Hisgaura Bridge (Modified Design), Colombia

Wind Engineering Study

Client: Oritia & Boreas, Spain	*Year Tested: 2015*	*Total Length of Bridge Span: 580 m*
Pylon Heights: 129.9 m and 147.5 m	*Deck Width: 14.6 m*	*Deck Section Model Scale: 1 to 40*

The Project

The proposed cable-stayed bridge is to be located in eastern Columbia between the Departments of Báyaca and Santander. It has an overall length of 580 m with a main span of 330 m and flanking side spans of 125 m. The original design of the deck section is 13.7 m wide and 1.4 m deep. An edge fairing has been proposed since the initial wind studies performed for the design of the bridge which will result in a deck width of about 14.6 m and an overall depth of 2.6 m. The bridge has two traffic lanes with traffic barrier protecting a 1.1 m wide pedestrian walkway on each side of the deck. The traffic barrier and railing configuration at the edges of the deck are of an open barrier type. The towers are also of reinforced concrete to 69.0 m above deck level, with resulting overall tower heights of 147.5 m and 129.9 m for the South and North towers, respectively. The bridge deck is supported by four groupings of 32 pairs of cables, radiating from the towers to the bridge deck in a modified fan arrangement to the sides of the deck at a transverse centre-to-centre distance of 12.4 m.

The study of the wind action on the modified design of the Hisgaura 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 existing 1:40 scale section model of the bridge deck was modified to reflect the updated design of the deck section of the Hisgaura Bridge.

A primary objective of the section model study was to investigate the effects of the design change on the aeroelastic stability of the bridge in high wind conditions and to define the wind speeds associated with possible flutter instability and vortex shedding induced oscillation. An aim of the investigation was also to define the dynamic response characteristics of the bridge deck to turbulent wind over a full range of wind speed.

Analytical estimates of the critical wind speeds for flutter and the responses of the bridge to turbulent buffeting were also a primary focus of the investigation. A 3-D multimode analysis was employed, which integrates the findings of the experimental study with the dynamic modes and frequencies of the structure. Another major output of this analytical study is the equivalent static wind loads, which are used to verify and improve the wind load distributions used for design of the structure.

The wind criteria for the Hisgaura Bridge were based on the wind climate study performed by Oritia & Boreas.

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Western

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FSBR/ 66 / April 2020 / LK
Last Printed: April 7, 2020