The Rande Bridge, Spain

Wind Engineering Study

Client: Oritia & Boreas, Spain	*Year Tested: 2018*	*Length of Bridge Span: 1558 m*
Tower Heights: 148 m	*Deck Width: Existing Bridge 23.7 m; Widened Bridge 47.0 m*	*Full Bridge Aeroelastic Model Scale: 1:200 Section Model Scale: 1:80*

The Project

The Rande Bridge is a cable-stayed bridge spanning Vigo Ria across the Rande Strait, linking the municipalities of Redondela and Moaña. The original bridge was built in 1978 and forms part of the Atlántico Toll road. The bridge has an overall length of length of 1,558 metres and its main span measures 401 metres. The towers of the bridge have a height of 148 metres. The existing bridge deck has an overall with of 23.7m and is comprised of a trapezoidal steel box including sloped nosings at the edges of the deck. The deck has been widened to accommodate additional traffic lanes. This has been accomplished through the addition of twin boxes, connected to the main deck through hinged trusses at a spacing of 21.08m intervals along the length of the bridge and a separate system of cable stays to modified towers. The towers are widened at the upper portion to allow for the anchorage of the additional stay system. The current study investigates the wind engineering aspects associated with the deck widening.

The study of the wind action on the Rande 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

The wind study involves aerodynamic evaluation of the major expansion of the bridge. A primary objective of the section model study for the deck section was to investigate the overall aerodynamic 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.

A primary objective of the full aeroelastic model study was to investigate the behaviour of the completed bridge under low turbulence conditions as well as the overall aerodynamic stability in high wind conditions. The definition of the wind speeds associated with possible flutter instability and vortex shedding induced oscillation of the structure was also a primary objective. The investigation was intended to determine the 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.

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