

Designed to Last 150 Years – The San Francisco-Oakland Bay Bridge

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ABSTRACT

The east span of the San Francisco-Oakland Bay Bridge (SFOBB) is a 3.6 km long structure that lies between two major faults, which can generate magnitude 7.5 M and 8.1 M earthquakes, respectively. Four distinct structures make up the bridge crossing, including the signature span of the bridge - the self-anchored suspension (SAS) bridge. With a length of 624 m and total deck width of 79 m accommodating 10 lanes of traffic plus a bike/ pedestrian path, it is named, in the Guinness Book of World Records, as the world's longest self-anchored suspension bridge as well as the world's widest bridge. The design life of the SFOBB is 150 years. Key considerations in design and construction include designing elements replacement after a major seismic event, proper fatigue detailing, and cable and anchorage zone dehumidification. This paper discusses the design and construction of this long span bridge to ensure optimal performance throughout its design life.

Keywords: Suspension bridge, self-anchored, seismic, orthotropic box girder, dehumidification

1 INTRODUCTION

After the 1989 Loma Prieta earthquake damaged the original East Span of the SFOBB, the California Department of Transportation determined that the safest and effective solution was a total bridge replacement. The 3.7-kilometer-long East Span of the SFOBB opened to traffic on September 2, 2013; it is one of the busiest toll bridges in the United States. The bridge is also a designated lifeline structure with a 150-year design life and must be operational for emergency vehicles shortly after the strongest ground motions engineers can expect in a 1,500-year period.

The East Span comprises four distinct yet interconnected structures: the 618-meter (m)-long self-anchored suspension (SAS) span; the 2,085-m-long segmental concrete box girder Skyway viaducts (Skyway) that sweep up from the Oakland shoreline to connect with the SAS; the 406-m-long Oakland Touchdown, which links the Skyway to California's Interstate 80; and the 570-m-long Yerba Buena Island (YBI) Transition Structure that connects the SAS to the YBI tunnel. The East Span is the longest single-tower SAS in the world and the world's widest bridge at 78.74 m. The four distinct structures of the SFOBB crossing are shown on Figure 1.

The designer TYLin/Mofatt & Nichol Joint Venture, working in conjunction with Caltrans, California's Metropolitan Transportation Commission, and the California