

A New Tied Arch to Replace a Rural Mississippi River Crossing

Greg Hasbrouck, P.E., Martin Furrer, P.E., S.E.

Parsons, Chicago, IL, USA

Contact: greg.hasbrouck@parsons.com

Abstract

The US 52 bridge over the Mississippi River provides a crucial transportation link for the region, connecting Savanna, Illinois to Sabula, Iowa with the nearest alternate Mississippi River crossing located almost 32 kilometers to the south and is now rapidly approaching the end of its useful life. The proposed replacement consists of 12 spans totalling 748 meters from a causeway in the middle of the Upper Mississippi River Wildlife and Fish Refuge in the Mississippi River on the Iowa side to the high bluffs of the Mississippi Palisades in Illinois. The 166.4-meter main span steel tied-arch over the navigation channel incorporates a floating deck system and redundancy design concepts while simplifying details. The construction of deep cofferdams in the river is eliminated in favour of large diameter drilled shafts foundations with waterline footings, the first use of this construction method by the Illinois DOT.

Keywords: bridge replacement, steel girder, tied arch, internal redundancy, fracture critical, waterline footings, drilled shafts, steel detailing, galvanizing, Mississippi River.

1 Introduction

The US 52 bridge over the Mississippi River in Savanna, Illinois was originally constructed in 1932. It provides a crucial transportation link for the region, connecting Savanna, Illinois to Sabula, Iowa with the nearest alternate Mississippi River crossing located almost 32 kilometers to the south in Fulton, Illinois. Over the years, a number of repairs have been made to the bridge, which is functionally obsolete due to its geometric configuration. It is now rapidly approaching the end of its useful life, and is in need of replacement.

Parsons was selected by the Illinois and Iowa Departments of Transportation (DOTs) to provide preliminary and final design services for replacement of the existing US 52 Mississippi River Bridge. The new replacement bridge, a rendering of which is shown in Figure 1 consists of 12 spans totalling 748 meters. The proposed structure will

extend from a causeway on the Iowa side in the middle of the Upper Mississippi River Wildlife and Fish Refuge to the high bluffs of the Mississippi Palisades in Illinois. A 166.4-meter main span steel tied arch over the navigation channel flanked by steel girder approach spans has been designed by Parsons in coordination with the Illinois and Iowa DOTs with construction to be complete by December 2017.

Challenging aspects of the project include environmental impacts, varying geotechnical conditions, a relatively deep river pool, and substantial interagency coordination with both public and private entities. The influence of the structure depth on the vertical profile along with constructability and maintenance concerns led to the selection of a main span steel tied arch with floating deck system. The significant water depth and varying rock elevations would have made