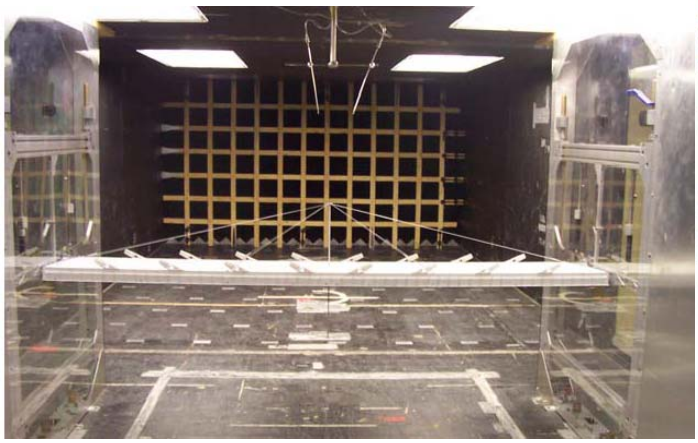
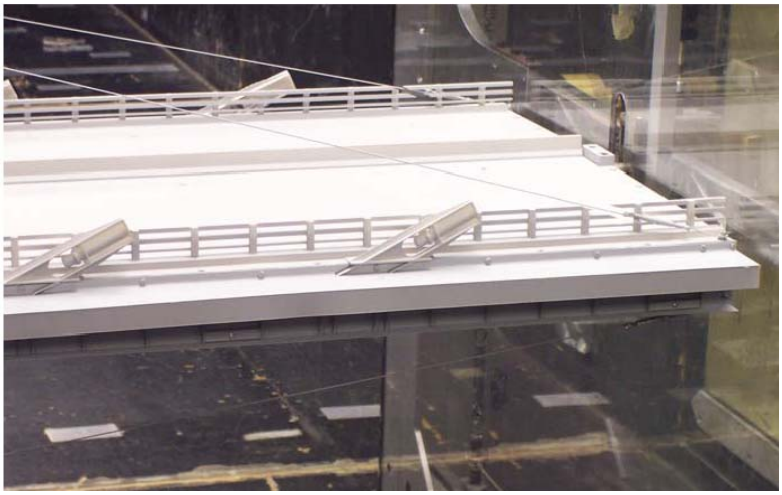
Busan-Geoje Grand Bridge, Korea

Wind Engineering Study



Basic Deck Section



Basic Deck Section with Fairing ALT0

Client: Daewoo Engineering and Construction Co. Ltd.	*Year Tested: 2004*	*Main Span: 475 m*
Pylon Height: 156 m	*Deck Width: 24 m*	*Section Model Scale: 1:50*

The Project

The proposed Busan Geoje Grand Bridge is a cable-stayed bridge with a main span of 475m, and two side spans of 222m each. The deck span cross section is 24m in width and non-symmetrical with respect to the center road barrier, with the south side 11m wide and the north side 13m wide. The two pylons are approximately 156m tall.

The following tests were performed in the Boundary Layer Wind Tunnel Laboratory at the University of Western Ontario:

1. Static section model tests to provide static coefficients;

2. Dynamic section model tests to investigate the overall stability of the basic deck section, as well as with different fairings in high wind conditions;

3. Dynamic section model tests to study the behaviour of the enhanced deck sections with respect to vortex shedding induced oscillations in smooth wind;

4. Dynamic section model tests to evaluate of the behaviour of the enhanced sections due to buffeting in turbulent wind;

5. Aerodynamic derivative tests of the optimized bridge deck section in smooth flow to provide flutter derivative parameters.

The Wind Tunnel Studies

A primary objective of the section model study was to investigate the overall aeroelastic stability of the deck in high wind conditions and define the wind speeds associated with possible flutter instability and vortex shedding induced oscillation. The investigation was performed in two stages. The purpose of the first stage was to select an optimized deck configuration which satisfied the stability criteria. The design wind speed was given as a target wind speed as specified by the design Engineers. Four deck configurations, including the basic deck section and the basic deck section with three different fairings (termed ALT0, ALT1 and ALT2) were studied in the first stage.

The second stage investigation was to study a selected deck section in more detail under different wind directions, turbulence intensity levels and damping values. The investigation also defined the dynamic response characteristics of the section to turbulent wind over a full range of wind speed and provided information for the design of the overall structure against wind effects. Three deck configurations, the main span in service (basic deck section with fairing ALT0, termed the “optimized” section), the back span in service and the main span under construction, were studied in the second stage.

The Boundary Layer Wind Tunnel Laboratory

Western

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