The 3rd Millennium Bridge, Zaragoza, Spain

Wind Engineering Study

Client: Dragados S.A. of Madrid	*Year Tested: 2007*	*Main Span: 216 m*
Arch Height above Deck: 36 m	*Deck Width: 42.66 m*	*Section Model Scale: 1:70* *Full Bridge Aeroelastic Model Scale: 1:125*

The Project

The proposed 3rd Millennium Bridge across the Ebro River in Zaragoza, Spain was part of the construction works for Expo 2008, which was held in that city. The tied-arch structure includes a precast concrete deck with integral edge box-girders supported by twin cable planes anchored to the concrete arch. The 216m main span of this cable supported bridge is flanked by two continuous side spans of 27m each. The arch springing is integral with the deck structure, forming a rigid connection and is supported on bearings at the main piers. The 42.66m wide deck is continuous over four bearings at the two main piers in addition to bearings at the abutments. The deck provides a clearance of only 8m to typical water levels, whereas the arch is 36m above the deck.

The wind tunnel tests were performed in the Boundary Layer Wind Tunnel Laboratory at the University of Western Ontario.

The Wind Tunnel Studies

A primary objective of the section model study for the deck section was to investigate the overall aeroelastic stability in high wind conditions and define the wind speeds associated with possible flutter instability and vortex shedding induced oscillation within the design criteria for wind. The investigation also served the purpose to define the dynamic response characteristics of the section to turbulent wind over a full range of wind speed and to provide information for the design of the overall structure against wind effects.

The full bridge aeroelastic model was designed and constructed to determine the response characteristics of the bridge to three dimensional turbulent flow in simulated site wind conditions, over a full range of wind speeds. The wind tunnel tests for the full bridge model were performed in the low speed test section of the boundary layer wind tunnel II.

The Boundary Layer Wind Tunnel Laboratory

Western

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