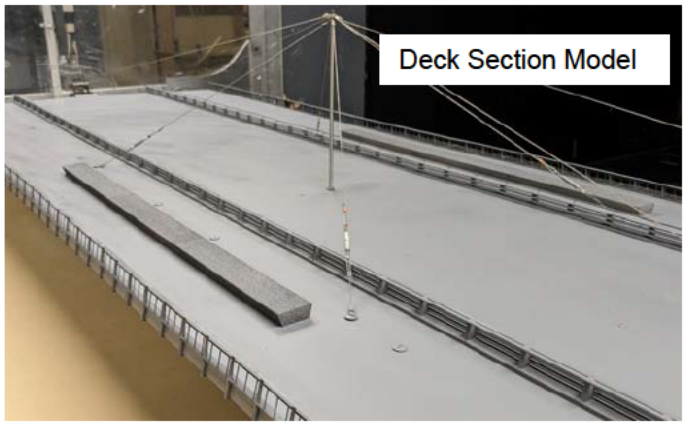
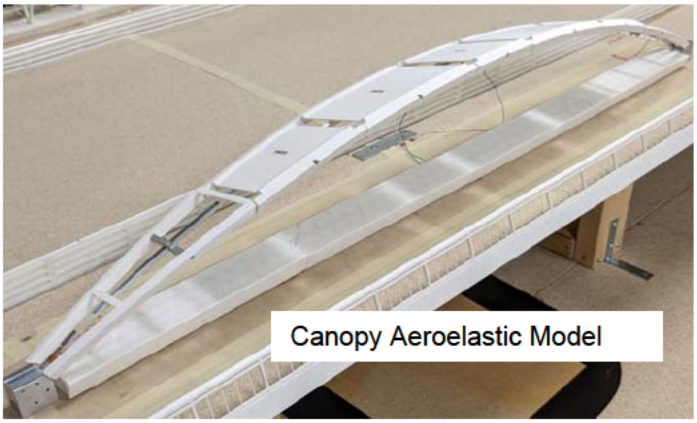
I-Street Bridge, Sacramento, CA

Wind Engineering Study





Clients: Modjeski and Masters	*Year Tested: 2024*	*Bridge Span Length: 308 ft* *Canopy Length: 105 ft*
Deck Height: ~26 ft above water *Arch Height: ~96 ft above water*	*Deck Widths: 76 ~ 109 ft*	*Deck Section Model Scale: 1 to 50* *Canopy Aeroelastic Model Scales: 1:30*

The Project

The proposed I Street Bridge is a single-span, 308-ft long arch-supported vertical-lift bridge that crosses the Sacramento River. The deck is approximately 109 ft wide at midspan, with four traffic lanes and extending pedestrian walkways. In the in-use position, the deck height is approximately 26-ft above the river. The deck features two 105-ft long architectural canopies which cover pedestrian seating, consisting of a pair of steel arches connected by steel crossbeam and taut fabric. Four towers are present at the ends of the main deck to raise the bridge.

The section model of the I-Street Bridge deck and the aeroelastic model of the Canopy were studied at the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario.

The Wind Tunnel Studies

A meteorological / site analysis was performed to evaluate the expected wind conditions at the project site. The analysis of hourly wind data is detailed to develop characteristics of wind speed and direction at the bridge site. An evaluation of turbulence characteristics at the site is also presented.

The Wind Tunnel Studies (Cont.)

The primary objectives of the section model study of the I-Street Bridge were to investigate the aeroelastic stability characteristics of the bridge deck in high wind conditions and to define the wind speeds associated with possible flutter (or galloping) instability and / or vortex shedding induced oscillation. An aim of the investigation was also to define the dynamic response characteristics of the bridge deck to turbulent wind over a full range of wind speed. A 3-D multimode desktop analysis was performed to provide the equivalent static wind loads, which are used to verify and improve the wind load distributions used for design of the bridge.

A primary objective of the Canopy aeroelastic model study was to investigate its behaviour under low turbulence conditions as well as the overall aerodynamic stability in high wind conditions. The investigation was also intended to determine its response characteristics to three-dimensional turbulent wind in expected site wind conditions over a full range of wind speeds.

An assessment of the likelihood of cable vibration due to parametric, wind and rain-wind excitation was also an important objective.

The Boundary Layer Wind Tunnel Laboratory

Western

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