

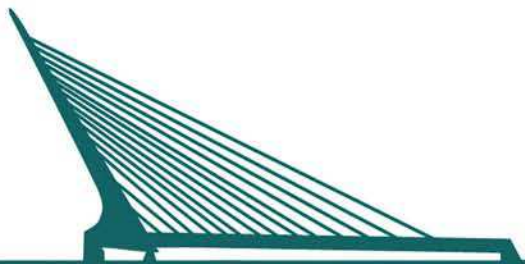


San Francisco – Oakland Bay Bridge Skyway

San Francisco Bay, California



FOCUSING ON VALUE AND EFFICIENCY, SCHWAGER DAVIS, INC. DESIGNED AND SUPPLIED THE SUPERSTRUCTURE ERECTION SCHEME, HEAVY LIFTING EQUIPMENT AND AN ALL-NEW POST-TENSIONING SYSTEM FOR THIS MAJOR U.S. SEGMENTAL BRIDGE PROJECT. THE SKYWAY WAS SUCCESSFULLY COMPLETED IN DECEMBER OF 2006 AND THE PROJECT CURRENTLY RANKS AS THE LARGEST SINGLE POST-TENSIONING CONTRACT IN U.S. CONSTRUCTION HISTORY.



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SAN FRANCISCO - OAKLAND BAY BRIDGE SKYWAY PROJECT

CONSTRUCTION OF THE 6,900 FOOT LONG skyway portion of the new San Francisco–Oakland Bay Bridge commenced in January of 2003 and was completed in December 2006. The new bridge incorporates the latest developments in seismic engineering and is designed to withstand an earthquake magnitude of 8.5 on the Richter scale as well as to have a service life of 150 years. The bridge consists of twin pre-stressed box girder structures, each carrying five traffic lanes and an emergency lane. The south structure features a 15-foot-wide pedestrian and bicycle lane along with six viewing platforms. A total of 28 piers – 14 for each structure -- support the bridges at a maximum height of 148 feet above San Francisco Bay. Although the eastern spans near the Oakland shore were built on falsework, the majority of the bridge was built using the balanced cantilever method. A total of 452 precast box girder segments weighing up to 800 tons were delivered on barges from the precast yard in Stockton, California and lifted onto the superstructure.

During planning in 2002, Joint Venture partner Kiewit Pacific contracted with Schwager Davis Inc. (SDI) to design and supply the heavy lifting system for erection of the bridge. As part of a comprehensive construction solution, SDI also designed and supplied the grouted multistrand post-tensioning system for the project. The post-tensioning contract involved the design of a new and compact anchorage system tailored specifically to address the project's highly-congested reinforcement and totaled 23 million pounds of steel. Post-tensioning operations included installation and stressing of the cantilever tendons, top and bottom slab tendons, draped web tendons and vertical post-tensioning bars in the box girder webs.

SDI's solution for the erection procedures entailed the design and fabrication of four Self Launching Erection Devices (SLEDs) that hoisted the concrete box girders onto the superstructure. Rather than opting for slower strand lifting methods, SDI's hydraulic-winch-equipped SLEDs placed the 88-foot-wide x 28-foot-deep segments in fast, repetitive cycles, thereby maximizing the project's schedule and cost-efficiency. A typical segment was lifted into place in approximately 20 minutes. The SLEDs then launched themselves forward to place successive segments in a production line manner.

The 170,000-pound lifting units, each consisting of two self-contained structural steel frames operated as unified & independent pairs at each end of the

cantilevers and were tied to the deck by 75mm post-tensioning bars embedded in the tops of the webs.

SDI's SLED design incorporated adjustable pod-type supports that adjust to changing deck slopes without shimming. The movements and adjustments of each segment were controlled in all directions to a tolerance of 1/8th inch during the lifting process.

The massive precast segments were raised by four hydraulic winches and four ten-part blocks, using high-strength 1-3/8th inch wire ropes. The dead ends of each pair of winches were connected in order to equalize the load of the segment. This simulated a three-point pick and assured load sharing among the winches. SDI also designed and supplied two integrated work platforms on the frontsides of the SLEDs to provide easy access for ironworkers to stress the post-tensioning tendons. The work platforms also included permanent rigging to support and position two 1,000-ton rams.

The final girder was lifted into position on December 6, 2005

