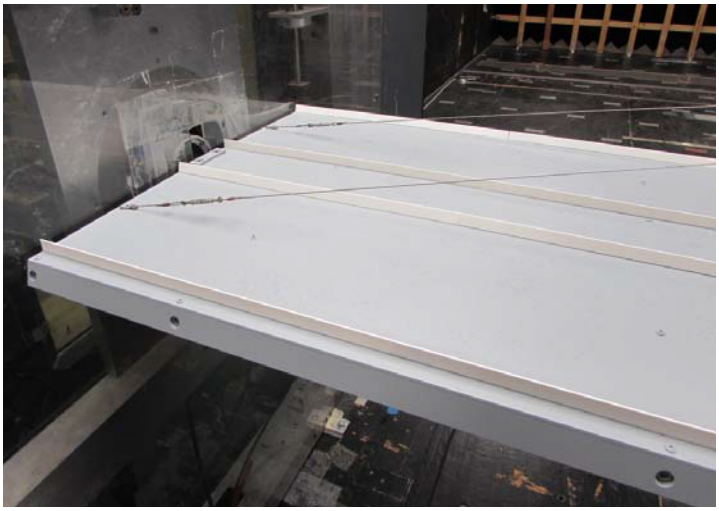
Gerald Desmond Bridge, California

Wind Engineering Study



Client: Ove Arup & Partners Ltd, Toronto	*Year Tested: 2019*	*Main Span: 610 m*
Tower Height: 157 m	*Deck Width: 47.6 m*	*Section Model Scale: 1 to 100*

The Project

The proposed Gerald Desmond Bridge replacement consists of a 610 m long main span and two 157 m tall towers, which after completion will be California's first cable-stayed bridge for vehicular traffic.

Cable-stayed structures are wind sensitive and therefore a wind tunnel study was performed to develop structure-specific aerodynamic information to facilitate the design of the bridge.

The study of the wind action on the Gerald Desmond Bridge was performed in the Boundary Layer Wind Tunnel Laboratory at the University of Western Ontario.

Wind tunnel study was performed for the following deck configurations using the section model approach:

1. The construction stage of the bare deck section.
2. The construction stage of the deck section with rebar enclosures.

The Wind Tunnel Studies

A section model of the bridge deck was designed and constructed at a geometric scale of 1:100.

The Wind Tunnel Studies (Cont.)

The model was designed and constructed in a way that the rebar enclosures can be removed and installed to reflect the different construction stages of the bridge deck under investigation.

The primary objectives of the section model study were to investigate the aerodynamic characteristics of the bridge deck for two configurations described above. The aims of the study were:

1. to provide basic aerodynamic information for the bridge deck for the construction stages considered;
2. the determination of static coefficients of the deck in smooth and turbulent flow conditions for the selected construction stages;
3. the determination of the aerodynamic admittance function in turbulent flow conditions for the construction stage of the deck section with rebar enclosures.

In the study, the section model was also instrumented with a ring of 34 pressure taps located close to the centre of the model. The pressure measurements were integrated to develop the lift, drag, and torsion forces, and then established procedures for developing the aerodynamic admittance function were applied.

The Boundary Layer Wind Tunnel Laboratory

Western

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