

Benicia-Martinez Bridge Seismic Retrofit

A HOCHTIEF Company

Owner

California Department of Transportation

Location

Contra Costa/Solano Counties, CA

Value

\$122,100,000

Market

Bridges - Seismic Retrofit

Start - Completion Dates

7/1998 - 5/2002

- 9,200 linear feet of grouted pipe piles drilled through existing CIDH marine pier shaft foundations
- 6,200 linear feet of new drilled diameter shafts, with rock sockets extending up to 240 feet deep
- 22 friction pendulum bearings (over 40,000 lbs each)

Project Description

This bridge was originally built in 1962 and carries more than 100,000 vehicles a day. Both the substructure and superstructure of the 10 main steel truss spans (totaling 4,894 feet) were seismically retrofitted. Construction was mostly performed over the Carquinez Straights from barge-mounted cranes, trestles, and cofferdams, without affecting traffic. Due to lack of working space within the bridge truss, a system of winches moved and hoisted the steel parts to their final positions.

Work on the deck of the bridge was limited to the replacement of expansion joints. To facilitate this and ensure safety for traffic and construction personnel, moveable traffic barriers were used to provide positive separation of traffic and work areas. Barriers were moved into place at the start of every night shift to protect work areas and moved back at the end of every night shift to provide full access of traffic.

Stability of the existing foundations, including the nine pier footings set in the water, was improved by installing grouted pipe piles through existing drilled shafts under tight tolerances, installing up to 10 additional drilled shafts at every footing, and placing tie-down anchors through spread footings. Pier footings were strengthened by new pre-stressed and reinforced concrete. New tapered exterior concrete jackets were added to each of the pier columns, while reinforced concrete was added to the interior. The steel truss superstructure was reinforced by strengthening and replacing steel members, replacing all expansion joints with larger steel joints, fixing and reinforcing expansion hinges, strengthening the lateral bracing system, adding steel members and anchors for added deck strength, and installing both friction pendulum bearings and a seismic monitoring system. The new bearings allow the bridge's substructure to move up to six feet horizontally during an earthquake with minimal displacement of the superstructure. The seismic isolation bearings used on the project are the largest friction pendulum bearings ever built, weighing over 40,000 pounds each.

Company Role

Flatiron was the prime contractor for this project.

