Hisgaura Bridge, 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: 13.7 m*	*Deck Section Model Scale: 1 to 40*

The Project

The proposed cable-stayed Hisgaura Bridge is located in eastern Colombia 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 proposed deck has a 13.7 m wide, 1.4 m deep concrete deck, with a recessed 6.8 m wide trapezoidal cavity that is 1.21 m deep at the underside of the deck. This results in an edge beam at each side of the deck which also include shallow triangular leading edges. 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 pylons are also of reinforced concrete to 69.0 m above deck level, with resulting overall pylon heights of 147.5 m and 129.9 m for the South and North pylons, 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 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

A section model of the bridge deck was designed and constructed at a geometric scale of 1:40.

The primary objectives of the section model study were to investigate the aeroelastic stability characteristics of the deck in high wind conditions and to define the wind speeds associated with possible flutter instability and / or 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.

The Boundary Layer Wind Tunnel Laboratory

Western

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