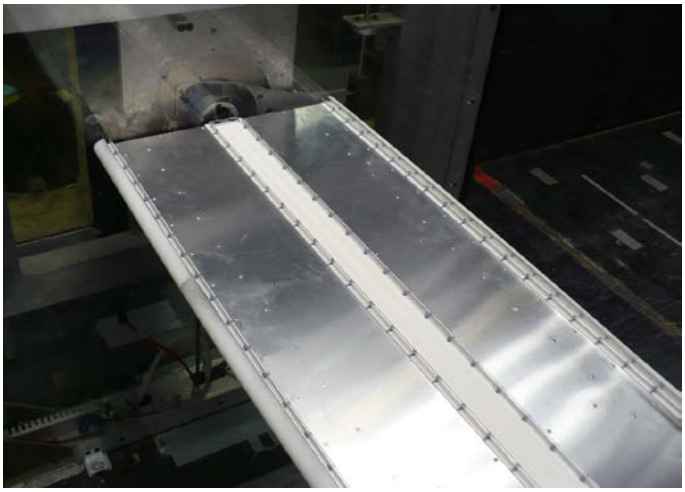
The Cultural City Bridge, Doha, Qatar

Wind Engineering Study



Owner: Public Works Authority (ASHGHAL), State of Qatar	*Design: Santiago Calatrava Mideast LLC*	*Year Tested: April 2014*
Total Span Length: 1268.8 m	*Deck Width: 32.6 m*	*Section Models: 1 to 75 scale*

The Project

The Cultural City Bridge consists of a multi-span cable-stayed bridge structure, connecting the Cultural City district to Doha's new airport. The offshore bridge connects to an immerged tunnel system at either end. Man-made islands form the interfaces between the bridge structure and the tunnels. The deck width of the bridge is 32.6 m, and the total deck span length with the eight spans together is 1268.8 m. The heights of the seven pylons range from about 95 m to 125 m.

The section model of the Cultural City Bridge was studied at the inlet to the high-speed section of BLWT II at the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario.

The Wind Tunnel Studies

A primary objective of the section model study is to investigate the aeroelastic stability of the bridge deck section in high wind conditions and to define the wind speeds associated with possible flutter or galloping instability as well as vortex shedding induced oscillation. The investigation also defines the dynamic response characteristics of the section to turbulent wind over a full range of wind speed and provides equivalent static loads, which are suitable for the design of the bridge structure against wind effects.

The Wind Tunnel Studies (Cont.)

The study was consisted of a 1 to 75 scale section model of the bridge deck section. Static section model tests were performed to obtain the static coefficients. Dynamic tests were performed in smooth flow to investigate the overall aerodynamic stability of the deck, and in grid-generated turbulent flow to define the buffeting response characteristics of the section. Aerodynamic derivative tests were also performed to study the motion related aerodynamic force parameters. The static force coefficients and the aerodynamic derivatives were then used in wind buffeting analysis and in the development of the equivalent static wind Loads for the bridge structure.

The Boundary Layer Wind Tunnel Laboratory

Western

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