eastbound bridge also has a 3.66 meter shared use path. The total out to out width is 39 meters. Aesthetics were an important consideration in the design development due to the adjacent communities' desire for an attractive structure. Therefore, the fascia girders are colored blue-green using a concrete coating and formed concrete surfaces of the superstructures and substructures are colored antique ivory. The pedestrian railing along the shared use path is an ornamental aluminum picket railing. There are also three overlooks spaced along the path with a bench located at each. The outside traffic barriers are an open concrete barrier rather than the traditional, solid New Jersey configuration. At night the bridge is illuminated with a string of ornamental necklace lights attached to the fascia girders and edge accent lights on the piers.



The deck is supported by precast, prestressed bulb-tee girders at a typical spacing of approximately 3.66 meters. The roadway alignment is curved at each end to shift the new bridge's alignment 46 meters south of the original bridge.

Fig. 1: New US 90 Bridges over Biloxi Bay

The 3-span channel unit has a 76 meter main span with 61 meter side spans and is comprised of 3.66 meter deep haunched segments over the piers and modified 1981 mm deep girders for the drop-in and end segments. The piers are founded on waterline footings that are supported by precast prestressed concrete piling.

The massive reconstruction efforts along the Gulf Coast after Katrina produced an overwhelming demand on the precast industry and represented a significant supply and schedule risk for this project. Therefore, the design was developed to diversify the required precast piling and girders and minimize the specialty products that only a few precastors are capable of producing. This provided GC Constructors with significant redundancy in potential suppliers during construction should a specific precastor be unable to deliver products according to the required schedule. This is the main reason that 1828 mm girders were used extensively even though longer spans utilizing 1981 mm girders are more economical. In addition, 914 mm square piles were completely avoided due to the limited number of producers of this product even though the significant vessel collision loads are more effectively resisted with larger piles.