The Confederation Bridge, PEI, Canada

Wind Engineering Study

Client Strait Crossing Inc.	*Engineer* Jean Muller Engineers, Inc & Stanley Engineers	*Year Tested* 1988 - 1994
Length of Superstructure 12.91 kilometres	*Main Span Lengths* 42 spans at 250 metres	*Navigation Span Deck Height* 60.3 metres
Marine Span Deck Height 49 metres	*Deck Depth* Varies 4.5 to 14 metres	*Deck Width* 12 metres

The Project

The Confederation Bridge is a two-lane precast concrete bridge between Borden Prince Edward Island and Cape Tormentine, New Brunswick in Eastern Canada over the Northumberland Straits. Alternate spans consist of rigid frame and cantilever / drop-in section designs. Wind engineering studies were carried out for the Confederation Bridge in order to optimise the design loads for wind for the bridge while under construction and after completion.

The Wind Tunnel Studies

A meteorological study, which included the analysis of existing records at six locations near the project site, comprised of both surface and upper-level data. Two important sources of data were the ferry terminals, which were located in close proximity to the abutments of the bridge.

The Wind Tunnel Studies (cont'd)

A section model study: i) for the development of static force coefficients on three representative deck depths, to be used in the wind loading model; ii) to estimate wind speeds over the deck as it would affect the drivability of the bridge and iii) with scaled dynamic structural properties of the prototype. The section model was tested in smooth flow, as well as grid generated turbulent wind.

Tests of a full aeroelastic model of the bridge in turbulent boundary layer flow included three stages of construction of typical marine and navigation spans.

A consistent design methodology was developed that integrated the wind tunnel test data with the full-scale properties of the prototype. Wind loads for each span of the bridge were defined using a gust factor approach that defined the loading for the fully completed bridge, as well as the critical double and single cantilever stages of construction.

The Boundary Layer Wind Tunnel Laboratory

Western

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FSBR/ 04 / September 2000 / PK
Last Printed: February 18, 2009