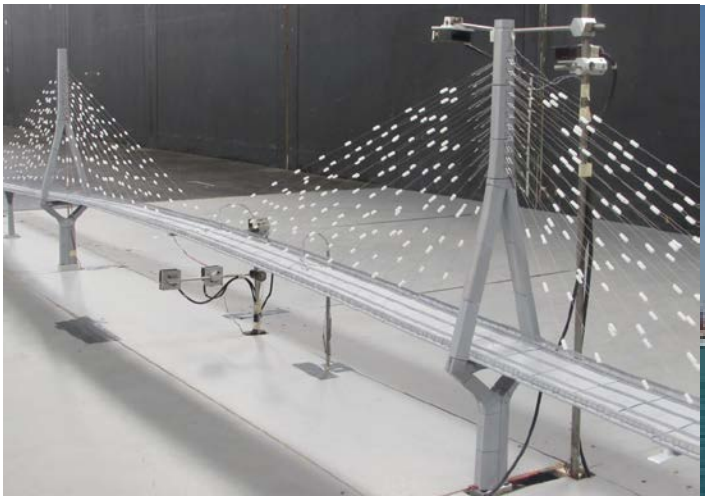
The Cadiz Bridge, Spain

Wind Engineering Study



Client: Oritia & Boreas, Spain	*Year Tested: 2015*	*Length of Bridge Span: 860 m*
Tower Heights: 180 m	*Deck Width: 35.8 m*	*Full Bridge Aeroelastic Model Scale: 1:265*

The Project

The Cadiz Bay Bridge crosses the Bay of Cadiz linking Cadiz with Puerto Real in mainland Spain. It will be the longest bridge in Spain as well as the longest cable-stayed bridge in the country. The main span of the bridge has a length of 540 m with side spans of 200 m and anchor spans of 120 m. The deck in the cable-stayed portion of the structure is comprised of a steel box shape of 35.8 m in overall width. The bridge carries two rail tracks on the North side of the deck, in addition to four lanes of traffic on the central and Southern side of the deck. The deck in the East side span and adjacent anchor spans presents a varying rotation with respect to the horizontal plane from 0 to 3.2% (0 ~ 1.8 degrees) to accommodate a sweeping horizontal curve in the alignment of the bridge. The concrete towers are 180 metres in height and are of a delta-shape above deck and a single pier shaft below deck.

The study of the wind action on the Cadiz Bridge was a joint effort by the Boundary Layer Wind Tunnel Laboratory and the Oritia & Boreas, with all wind tunnel tests performed in the Boundary Layer Wind Tunnel Laboratory at the University of Western Ontario.

The Wind Tunnel Studies

A primary objective of the full bridge aeroelastic model study was to investigate the overall aerodynamic stability of the Cadiz Bridge in high wind conditions and to define the wind speeds associated with possible aerodynamic instability and vortex shedding induced oscillation of the structure. The investigation also was to determine the response characteristics of the bridge to three dimensional turbulent wind in simulated site wind conditions over a full range of wind speeds expected at the bridge site.

A full aeroelastic model of the bridge was designed and constructed at a geometric scale of 1:265 relative to the prototype. Tested configurations of the bridge include the completed structure and a cantilevered construction stage. The construction stage presents a discontinuous deck at the midspan location of the main span as well as at two pier locations.

The wind criteria for the Cadiz Bridge were based on the wind climate study performed by Oritia & Boreas and was based on the applicable Spanish Codes of Practice.

The Boundary Layer Wind Tunnel Laboratory

Western

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