Edwards Avenue Pedestrian Bridge, Santa Rosa, CA

Wind Engineering Study

Clients: Biggs Cardosa Associates Inc.	*Year Tested: 2022*	*Bridge Span Length: 751.5 ft*
Pylon Height: 142 ft	*Deck Width: 15.9 ft*	*Deck Section Model Scale: 1 to 16* *Pylon Section Model Scales: 1:5.25 and 1:6*

The Project

The proposed Edwards Avenue Pedestrian bridge is a 10-span, 751.5 ft long steel box girder pedestrian bridge, with a 231 ft cable-stayed primary span that crosses Cleveland Avenue and U.S. Route 101 in Santa Rosa, California. The deck width is 15.9 ft wide including both a pedestrian walkway and two bike lanes. A single pylon, offset from the northeast side of the main span, supports the main span via stay cables, which requires asymmetrical outriggers to be attached to the deck each side of the deck in the main span. The pylon is stabilized through a set of backstays.

The section models of the Edwards Avenue Pedestrian Bridge deck and pylon were studied at the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario.

The Wind Tunnel Studies

The design wind speeds for the Edwards Avenue Pedestrian bridge for analysis of wind loads and aerodynamic stability were calculated based on AASHTO specifications.

The Wind Tunnel Studies (Cont.)

The primary objectives of the section model study of the Edwards Avenue Pedestrian Bridge were to investigate the aeroelastic stability characteristics of the bridge deck and pylon 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 and pylon to turbulent wind over a full range of wind speed. Analytical estimates of the critical wind speeds for flutter (or galloping) and the responses of the bridge to turbulent buffeting were carried out using a 3-D multimode analysis, which integrates the findings of the experimental study with the dynamic modes and frequencies of the bridge. Another major output of the analytical study is the equivalent static wind loads, which are used to verify and improve the wind load distributions used for design of the bridge.

An assessment of the likelihood of cable vibration due to parametric, wind and rain-wind excitation was also an important objective. In addition, a desktop study of pedestrian-induced vibration based on SETRA guidelines was performed for the bridge.

The Boundary Layer Wind Tunnel Laboratory

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FSBR/ 97 / January 2025 / LK
Last Printed: January 21 2025