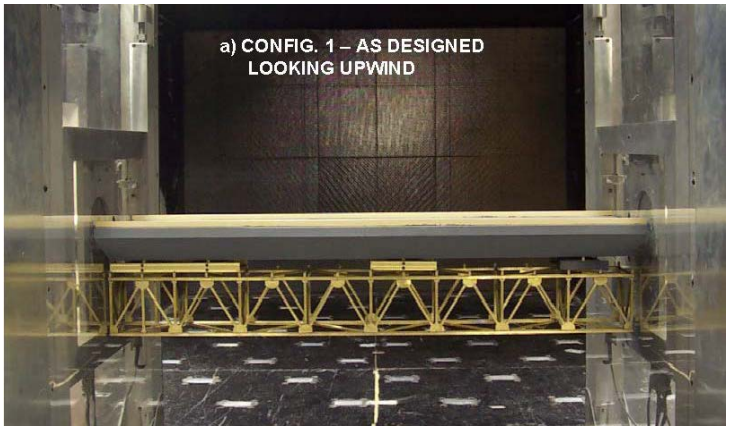
Self-Anchored Suspension Bridge – Oakland, CA

Wind Engineering Study



Deck Test Set-up

Tower Test Set-up

Clients: American Bridge / Fluor JV	*Year Tested: 2007*	*Bridge Span Length: 565 m*
Deck Width: 27.88 m	*Tower height: 160 m*	*Deck Section Model Scale: 1: 63* *Tower Section Model Scale: 1:48*

The Project

The self-anchored suspension bridge consists of a 385 m. main span and a 180 m back span. The tower is 160 m tall and comprises four steel shafts connected with intermittent steel shear links along its height. The 0.78 m diameter cable is anchored to the deck at the east bent and looped around the west bent through deviation saddles. The cables at the tower do not cross and are secured in a single saddle. The suspenders are splayed to the exterior sides of the box girders and are spaced 10 m apart. The superstructure consists of dual, hollow orthotropic steel boxes. Diaphragms spaced 5 m apart support the orthotropic deck and distribute the suspender loads to the box. The box girders are connected together by 10 m wide by 5.5 m deep crossbeams spaced 30 m apart. These crossbeams carry the transverse loads between the suspenders, which have a span of 72 m.

The wind project was studied at the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario.

The Wind Tunnel Studies

The section model of the deck and truss system was constructed at a geometric scale of 1:63 relative to prototype. The section model of the Temporary and Permanent Towers were constructed at a geometric scale of 1:48.

The Wind Tunnel Studies (Cont.)

A primary objective of the section model study was to investigate the aerodynamic force coefficients for the combined bridge deck and supporting truss system as well as typical sections of the T1 Erection Tower, Favco Tower Crane including representative stages of construction of Main Tower. The static coefficients and their slopes were intended for use in an analytical approach to define the static and dynamic wind loads of the structure while under construction. The specific aims of this study were to:

1. determine the static force coefficients from a static section model test of the combined single Orthotropic Box Girder (OBG) and supporting truss and cradle system;

2. determine the static force coefficients from a section model test of the combined T1 Erection Tower, Favco Tower Crane and portions of the Main Tower;

3. determine the proportion of the wind force coefficient determined in (2) which is attributable to a) the Main Tower and b) the T1 Erection Tower.

The section models were tested in smooth flow conditions. The Main Tower was also examined for the potential for both vortex shedding induced oscillation and galloping instability.

The Boundary Layer Wind Tunnel Laboratory

Western

The Boundary Layer Wind Tunnel Laboratory
The University of Western Ontario
Faculty of Engineering, London, Ontario
Canada, N6A 5B9 Tel: (519) 661-3338 Fax: (519) 661-3339
Internet: www.blwtl.uwo.ca E-mail: info@blwtl.uwo.ca

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