2003 – Carquinez Strait Bridge (Al Zampa Bridge)

Description

Meta Fields
Other Related Url 0 Other Related Link : https://dot.ca.gov/programs/engineering-services/working-with-division-of-engineering-services
Abc Construction Equipment : Float in, Strand jacks
Prefabricated Bridge Elements : Steel orthotropic box girder span, Precast cap shells
Project Delivery : Design-bid-build
Longitude : -122.22527778
Latitude : 38.0613899
State Id # : 28-0352L
Construction Equipment : Other ABC Method
Total Bridge Length Ft : 3465
Max Span Length Ft : 2389
Beam Material : Steel
Spans : Three-span
Location : Urban
Owner : State
State : CA
Year Abc Built : 2003
Other Related Url : 1
Additional Information : Caltrans Accelerated Bridge Construction Manual
Incentive Program : FEMA emergency relief funds
Funding Source : Other
Costs : The engineer's estimate for this project was $186.6 million. The low bid was $187.8 million ($1.2 million < 1% higher than engineer's estimate). There were six bidders. The bridge cost was $662 per sq ft. Funding: Bridge tolls
Contacts : Owner: Brian Boal, P.E. Senior Bridge Engineer, SFOBB - SAS California Department of Transportation Brian_Boal@dot.ca.gov 510-622-5191
Construction Method : Each tower leg was supported on a pile cap on top of six 10-ft-diameter piles (12 piles per tower). The piles were a hybrid cast-in-drilled-hole (CIDH) piles embedded up to 100 feet into bedrock. Steel shells that extended from the rock sockets to the pile cap were cut off below sea level. The pile caps consisted of a permanent precast reinforced concrete exterior shell, called the "footing form." The footing form was floated into place above the completed steel shells of the CIDH

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piles at high tide and lowered into position on the piles by the falling tide. The form was secured, sealed, and pumped dry for completion of the interior of the reinforced concrete pile caps and the upper portion of the piles within the steel shells. These were not really cofferdams but simply the first component of the pile cap. The use of conventional cofferdams was not precluded and could have been used for the foundation of the south tower if the precast shell had not been an option. The superstructure consists of a steel orthotropic box girder supported by suspender ropes along its edges. The 10-ft-deep and 95-ft-wide orthotropic box girder units were chamfered on their sides to be aerodynamically stable. The decks consist of a 5/8-inch-thick deck plate with 12-inch-deep trapezoidal closed ribs of 5/16-inch-thick plates. The 24 superstructure units were fabricated in Japan, shipped to the site, erected with strand jacks and skids, and welded together. The superstructure units were each 79 to 163 ft in length and weighed 570 to 880 tons. They could not be erected using a gantry mounted on the main cable because the adjacent bridge scheduled for demolition was only 40 to 60 ft from the new bridge. Instead, four strand jacks were mounted on a deck unit and attached to temporary strands suspended from the main cable. Some units were raised directly into their final locations and connected to their permanent suspenders. Shallow water on the south side of the strait, high bluffs on the north, and the location of the foundations of the adjacent bridge, prevented this method from being used for many of the orthotropic box girder units. Those units were raised into a temporary position, then were transferred along the main cable by a series of trapeze-like swings to their final locations in the main span, or onto temporary supports on land or on a temporary trestle, and jacked into position for final erection in the side spans.

Replacement Or New Bridge : The new westbound bridge has four traffic lanes, two 10-ft-wide shoulders, and a 12-ft-wide sidewalk. The bridge has two batter-leg concrete frame towers with classic draped cables and vertical suspender ropes to support the orthotropic box girder cross-section (note the distinction that this is an orthotropic box girder, not a box girder with an orthotropic deck). It is the first, and at this time the only, orthotropic box girder superstructure on a suspension bridge in the western hemisphere, is the first use of concrete towers on a major suspension bridge in the western hemisphere, and is the first use of pile foundations in lieu of caissons for the towers of a major suspension bridge. Precast shells were used as forms for the pile caps.

Existing Bridge Description : The existing bridge was an important link between Sacramento and the Bay Area. Built in 1927, the steel truss bridge was deteriorated and too narrow for the heavy I-80 traffic, and it was not feasible to widen it or upgrade it with a needed seismic retrofit. The bridge required replacement.

Traffic Management : Traffic management alternative, if constructed conventionally: same as ABC; new bridge built on new alignment

Average Daily Traffic At Time Of Construction : 60000

Dimensions : 3,465-ft-long and 95-ft-wide three-span steel orthotropic box girder suspension bridge (482 ft – 2,389 ft – 594 ft)

Primary Drivers : improved site constructability

Impact Category : Tier 6 (longer but reduced by months/years)

Mobility Impact Time : ABC: No traffic impact; traffic was carried on existing structure while new structure was built on new alignment Conventional: N/A

Project Location : I-80 across the Carquinez Strait, a short body of water connecting Suisun Bay to San Pablo Bay in the San Francisco Bay system

Project Summary : Steel orthotropic box girder suspension bridge on new alignment that replaced a functionally obsolete bridge that also needed a seismic retrofit.

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